



THE UNIVERSITY OF CHICAGO
THE LAW SCHOOL
Abrams Environmental
Law Clinic

September 12, 2024

Via E-Filing

Ms. Lisa Felice
Executive Secretary
Michigan Public Service Commission
7109 West Saginaw Highway
Lansing, MI 48917

RE: MPSC Case No. U-21534

Dear Ms. Felice:

Please find enclosed the Official Exhibits DAO-251 to DAO-263 sponsored by Arjun Makhijani (Part 7 of 10) on Behalf of Soulardarity and We Want Green, Too, along with proof of service for electronic filing in the above-referenced matter. Please do not hesitate to contact me with any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark N. Templeton".

Mark N. Templeton, *pro hac vice*
6020 S. University Avenue
Chicago, IL 60637
Phone: (773) 702-9611
Email: templeton@uchicago.edu

xc: Parties to Case No. U-21534



**INSTITUTE FOR ENERGY AND
ENVIRONMENTAL RESEARCH**

*Democratizing science to protect
health and the environment*

Curriculum Vita of Arjun Makhijani

Arjun Makhijani is President of the Institute for Energy and Environmental Research in Takoma Park, Maryland. He earned his Ph.D. from the Department of Electrical Engineering and Computer Sciences at the University of California, Berkeley in 1972, specializing in nuclear fusion.

Dr. Makhijani has done extensive work on the health and environmental impacts of nuclear weapons production and testing, including U.S. testing in the Marshall Islands. He is a co-author of a comprehensive work on nuclear weapons testing, *Radioactive Heaven and Earth: The Health and Environmental Effects of Nuclear Weapons Testing In, On, and Above the Earth* (1991). From 2004 to 2018, he served on a team to provide scientific support to the presidentially-appointed Advisory Board on Radiation and Worker Health. He has served on the Radiation Advisory Committee of the Environmental Protection Agency, among other official bodies. He is currently one of the members of the Expert Panel of scientists appointed by the Pacific Islands Forum to advise it on the proposed discharge of post-treatment radioactively contaminated water from the 2011 Fukushima to the Pacific Ocean.

He is author or co-author of many books, reports, and analyses of radionuclides emissions from nuclear weapons facilities, radiological conditions at nuclear production and testing sites, worker exposures, and the risks of radiation exposure. He is principal editor and co-author of *Nuclear Wastelands: A Global Guide to Nuclear Weapons Production and Its Health and Environmental Effects*, (MIT Press, 1995 and 2000), which was nominated for a Pulitzer Prize by MIT Press in 1995. He has authored and co-authored articles in journals as varied as the *Journal of Geophysical Research*, *Bulletin of the Atomic Scientists*, *Environment*, and *Physics of Fluids*, as well as in newspapers and magazines, including the *Washington Post*.

In 2007, he was elected Fellow of the American Physical Society, an honor granted each year to at most half-a-percent of the Society's members. He was named a Ploughshares Hero, by the Ploughshares Fund (2006); was awarded the Jane Bagley Lehman Award of the Tides Foundation in 2008 and the Josephine Butler Nuclear Free Future Award in 2001; and in 1989 he received The John Bartlow Martin Award for Public Interest Magazine Journalism of the Medill School of Journalism, Northwestern University, with Robert Alvarez.

Dr. Makhijani has testified before Congress, and has appeared on ABC World News Tonight, the CBS Evening News, CBS 60 Minutes, NPR, CNN, and BBC, among others. He has served as a consultant on energy issues to utilities, including the Tennessee Valley Authority, the Edison Electric Institute, the Lawrence Berkeley Laboratory, and several agencies of the United Nations.

P.O. Box 5324, Takoma Park, MD 20913. Phone 301-509-6843. Website: www.ieer.org

Education

- Ph.D. University of California, Berkeley, 1972, from the Department of Electrical Engineering. Area of specialization: plasma physics as applied to controlled nuclear fusion. Dissertation topic: multiple mirror confinement of plasmas. Minor fields of doctoral study: statistics and physics.
- M.S. (Electrical Engineering) Washington State University, Pullman, Washington, 1967. Thesis topic: electromagnetic wave propagation in the ionosphere.
- Bachelor of Engineering (Electrical), University of Bombay, Bombay, India, 1965.

Current Employment

- 1987-present: President, Institute for Energy and Environmental Research, Takoma Park, Maryland (part-time in 1987).

Other Long-term Employment

- 2004-18: Associate, SC&A, Inc., one of the principal members of an SC&A team providing technical support to the Advisory Board on Radiation and Worker Health regarding the reconstruction of worker radiation doses under the Energy Employees Occupational Illness Compensation Program Act (under contract to the Centers for Disease Control and Prevention, U.S. Department of Health and Human Services)
- 1984-88: Associate Professor, Capitol College, Laurel, Maryland (part-time in 1988).
- 1983-84: Assistant Professor, Capitol College, Laurel, Maryland.
- 1977-79: Visiting Professor, National Institute of Bank Management, Bombay, India. Principal responsibility: evaluation of the Institute's extensive pilot rural development program.
- 1975-87: Independent consultant (see page 3 for details)
- 1972-74: Project Specialist, Ford Foundation Energy Policy Project. Responsibilities included research and writing on the technical and economic aspects of energy conservation and supply in the U.S.; analysis of Third World rural energy problems; preparation of requests for proposals; evaluation of proposals; and the management of grants made by the Project to other institutions.
- 1969-70: Assistant Electrical Engineer, Kaiser Engineers, Oakland California. Responsibilities included the design and checking of the electrical aspects of mineral industries such as cement plants, and plants for processing mineral ores such as lead and uranium ores. Pioneered the use of the desk-top computer at Kaiser Engineers for performing electrical design calculations.

Professional Societies

- Institute of Electrical and Electronics Engineers and its Power Engineering Society
- American Physical Society (Elected a Fellow in 2007)
- Health Physics Society
- American Association for the Advancement of Science

Awards and Honors

- The John Bartlow Martin Award for Public Interest Magazine Journalism of the Medill School of Journalism, Northwestern University, 1989, with Robert Alvarez
- The Josephine Butler Nuclear Free Future Award, 2001
- Ploughshares Hero, Ploughshares Fund, 2006

- Elected a Fellow of the American Physical Society, 2007, *“For his tireless efforts to provide the public with accurate and understandable information on energy and environmental issues”*
- Jane Bagley Lehman Award of the Tides Foundation, 2007/2000

Advisory Groups and Committees

- December 2021-December 2023: Member of the Panel of Independent Global Experts on Nuclear Issues appointed by the Pacific Islands Forum.
- 2015-present: Member, Mitigation Working Group of the Maryland Commission on Climate Change
- 2013-present: Member, Advisory Council, Maryland Clean Energy Center, 2013-2015
- 1992-1994: Committee Member, Radiation Advisory Committee, Science Advisory Board, U.S. Environmental Protection Agency
- 2006: Invited Faculty Member, Center for Health and the Global Environment, Harvard Medical School: Annual Congressional Course, Environmental Change: The Science and Human Health Impacts, April 18-19, 2006, Lecture Topic: An Update on Nuclear Power - Is it Safe?

Consulting Experience, 1975-1987

Consultant on a wide variety of issues relating to technical and economic analyses of alternative energy sources; electric utility rates and investment planning; energy conservation; analysis of energy use in agriculture; US energy policy; energy policy for the Third World; evaluations of portions of the nuclear fuel cycle.

Partial list of institutions to which Arjun Makhijani was a consultant in the 1975-87 period:

- Tennessee Valley Authority
- Lower Colorado River Authority
- Federation of Rocky Mountain States
- Environmental Policy Institute
- Lawrence Berkeley Laboratory
- Food and Agriculture Organization of the United Nations
- International Labour Office of the United Nations
- United Nations Environment Programme
- United Nations Center on Transnational Corporations
- The Ford Foundation
- Economic and Social Commission for Asia and the Pacific
- United Nations Development Programme

Languages

- English, French, Hindi, Sindhi, and Marathi

Publications -- Reports, Books, and Articles (Partial list)

(Newsletter articles, most newspaper articles, excerpts from publications reprinted in books and magazines or adapted therein, and other similar publications are not listed below. Numerous reports

authored or co-authored prepared for the Advisory Board on Radiation and Worker Health are not listed below.)

Hower, G.L., and A. Makhijani, "Further Comparison of Spread-F and Backscatter Sounder Measurements," *Journal of Geophysical Research* 74 (1969): 3723.

Makhijani, A., and A.J. Lichtenberg, *An Assessment of Energy and Materials Utilization in the U.S.A.*, University of California Electronics Research Laboratory, Berkeley, 1971.

Logan, B. G., A.J. Lichtenberg, M. Lieberman, and A. Makhijani, "Multiple-Mirror Confinement of Plasmas," *Physical Review Letters* 28 (1972): 144-147.

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Exploring Energy Choices: A Preliminary Report, The Ford Foundation, New York, New York, 1974. One of many co-authors.

A Time to Choose: America's Energy Future, final report of the Ford Foundation Energy Policy Project, Ballinger, Cambridge, 1974. One of many co-authors.

Makhijani, A., and A. Poole, *Energy and Agriculture in the Third World*, Ballinger, Cambridge, 1975.

Makhijani, A., *Energy Policy for the Rural Third World*, International Institute for Environment and Development, London, 1976.

Kahn, E., M. Davidson, A. Makhijani, P. Caeser, and S. Berman, *Investment Planning in the Energy Sector*, Lawrence Berkeley Laboratory, Berkeley, 1976.

Makhijani, A., "Solar Energy for the Rural Third World," *Bulletin of the Atomic Scientists*, May 1977.

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Makhijani, A., *Some Questions of Method in the Tennessee Valley Authority Rate Study*, Report to the Tennessee Valley Authority, Chattanooga, 1978.

Makhijani, A., *The Economics and Sociology of Alternative Energy Sources*, Economic and Social Commission for Asia and the Pacific, 1979

Makhijani, A., *Energy Use in the Post-Harvest Component of the Food Systems in Ivory Coast and Nicaragua*, Food and Agriculture Organization of the United Nations, Rome, 1982.

Makhijani, A., *Oil Prices and the Crises of Debt and Unemployment: Methodological and Structural Aspects*, International Labour Office of the United Nations, Final Draft Report, Geneva, April 1983.

Makhijani, A., and D. Albright, *The Irradiation of Personnel at Operation Crossroads*, International Radiation Research and Training Institute, Washington, D.C., 1983.

Makhijani, A., K.M. Tucker, with Appendix by D. White, *Heat, High Water, and Rock Instability at Hanford*, Health and Energy Institute, Washington, D.C., 1985.

Makhijani, A., and J. Kelly, *Target: Japan - The Decision to Bomb Hiroshima and Nagasaki*, July 1985, a report published as a book in Japanese under the title, *Why Japan?*, Kyoikusha, Tokyo, 1985.

Makhijani, A., *Experimental Irradiation of Air Force Personnel During Operation Redwing - 1956*, Environmental Policy Institute, Washington, D.C., 1985.

Makhijani, A., and R.S. Browne, "Restructuring the International Monetary System," *World Policy Journal* (Winter 1985-86).

Makhijani, A., R. Alvarez, and B. Blackwelder, *Deadly Crop in the Tank Farm: An Assessment of Management of High-Level Radioactive Wastes in the Savannah River Plant Tank Farm*, Environmental Policy Institute, Washington, D.C., 1986.

Makhijani, A., "Relative Wages and Productivity in International Competition," *College Industry Conference Proceedings*, American Society for Engineering Education, Washington, D.C., 1987.

Makhijani, A., *An Assessment of the Energy Recovery Aspect of the Proposed Mass Burn Facility at Preston, Connecticut*, Institute for Energy and Environmental Research, Takoma Park, 1987.

Makhijani, A., R. Alvarez, and B. Blackwelder, *Evading the Deadly Issues: Corporate Mismanagement of America's Nuclear Weapons Production*, Environmental Policy Institute, Washington, D.C., 1987.

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Makhijani, A., *Release Estimates of Radioactive and Non-Radioactive Materials to the Environment by the Feed Materials Production Center, 1951-85*, Institute for Energy and Environmental Research, Takoma Park, 1988

Alvarez, R., and A. Makhijani, "The Hidden Nuclear Legacy," *Technology Review* 91 (1988): 42-51.

Makhijani, A., Annie Makhijani, and A. Bickel, *Saving Our Skins: Technical Potential and Policies for the Elimination of Ozone-Depleting Chlorine Compounds*, Environmental Policy Institute and Institute for Energy and Environmental Research, Takoma Park, 1988.

Makhijani, A., Annie Makhijani, and A. Bickel, *Reducing Ozone-Depleting Chlorine and Bromine Accumulations in the Stratosphere: A Critique of the U.S. Environmental Protection Agency's Analysis and Recommendations*, Institute for Energy and Environmental Research and Environmental Policy Institute/Friends of the Earth, Takoma Park, 1989.

Makhijani, A., and B. Franke, *Addendum to Release Estimates of Radioactive and Non- Radioactive Materials to the Environment by the Feed Materials Production Center, 1951-85*, Institute for Energy and Environmental Research, Takoma Park, 1989.

Makhijani, A., *Global Warming and Ozone Depletion: An Action Program for States*, Institute for Energy and Environmental Research, Takoma Park, 1989.

Makhijani, A., *Managing Municipal Solid Wastes in Montgomery County*, Prepared for the Sugarloaf Citizens Association, Institute for Energy and Environmental Research, Takoma Park, 1990.

Saleska, S., and A. Makhijani, *To Reprocess or Not to Reprocess: The Purex Question - A Preliminary Assessment of Alternatives for the Management of N-Reactor Irradiated Fuel at the U.S. Department of Energy's Hanford Nuclear Weapons Production Facility*, Institute for Energy and Environmental Research, Takoma Park, 1990.

Makhijani, A., "Common Security is Far Off," *Bulletin of the Atomic Scientists*, May 1990.

Makhijani, A., Amanda Bickel, and Annie Makhijani, "Still Working on the Ozone Hole: Beyond the Montreal Protocol," *Technology Review* 93 (May/June 1990): 52-59.

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Mehta, P.S., S.J. Mehta, A.S. Mehta, and A. Makhijani, "Bhopal Tragedy's Health Effects: A Review of Methyl Isocyanate Toxicity," *JAMA* 264 (December 5, 1990): 2781-2781.

Special Commission of International Physicians for the Prevention of Nuclear War and the Institute for Energy and Environmental Research, *Radioactive Heaven and Earth: The Health and Environmental Effects of Nuclear Weapons Testing In, On, and Above the Earth*, Apex Press, New York, 1991. One of many co-authors.

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U.S. Government Printing Office, Washington, DC, January 1991. One of many contractors to the OTA Project Staff.

U.S. Congress, Office of Technology Assessment, *Fueling Development: Energy Technologies for Developing Countries*, OTA-E-516, U.S. Government Printing Office, Washington, DC, April 1992. One of many contractors to the OTA Project Staff.

Saleska, S., and A. Makhijani, *Environmental Issues at Sequoyah Fuels Corporation's Uranium Conversion Plant near Gore, Oklahoma*, Institute for Energy and Environmental Research, Takoma Park, July 20, 1992.

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Principal author of three chapters in Schwartz, S., ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons Since 1940*, Brookings Institution, Washington, D.C., 1998.

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Makhijani, A., *Plutonium End Game: Managing Global Stocks of Separated Weapons-Usable Commercial and Surplus Nuclear Weapons Plutonium*, Institute for Energy and Environmental Research, Takoma Park, January 2001.

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Makhijani, A., *Ecology and Genetics: An Essay on the Nature of Life and the Problem of Genetic Engineering*. New York: Apex Press, 2001.

Makhijani, A., "Burden of Proof," *Bulletin of the Atomic Scientists*, July/August 2001.

Makhijani, A., "Reflections on September 11, 2001," in Kamla Bhasin, Smitu Kothari, and Bindia Thapar, eds., *Voices of Sanity: Reaching Out for Peace*, Lokayan, New Delhi, 2001, pp. 59-64.

Makhijani, A., and Michele Boyd, *Poison in the Vadose Zone: An examination of the threats to the Snake River Plain aquifer from the Idaho National Engineering and Environmental Laboratory*, Institute for Energy and Environmental Research, Takoma Park, October 2001.

Makhijani, A., *Securing the Energy Future of the United States: Securing the Energy Future of the United States: Oil, Nuclear, and Electricity Vulnerabilities and a Post-September 11, 2001 Roadmap for Action*, Institute for Energy and Environmental Research, Takoma Park, November 2001.

Makhijani, A., and Sriram Gopal, *Setting Cleanup Standards to Protect Future Generations: The Scientific Basis of Subsistence Farmer Scenario and Its Application to the Estimation of Radionuclide Soil Action Levels (RSALs) for Rocky Flats*, Institute for Energy and Environmental Research, Takoma Park, December 2001.

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Makhijani, Annie, Linda Gunter, and A. Makhijani, *Cogema: Above the Law?: Concerns about the French Parent Company of a U.S. Corporation Set to Process Plutonium in South Carolina*. A report prepared by Institute for Energy and Environmental Research and Safe Energy Communication Council. Takoma Park, MD, May 7, 2002.

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Makhijani, A., "Nuclear targeting: The first 60 years," *Bulletin of the Atomic Scientists*, May/June 2003.

Makhijani, A., "Strontium," *Chemical & Engineering News*, September 8, 2003

Makhijani, A., and Nicole Deller, *NATO and Nuclear Disarmament: An Analysis of the Obligations of the NATO Allies of the United States under the Nuclear Non-Proliferation Treaty and the Comprehensive Test Ban Treaty*, Institute for Energy and Environmental Research, Takoma Park, Maryland, October 2003.

Makhijani, A., *Manifesto for Global Democracy: Two Essays on Imperialism and the Struggle for Freedom*, Apex Press, New York, 2004.

Makhijani, A., "Atomic Myths, Radioactive Realities: Why nuclear power is a poor way to meet energy needs," *Journal of Land, Resources, & Environmental Law* 24, no. 1 (2004): 61-72.

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Makhijani, A., and Michele Boyd, *Nuclear Dumps by the Riverside: Threats to the Savannah River from Radioactive Contamination at the Savannah River Site*, Institute for Energy and Environmental Research, Takoma Park, Maryland, March 2004.

Makhijani, A., and Brice Smith, *The Role of E.I. du Pont de Nemours and Company (Du Pont) and the General Electric Company in Plutonium Production and the Associated I-131 Emissions from the Hanford Works*, Institute for Energy and Environmental Research, Takoma Park, Maryland, March 30, 2004.

Makhijani, A., Peter Bickel, Aiyu Chen, and Brice Smith, *Cash Crop on the Wind Farm: A New Mexico Case Study of the Cost, Price, and Value of Wind-Generated Electricity*, Institute for Energy and Environmental Research, Takoma Park, Maryland, April 2004.

Makhijani, A., Lois Chalmers, and Brice Smith, *Uranium Enrichment: Just Plain Facts to Fuel an Informed Debate on Nuclear Proliferation and Nuclear Power*, Institute for Energy and Environmental Research, Takoma Park, Maryland, October 15, 2004.

Makhijani, A., and Brice Smith, *Costs and Risks of Management and Disposal of Depleted Uranium from the National Enrichment Facility Proposed to be Built in Lea County New Mexico by LES*, Institute for Energy and Environmental Research, Takoma Park, Maryland, November 24, 2004.

Makhijani, A., project director, *Examen critique du programme de recherche de l'ANDRA pour déterminer l'aptitude du site de Bure au confinement géologique des déchets à haute activité et à vie longue: Rapport final*, prepared for the Comité Local d'Information et de Suivi du Laboratoire de Bure (CLIS); coordinator: Annie Makhijani; authors: Detlef Appel, Jaak Daemen, George Danko, Yuri Dublyansky, Rod Ewing, Gerhard Jentzsch, Horst Letz, Arjun Makhijani, Institute for Energy and Environmental Research, Takoma Park, Maryland, December 2004.

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Makhijani, A., and Brice Smith, *Dangerous Discrepancies: Missing Weapons Plutonium in Los Alamos National Laboratory Waste Accounts*, Institute for Energy and Environmental Research, Takoma Park, Maryland, April 21, 2006.

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U.S. Department of Energy) and Mary Beth Burandt (Office of River Protection, U.S. Department of Energy).

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ORDER NO. 87082

IN THE MATTER OF POTOMAC EDISON *
COMPANY D/B/A ALLEGHENY POWER'S *
ENERGY EFFICIENCY, CONSERVATION AND *
DEMAND RESPONSE PROGRAMS PURSUANT TO *
THE EMPOWER MARYLAND ENERGY *
EFFICIENCY ACT OF 2008 *

BEFORE THE
PUBLIC SERVICE COMMISSION
OF MARYLAND

CASE NO. 9153

IN THE MATTER OF BALTIMORE GAS AND *
ELECTRIC COMPANY'S ENERGY EFFICIENCY, *
CONSERVATION AND DEMAND RESPONSE *
PROGRAMS PURSUANT TO THE EMPOWER *
MARYLAND ENERGY EFFICIENCY ACT OF 2008 *

CASE NO. 9154

IN THE MATTER OF POTOMAC ELECTRIC *
POWER COMPANY'S ENERGY EFFICIENCY, *
CONSERVATION AND DEMAND RESPONSE *
PROGRAMS PURSUANT TO THE EMPOWER *
MARYLAND ENERGY EFFICIENCY ACT OF 2008 *

CASE NO. 9155

IN THE MATTER OF DELMARVA POWER & *
LIGHT COMPANY'S ENERGY EFFICIENCY, *
CONSERVATION AND DEMAND RESPONSE *
PROGRAMS PURSUANT TO THE EMPOWER *
MARYLAND ENERGY EFFICIENCY ACT OF 2008 *

CASE NO. 9156

IN THE MATTER OF SOUTHERN MARYLAND *
ELECTRIC COOPERATIVE, INC.'S ENERGY *
EFFICIENCY, CONSERVATION AND DEMAND *
RESPONSE PROGRAMS PURSUANT TO THE *
EMPOWER MARYLAND ENERGY EFFICIENCY *
ACT OF 2008 *

CASE NO. 9157

IN THE MATTER OF WASHINGTON GAS LIGHT *
COMPANY'S ENERGY EFFICIENCY, *
CONSERVATION AND DEMAND RESPONSE *
PROGRAMS PURSUANT TO THE EMPOWER *
MARYLAND ENERGY EFFICIENCY ACT OF 2008 *

CASE NO. 9362

Issue Date: July 16, 2015

On February 12 and 13, 2015, the Public Service Commission of Maryland (“Commission”) held a legislative-style hearing in the above-captioned cases to consider the topics of post-2015 energy efficiency goal allocations and future cost-effectiveness screening methodologies. The Commission received and reviewed comments filed by The Potomac Edison Company (“PE”);¹ Baltimore Gas and Electric Company (“BGE”);² Potomac Electric Power Company (“Pepco”) and Delmarva Power & Light Company (“Delmarva”);³ Southern Maryland Electric Cooperative, Inc. (“SMECO”);⁴ and Washington Gas Light Company (“WGL”)⁵ (collectively, the “Utilities”). In accordance with the EmPOWER Maryland Energy Efficiency Act of 2008 (“EmPOWER”),⁶ the Commission also reviewed the comments filed by its Technical Staff (“Staff”);⁷ the Office of People’s Counsel (“OPC”);⁸ the Maryland Energy Administration (“MEA”);⁹ the Coalition of Maryland Energy Efficiency Advocates (the “Coalition”);¹⁰ and the Maryland Chapter of Efficiency First (“Efficiency First”).¹¹

¹ ML#163520: *The Potomac Edison Company Comments on Post-2015 Goal Allocation and Future Cost Effectiveness Assessment Methodologies* (“PE Comments”) (Jan. 30, 2015).

² ML#163598: *Comments of Baltimore Gas and Electric Company* (“BGE Comments”) (Jan. 30, 2015).

³ ML#163542: *Delmarva Power & Light Company and Potomac Electric Power Company’s Comments in response to Order No. 86785* (“PHI Comments”) (Jan. 30, 2015).

⁴ ML#163500: *Southern Maryland Electric Cooperative, Inc. Comments on Goals and Cost Effectiveness Calculation* (“SMECO Comments”) (Jan. 29, 2015).

⁵ ML#163607: *Comments of Washington Gas* (“WGL Comments”) (Jan. 30, 2015).

⁶ Public Utilities Article (“PUA”) § 7-211.

⁷ ML#163612: *Comments Regarding the Post-2015 Goal Allocation and Future Cost-Effectiveness Screening Methodologies for EmPOWER Maryland* (“Staff Comments”) (Jan. 30, 2015).

⁸ ML#163617: *Office of People’s Counsel Comments on EmPOWER Maryland* (“OPC Comments”) (Jan. 30, 2015).

⁹ ML#157744: *EmPOWER 2015 – 2017 Cost Effectiveness Framework* (“MEA Framework Comments”) (Aug. 19, 2014); ML#163513: *Maryland Energy Administration Comments regarding post-2015 goal allocation methodologies and future cost-effectiveness screening methodologies* (“MEA Comments”) (Jan. 30, 2015).

¹⁰ ML#163616: *Comments of the Maryland Energy Efficiency Advocates* (“Coalition Comments”) (Jan. 30, 2015).

¹¹ ML#163376: *Comments on Cost Effectiveness and Goal Allocation* (“Efficiency First Comments”) (Jan. 28, 2015).

In this Order we outline a framework for prospective cost-effectiveness screening and establish a methodology for determining post-2015 electric energy efficiency goals. We also provide a timeline and parameters for the development of robust natural gas energy efficiency goals and goals specific to the residential limited-income sector.

I. Future Cost-Effectiveness Screening

We have a statutory duty to require each gas and electric company to establish any program or service that the Commission deems appropriate and cost effective to encourage and promote the efficient use and conservation of energy.¹² We maintain an active role throughout program implementation, as the Commission is charged with monitoring and analyzing program impacts and outcomes using four statutory factors, including whether the program is cost effective.¹³ As part of our ongoing review, should a program not yield “the best possible results,” we may in turn direct the utility to remedy these findings.¹⁴

To date, our cost-effectiveness standard has focused on ensuring a real return on the ratepayers’ investment. Based on evaluation, measurement, and verification (“EM&V”) best practices, in 2009 we adopted an independent, third-party evaluator model to review the EmPOWER Maryland portfolio results.¹⁵ Among other things, this process evaluates free-ridership, deemed savings calculations, spillover, cost-

¹² PUA § 7-211(f).

¹³ PUA § 7-211(i)(1). The other three statutory factors include the impact on rates of each ratepayer class; the impact on jobs; and the impact on the environment. *Id.*

¹⁴ PUA § 7-211(i)(2)-(3).

¹⁵ Order No. 82869 (Aug. 31, 2009).

effectiveness, and other factors pertinent to a thorough and ongoing review of viable and cost-effective energy efficiency and demand response programs.

While the results of this thorough EM&V analysis frequently result in recommendations for future programmatic modifications, it is by definition a *retrospective* evaluation.¹⁶ Today we provide direction regarding the scope and balancing of factors for purposes of *prospective* cost-effectiveness screening in order to provide transparency and foster innovation in the growing energy efficiency industry of Maryland.

A. Cost-Effectiveness Tests

Since the inception of the EmPOWER Maryland programs we have focused primarily on the Total Resource Cost (“TRC”) test as the key predictor of cost effectiveness.¹⁷ There are, however, four additional tests utilized to varying degrees to screen customer-facing energy efficiency programs: the Societal Cost test (“SCT”); the Ratepayer Impact Measure (“RIM”) test; the Participant Cost test (“Participant”); and the Program Administrator Cost test (“PACT”). In the Northeast and Mid-Atlantic regions, the TRC, the SCT, and the PACT are the tests used most often; the TRC is the most widely used cost-effectiveness test nationwide.¹⁸

The Utilities, Staff, MEA, OPC, and other stakeholders advocated for a range of cost-effectiveness tests and combinations moving forward, although the parties’ positions

¹⁶ The verified savings resulting from this retrospective evaluation have been used to track progress toward the 2015 EmPOWER Maryland goals. Furthermore, it is standard practice for all EmPOWER Maryland program implementers to apply the calculated realization rates to reported savings on a prospective basis. This Order does not alter these long-standing practices, and to the extent that any party seeks to modify them, the proposal would require a Commission determination prior to enactment.

¹⁷ Staff Comments at 20.

¹⁸ Northeast Energy Efficiency Partnerships, *Cost-Effectiveness Screening Principles and Guidelines* (Nov. 2014) at 56, *available at*: http://www.neep.org/sites/default/files/resources/Forum_C-E_Screening_Guidelines_Final_No_2014.pdf.

generally focus on whether the TRC or the SCT should take precedence on a prospective basis.¹⁹ Across the parties, the recommended choice of test ultimately depended on the Commission’s decision regarding whether to account for non-energy benefits (“NEBs”). As asserted by the Coalition, “the test will be skewed against energy efficiency resources” if participant costs are included, but not the full complement of benefits that accrue to participants, such as limited-income arrearage relief and other NEBs.²⁰ OPC, Efficiency First, Delmarva, and Pepco also advocated for the inclusion of known and quantifiable NEBs in any primary cost-effectiveness assessment tool, with the PHI companies referring to the expanded test as the “TRC Hybrid.”²¹

In reaching a determination regarding future cost-effectiveness screening methodologies, we note the prominence of the TRC as a cost-effectiveness screening tool nationwide, as well as its reputation as one of the most balanced and fair tests in terms of examining the inclusivity of costs and benefits.²² For these reasons, coupled with our frequent reliance on comparisons to utility energy efficiency programs operated in other jurisdictions, we are reluctant to alter the inputs of the TRC to such a degree as to render comparisons to TRC results from other jurisdictions meaningless. As stated by BGE, the TRC “should maintain its integrity as a key cost-effectiveness screening measure considered in implementing energy efficiency programs.”²³

However, we are not persuaded that the TRC should remain as the *only* screening tool on a prospective basis; on the contrary, we concur with parties such as PE that note,

¹⁹ The exception to this generalization is the position of PE; the company argued that the RIM and the TRC should be treated as equally valid primary assessment tests. PE Comments at 13.

²⁰ Coalition Comments at 4.

²¹ PHI Comments at 4; OPC Comments at 5-6; Efficiency First Comments at 5.

²² Staff Comments at 19.

²³ BGE Comments at 2.

“[t]he TRC test alone fails to consider the cost-effectiveness of investments from a non-participating ratepayer point of view.”²⁴ Indeed, the Coalition contends that failing to account for “benefits that accrue to participants and non-participants alike, such as reduced air pollution and the corresponding reductions in adverse health effects” mischaracterizes the true cost-effectiveness of energy efficiency investments.²⁵ A failure on our part to consider a broader societal impact stemming from the implementation of energy efficiency programs would ignore the codified intent of the General Assembly “to provide affordable, reliable, and clean energy for consumers of Maryland.”²⁶ This directive is not limited to only those consumers who participate in an energy efficiency program, just as the benefits of energy efficiency investments do not accrue only to direct program participants. We concur with MEA that the directive of the General Assembly to the Commission requires a societal viewpoint as the primary orienting framework,²⁷ and thus we direct the use of both the TRC *and* the SCT as assessment tools for purposes of conducting preliminary cost-effectiveness screening.²⁸

We recognize that the use of two tests for assessment purposes could lead to some ambiguities in situations that generate positive results under one test only, just as we recognize that the use of two tests will likely expand the realm of potential cost-effective program offerings. We find, however, that the first situation is easily resolved and that

²⁴ PE Comments at 13. While PE asserts that the perceived shortcomings of the TRC can be overcome by coupling it with the RIM test, we find that the impact on rates for each ratepayer class is more properly accounted for as part of our “appropriate screen” described later in this section.

²⁵ Coalition Comments at 4.

²⁶ PUA § 7-211(b).

²⁷ MEA Comments at 9. As stated by MEA, the societal-based directive is reinforced multiple times in the statute because saving energy is good for society – including ratepayers, the economy, the electricity grid, the environment, and the utilities. *Id.*

²⁸ Even parties such as BGE and SMECO, who primarily advocated for retention of a “clean TRC”, noted that the Commission should consider the SCT. *See* BGE Comments at 2-3; SMECO Comments at 2.

the second situation is in fact desirable. In the first instance, we note that during the EmPOWER Maryland Planning Work Group process the parties concluded that it would be feasible to screen programs from all five perspectives;²⁹ thus, restricting our directive to only two tests is feasible. Furthermore, since we concur with MEA that the societal viewpoint is the primary orienting framework intended by the General Assembly, a positive result from the SCT shall be recognized as a cost-effective outcome. The TRC, while also considered a primary assessment test, will function as a guidepost and comparative tool to other jurisdictions, as well as our own past programmatic performance.

We are cognizant of the concern raised by at least one utility that reliance on a societal viewpoint will expand the definition of cost effectiveness in a way that will greatly impact consumer rates;³⁰ however, we strongly disagree. By definition, a cost-effective program must yield benefits in excess of its costs.³¹ Moreover, we are not bound to approve *any* cost-effective program or service that is proposed to us; rather, the authorizing statute grants the Commission discretion in determining what we consider to be “appropriate” in light of certain statutory factors.³² *In addition to* considering whether the program is cost effective, we must also consider the program’s impact on rates of each ratepayer class, its impact on jobs, and its impact on the environment.³³ If we find a program to be appropriate after fully considering these four factors, only then will we

²⁹ MEA Framework Comments at 6.

³⁰ PE Comments at 13.

³¹ MEA Comments at 10.

³² PUA § 7-211(f).

³³ PUA § 7-211(i)(1)(i) – (iv).

authorize its implementation.³⁴ Therefore, we find that conflating a program's impact on consumer rates with whether the program is cost effective is unwarranted given the statutory discretion afforded to the Commission through inclusion of the "appropriate" screen.³⁵ For the circumstances in which a cost-effective program is projected to yield inappropriate impacts on consumer rates, the Commission retains its discretion to deny the implementation request irrespective of the cost-effectiveness screening results.

B. Cost-Effectiveness Screening Levels

In Order No. 84569, we directed the examination of cost effectiveness to occur at the sub-portfolio level, *i.e.*, collectively for residential programs and collectively for commercial and industrial ("C&I") programs.³⁶ In its August 2014 filing, MEA on behalf of the EmPOWER Maryland Planning Work Group recommended that we continue with sub-portfolio testing.³⁷ However, BGE distinguished its position from the Work Group by noting its preference that cost-effectiveness testing occur at both the sub-portfolio level and at the program level.³⁸ BGE expressed concern regarding sub-portfolio testing, noting that the results may obscure projections related to individual programs that have not yet demonstrated the potential for future successful outcomes or market transformation.³⁹

We have expressed repeatedly our intent to encourage additional innovation in EmPOWER program offerings,⁴⁰ and we acknowledge our earlier finding that such

³⁴ PUA § 7-211(f)(1).

³⁵ Whether a program is "appropriate" is subjective, while a program can be defined mathematically as "cost effective." MEA Comments at 9.

³⁶ Order No. 84569 (Dec. 22, 2011) at 16.

³⁷ MEA Framework Comments at 7.

³⁸ *Id.* at 19.

³⁹ *Id.*

⁴⁰ *See, e.g.* Order No. 86785 (Dec. 23, 2014) at 5; Order No. 86995 (May 21, 2015) at 13.

innovation may not always satisfy cost-effectiveness standards on a program-by-program basis.⁴¹ Therefore, we accept the recommendation by the Work Group to continue cost-effectiveness screening at a sub-portfolio level, subject to two important clarifications. *First*, we note that prospective cost-effectiveness screening is different than retrospective cost-effectiveness evaluation; and *second*, we note that limited-income programs comprise a sub-portfolio to be considered separately during cost-effectiveness screening from the residential and C&I sub-portfolios.

As described previously, we rely heavily on a suite of EM&V best practices that yields, among other things, retrospective cost-effectiveness determinations for individual programs. These retrospective cost-effectiveness results are critical for our evaluation of recommended program modifications and for purposes of fulfilling our statutory directive to seek “the best possible results” from program implementation.⁴² However, this retrospective program-by-program evaluation serves a different purpose than the prospective cost-effectiveness screening discussed here, which we find is structured appropriately to occur at the sub-portfolio level so as to encourage the development of innovative program offerings. This decision to conduct cost-effectiveness screening at the sub-portfolio level does not remove our overarching discretion to modify or discontinue an individual program at any time should it fail during implementation to demonstrate the potential for future successful outcomes or market transformation.

With respect to limited-income programs, which constitute a separate and distinct sub-portfolio of programs, we concur with the Coalition that unique treatment in cost-

⁴¹ Order No. 84569 at 16.

⁴² PUA § 7-211(i)(3).

effectiveness screening is appropriate.⁴³ Improving the energy efficiency of limited-income households is a critical area of focus under the EmPOWER umbrella, and simply waiving the requirement that the limited-income programs undergo cost-effectiveness screening may do our ratepayers a disservice by failing to maximize the benefits of the energy efficiency investment. However, requiring that the limited-income sub-portfolio “pass” cost-effectiveness screening may do our ratepayers a similar disservice by too greatly limiting these critical program offerings. Therefore, we accept the recommendation of the Coalition that, while cost-effectiveness screening of the limited-income sub-portfolio shall be required in the same manner as with respect to the other EmPOWER sub-portfolios, the results of the limited-income sub-portfolio screening shall serve as a point of comparison to other jurisdictions and past programmatic performance rather than as the basis for precluding certain limited-income program offerings.⁴⁴

C. Cost-Effectiveness Assumptions

Cost-effectiveness testing is carried out by a mathematical algorithm. The EmPOWER Maryland Planning Work Group is requesting Commission direction regarding certain assumptions and inputs to the algorithm. We find that the values derived from the Avoided Cost Study performed by Exeter Associates on behalf of MEA and the Power Plant Research Project (“PPRP”) for avoided energy costs were appropriately adopted by the EmPOWER Maryland Planning Work Group and reflected in the Utilities’ 2015 – 2017 program cycle proposals.⁴⁵ Although the cost-effectiveness framework indicated a high level of consensus among parties on this point, a similar level

⁴³ Coalition Comments at 7.

⁴⁴ *Id.* at 7-10.

⁴⁵ MEA Framework Comments at 9-10.

of agreement could not be reached with respect to the demand-reduction induced price effect (“DRIPE”) calculation, the selection of an appropriate discount rate, and the inclusion of NEBs.⁴⁶

1. DRIPE

The question before us is how to appropriately account for the value and length of Energy and Capacity DRIPE in the cost-effectiveness screening process. With respect to the DRIPE calculations, the Work Group developed a greater level of consensus surrounding the valuation of Energy DRIPE than compared to Capacity DRIPE.⁴⁷ OPC did, however, note several perceived shortcomings with respect to the methodology developed by Exeter to calculate Energy DRIPE; subject to the caveat that MEA address the identified issues moving forward, OPC recommended approval of the Exeter Energy DRIPE methodology.⁴⁸

Staff, OPC, and PE expressed varying degrees of concern with the expected value and length of the Capacity DRIPE proposed by the Exeter Avoided Cost Study.⁴⁹ Exeter concluded based on the last three reports from Synapse on the New England ISO avoided energy supply costs that prices could be influenced in the market for up to ten years.⁵⁰ However, Staff noted that a previous iteration of the Synapse report relied on by Exeter to support its ten-year assumption reflected only a four-year Capacity DRIPE benefit for calendar year 2009.⁵¹ Staff observed that Itron calculated the 2013 cost-effectiveness values using a Capacity DRIPE benefit of only four years, and recommended that this

⁴⁶ Staff Comments at 22-23.

⁴⁷ MEA Framework Comments at 2.

⁴⁸ OPC Comments at 6, Chernick-14.

⁴⁹ Staff Comments at 22.

⁵⁰ Staff Comments at 22-23.

⁵¹ *Id.*

same methodology be adopted here.⁵² OPC took issue with the specific methodology used by Exeter to calculate Capacity DRIPE altogether, instead recommending the adoption of a different methodology advanced by Synapse/Resource Insight.⁵³ While acknowledging that Capacity DRIPE may have a non-zero value in some auctions, PE asserted that Capacity (and Energy) DRIPE are too uncertain and subjective to be included in the base case cost-effectiveness analysis.⁵⁴

Throughout the proceeding we questioned the degree to which the DRIPE variables drive the cost-effectiveness screening results. As informed by our proceedings, we know that DRIPE has a lesser impact on energy efficiency program screening than on the consideration of demand response programs, and that it could potentially impact a portfolio's measure mix.⁵⁵ As such, OPC expressed concern that "inappropriate estimates of avoided costs will tend to misdirect incentive funds."⁵⁶ However, given that we retain our discretion to modify energy efficiency and demand response programs on an ongoing basis (including the appropriate incentive levels, funding, and measure mix), and given that we have a plethora of other tools to assist in these programmatic evaluations (such as forecasted versus realized participants, measures, budget, and savings), we decline to deviate from the DRIPE methodologies recommended here by Exeter and endorsed by many of the parties.⁵⁷ Furthermore, we concur with Staff that other variables unrelated to EmPOWER Maryland may influence market fluctuations in a

⁵² *Id.*

⁵³ OPC Comments at 6.

⁵⁴ PE Comments at 14-15.

⁵⁵ Tr. 211-212 (Sunderhauf).

⁵⁶ OPC Comments at Attachment 1-7.

⁵⁷ See PHI Comments at 5; MEA Framework Comments at 2; MEA Framework Comments (SMECO) at 46.

shorter timeframe, and thus a four-year Capacity DRIPE is appropriate for the remainder of the 2015 – 2017 program cycle.

As with all cost-effectiveness screening assumptions discussed in this section, we anticipate that the underlying technical analysis will be updated and refreshed in conjunction with subsequent three-year program cycles.⁵⁸ Our decision here to assume a four-year DRIPE and to retain the Exeter methodology for calculating Energy and Capacity DRIPE is applicable to the remainder of the 2015 – 2017 program cycle. The DRIPE methodology may be revisited in conjunction with subsequent program cycle planning following completion of additional analyses as recommended by Staff.⁵⁹

2. Non-Energy Benefits

Experts argue that the exclusion of non-energy benefits (“NEBs”) from the cost-benefit tests “may be the most significant problem with energy efficiency program screening methods in the United States today.”⁶⁰ Initially, none of the five established cost-effectiveness tests explicitly recognized the inclusion of NEBs; however, a recent study found that by 2011, 12 states indicated the inclusion of NEBs in their cost-benefit tests.⁶¹ As the literature on NEBs has evolved, more states are moving toward the inclusion of “readily measured” NEBs in their regulatory cost-benefit tests, while other

⁵⁸ See Tr. at 65 – 68 (Lucas/Commissioner Speakes-Backman), discussing the need to revalue and revise assumptions every three years so as not to “be caught up in huge seismic change that is baked in for many years to come.”

⁵⁹ Staff Comments at 23. So that the Commission may further evaluate the impact of DRIPE in the cost-effectiveness screening process, any future additional analyses conducted for purposes of revising the DRIPE methodology should include sensitivities that reflect results with and without energy and capacity DRIPE inputs.

⁶⁰ Woolf, T., W. Steinhurst, E. Malone, and K. Takahashi, *Energy Efficiency Cost-Effectiveness Screening*, Synapse Energy Economics, Inc., for the Regulatory Assistance Project, Inc. (2012) at 5-6.

⁶¹ Kushler, M., S. Nowak, and P. Witte, *A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs*, American Council for an Energy-Efficient Economy (2011).

states have opted for simple adders to reflect contributions from a subset of NEB categories.⁶²

As articulated by the Coalition in this proceeding, cost-effectiveness testing must be symmetrical in how it considers both costs and benefits, and thus an inclusion of all participant costs in a test requires the inclusion of all participant benefits – including NEBs.⁶³ We concur with this assessment, and note that our examination of additional benefits beyond energy savings is directly contemplated by the guiding statute. In order to determine whether a proposed program or service encourages and promotes the efficient use and conservation of energy, the Commission is explicitly directed by statute to consider non-energy categorical impacts on jobs and on the environment,⁶⁴ and more broadly to rely on energy efficiency as a resource to assist with the provision of affordable, reliable, and clean energy to Maryland ratepayers.⁶⁵

In determining how to appropriately account for NEBs in our screening process, we are guided by the positions of parties such as MEA, OPC, the Coalition, Efficiency First, Delmarva, and Pepco; these parties assert generally that NEBs should be included and that cost-effectiveness screening methodologies should reflect the viewpoint of the beneficiary of the energy efficiency programs.⁶⁶ There are three classes of NEBs

⁶² ML#164304: Skumatz, Lisa A. *Non-Energy Benefits / Non-Energy Impacts (NEBs/NEIs) and their Role & Values in Cost-Effectiveness Tests: State of Maryland*, NRDC (March 31, 2014), at 1.

⁶³ Coalition Comments at 4.

⁶⁴ See PUA § 7-211(i)(1)(ii)-(iv), which directs the Commission to consider the impact on rates, jobs, and the environment.

⁶⁵ PUA § 7-211(b)(2).

⁶⁶ MEA Comments at 14-15; OPC Comments at 6; Efficiency First Comments at 5-6; Coalition Comments at 4-5; and PHI Comments at 5.

depending on the selected “beneficiary” viewpoint,⁶⁷ and thus the inclusion of the NEBs we order today mirrors our selection of primary cost-effectiveness screening methodologies. Because the TRC test includes all participant costs, we concur that quantified NEBs accruing to program participants must be included in the TRC. In addition to quantified Participant NEBs, quantified Societal NEBs that represent indirect program effects and accrue to society at large also must be reflected in the SCT.⁶⁸ In keeping with our decision herein to apply unique treatment to the limited-income sub-portfolio in cost-effectiveness screening, we also direct the inclusion of certain Utility NEBs in the TRC test and the SCT as applied to the suite of limited-income programs.⁶⁹

Given that work is ongoing in this important area of research, we find that it is appropriate at this time to adopt the business-as-usual value equivalents of the Itron quantified NEBs for the categories of air emissions, comfort, C&I O&M, and reduced customer arrearages.⁷⁰ We find that the inclusion of these specific NEBs in the TRC test and the SCT as described above will enhance the parity of cost-effectiveness screening and assist us in completing the necessary statutory inquiries. Should the parties develop additional quantifications of Participant, Utility, or Societal NEBs moving forward, or

⁶⁷ See *Addressing Non-Energy Benefits in the Cost-Effectiveness Framework*, CPUC Energy Division Staff (2011), at 1, available at: <http://www.cpuc.ca.gov/NR/rdonlyres/BA1A54CF-AA89-4B80-BD90-0A4D32D11238/0/AddressingNEBsFinal.pdf>.

⁶⁸ Examples of “Participant NEBs” include reduced building operating costs, increased value, comfort, health, and safety. Examples of “Societal NEBs” include job creation, tax receipts growth, labor productivity, housing, value, neighborhood stability, and reduced emissions. *Id.*

⁶⁹ Examples of “Utility NEBs” include bill payment improvements and benefits from reduced customer arrearages.

⁷⁰ See ML#164454: *Development and Application of Select Non-Energy Benefits for the EmPOWER Maryland Energy Efficiency Programs*, Itron (Feb. 24, 2015). Itron quantified NEBs in the State using a business-as-usual value equivalent of: \$0.002/kWh saved (air emissions); \$34/year for each insulation or duct sealing installation (comfort: HPwES program); \$27/year for each insulation or duct sealing installation (comfort: limited-income participants); and 2% of kWh savings for the life of the measure (reduced customer arrearages: limited-income program). *Id.* at 6-2. The business-as-usual value equivalent for C&I O&M NEBs varies by utility program. *Id.* at 4-11 – 4-12.

should the parties seek to revise the valuation of the NEBs directed by our Order today, the parties may present such analysis in conjunction with planning for future program cycles.

3. Discount Rate

A significant input to the cost-effectiveness screening process is the discount rate assumption. Given that each cost-effectiveness test reflects a specific stakeholder perspective in comparing the net present value of the annual costs and benefits over the life of an energy efficiency measure, the choice of discount rate depends on which test is being employed.⁷¹ Typically, the discount rates assumed in the RIM test, the PACT, and the TRC test all correspond to the utility's weighted average cost of capital ("WACC"), while the Participant test utilizes the discount rate of an individual or business (such as the consumer lending rate).⁷² The SCT generally assumes a social discount rate that reflects the benefit to society of the energy efficiency investment over the long term.⁷³

Currently, the EmPOWER Maryland programs utilize the individual utility's WACC as the assumed discount rate for the TRC⁷⁴ consistent with the best practices outlined by the U.S. Environmental Protection Agency ("EPA").⁷⁵ Several parties requested a departure from this assumption, however, with the Coalition advocating for the use of a lower discount rate that takes into account the low-risk nature of energy efficiency investments for utilities.⁷⁶ MEA and Efficiency First similarly advocated for

⁷¹ *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*, U.S. Environmental Protection Agency (Nov. 2008), at 4-7.

⁷² *Id.* at 4-8.

⁷³ *Id.*

⁷⁴ Staff Comments at 21.

⁷⁵ *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*, U.S. Environmental Protection Agency (Nov. 2008), at 4-8.

⁷⁶ Coalition Comments at 6.

use of a lower discount rate, in particular the societal discount rate set at a nominal rate of 4.7%.⁷⁷ Staff in turn recommended using the average of the EmPOWER Utilities' WACC for all cost-effectiveness tests (except for the SCT), stating that "the average WACC equals out the various risks to the utility and participants."⁷⁸

We concur with MEA that the assumed discount rate "must represent the balance between short-term and long-term savings from the viewpoint of the *beneficiary* of the [energy efficiency and demand response] programs."⁷⁹ Further, as stated by MEA, "[w]hen [energy efficiency] programs are appropriately viewed from a societal perspective, the only choice for discount rate is a societal rate."⁸⁰ Therefore, because we endorse the societal perspective through the SCT, we adopt the 4.7% nominal discount rate recommended by MEA for use with the SCT.⁸¹ However, we decline to adopt the societal discount rate as the assumed input for *all* cost-effectiveness screening methodologies utilized in the EmPOWER process given our earlier stated preference to retain the integrity of the TRC test for comparison purposes. Instead, we find that the individual WACC of the Utilities should continue as the assumed discount rate for purposes of the TRC assessment, while a nominal 4.7% discount rate shall be assumed for purposes of the SCT assessment on a prospective basis. Given that our decision today renders the TRC test and the SCT as equally valid assessment tools for purposes of conducting prospective cost-effectiveness screening, we see no reason to depart from nationwide best practices regarding the discount rates assumed by the individual tests.

⁷⁷ MEA Comments at 18-19; Efficiency First Comments at 4-5.

⁷⁸ Staff Comments at 22.

⁷⁹ MEA Comments at 14.

⁸⁰ *Id.* at 15.

⁸¹ Societal discount rates typically range from 0% to 3% in *real* terms; thus, a 4.7% *nominal* rate was endorsed by MEA. *Id.*

II. Post-2015 Goal Allocation Methodologies

In 2008, faced with dramatic rate increases due to the removal of price caps established at the time of deregulation, as well as PJM projections of rolling blackouts in the State by 2011 due to generation shortages and reliability problems, the Maryland General Assembly passed legislation to meet specific energy efficiency, conservation, and demand response targets by the end of 2015, culminating in the EmPOWER Maryland Energy Efficiency Act of 2008.⁸² While the EmPOWER Maryland Act was officially adopted in 2008, the value of energy efficiency as a least-cost resource is hardly a new concept. For more than two decades – and before the enactment of the EmPOWER legislation – the Commission has been tasked with the statutory duty to “require each gas company and electric company to establish any program or service that the Commission deems appropriate and cost effective to encourage and promote the efficient use and conservation of energy.”⁸³ The Commission’s statutory directive stems from the declaration by the Maryland General Assembly that energy efficiency is among the least expensive ways to meet the growing electricity demands of the State⁸⁴ – a finding repeatedly affirmed by nationwide studies, such as a 2014 study conducted by the American Council for an Energy-Efficiency Economy (“ACEEE”).⁸⁵

⁸² PUA § 7-211.

⁸³ In 1991, the General Assembly enacted an energy conservation measure, then codified in Article 78, §28(g) of the Maryland Annotated Code, and later re-codified as PUA § 7-211.

⁸⁴ PUA § 7-211(b)(1).

⁸⁵ This study concluded that electric utility energy efficiency programs, at an average cost of 2.8 cents per kilowatt hour (“kWh”), provide resource options ranging from one half to one third the cost of alternative options such as building new power plants. Also, compared to a natural gas commodity price of 49 cents per therm in 2013, natural gas energy efficiency programs prevailed as a least-cost option at an average cost of 35 cents per therm. See Maggie Molina, *The Best Value for America’s Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs*, ACEEE Report Number U1402 (March 2014), at iii.

As we reach the end of the prescribed 2015 energy efficiency and demand reduction goals, we find that enormous potential still exists throughout the State for continued cost-effective investment in energy efficiency as a least-cost resource. Moreover, curtailing energy efficiency and demand management programs would result in increased load on the PJM system, thereby heightening reliability risks including exposure to localized brownouts due to unanticipated summer and winter peak demand. The elimination of energy efficiency and demand management programs would likely also result in the need for more costly generation and transmission projects to fulfill the demand currently met in part by EmPOWER Maryland programs. For ratepayers across the State, it continues to be less costly to invest in energy efficiency than it is to pay for electricity. Across all Utilities, the lifecycle cost per kWh for the energy efficiency programs is \$0.026 per kWh – significantly lower than the current cost of Standard Offer Service, which ranges from \$0.062 to \$0.093 per kWh.⁸⁶

Until such time that energy efficiency is no longer a least-cost resource, or until such time that the costs of investing in energy efficiency outweigh the projected benefits, we see value in establishing energy savings goals for the Utilities on a prospective basis.⁸⁷ In this Order we establish electric energy efficiency goals and describe a framework for goal formulation that can be replicated for the other sectors. While the

⁸⁶ *The EmPOWER Maryland Energy Efficiency Act Standard Report of 2015*, MD PSC (April 2015), at 4. The cost of SOS differs between utility service territories and changes by season. Customers can access the current cost of supply service for their utility and compare residential retail electricity supplier offers by visiting the Commission's shop-and-compare web portal, available at: <http://167.102.231.189/electricchoice/shop-and-compare/>.

⁸⁷ We note, however, that the establishment of any goals does not waive or otherwise impact the Commission's discretion with respect to determining whether a program is cost effective and appropriate. As discussed in Section I: Future Cost-Effectiveness Methodologies, the Commission may decline to implement cost-effective energy efficiency programs if the impact on rates of a certain ratepayer class is found to be inappropriate. See PUA § 7-211(f) and (i).

record is not yet developed to the degree necessary to support the establishment of robust natural gas energy efficiency goals, or goals specific to the residential limited-income sector, we provide a timeline and guidance herein as to their future development.

A. Post-2015 Energy Efficiency and Conservation Goals

1. Electric Energy Efficiency Goals

The EmPOWER Maryland Planning Work Group utilized a common set of questions to consider the structure and nature of post-2015 energy savings goals.⁸⁸ A high level of consensus was achieved regarding several structural elements, including that goals should be established at the gross wholesale level, on a utility-wide basis, and in conjunction with the established three-year program cycle format.⁸⁹ The parties also decried generally the expression of post-2015 goals using a per capita methodology, and instead advocated for a bottom-up methodology capable of reflecting the normalization of variables such as weather.⁹⁰

A similar consensus was not achieved, however, with respect to the expression or specificity of post-2015 electric savings targets. OPC and the Coalition proffered similar proposals, both recommending that post-2015 energy savings goals should be expressed as a percentage of retail sales and both recommending that the Commission establish a trajectory so that the Utilities achieve 2% annual incremental gross energy savings.⁹¹ While other parties declined to offer specific proposals pending completion of the MEA-led potential study, the Coalition countered that significant evidence exists that “the

⁸⁸ OPC Comments at 4.

⁸⁹ Staff Comments at 12-14; OPC Comments at 4-5; MEA Comments at 22-24; Coalition Comments at 18; PHI Comments at 2-3; BGE Comments at 1; SMECO Comments at 1; PE Comments at 9-10.

⁹⁰ See, e.g. Staff Comments at 12-14.

⁹¹ OPC Comments at 4-8; Coalition Comments at 18-22.

EmPOWER programs have not come close to saturating markets with energy efficiency,” and that “Maryland is not even close to meeting the savings achievements of the Nation’s leading states.”⁹² We agree with the Coalition and find that the continued lack of completion of the potential study can no longer be a barrier to establishing targets for EmPOWER. A potential study – the results of which are highly dependent on the selected input assumptions – is only one of several tools that can be used in this endeavor. Thus, while the parties may continue to pursue the outstanding potential study, we will look to its forthcoming results as only an informative guidepost in future discussions.

Instead, we move forward today by establishing a definitive and flexible framework for post-2015 electric goals. *First*, we accept the parties’ consensus recommendation that goals should be established utility-wide⁹³ and at the gross wholesale level. *Second*, we concur also with the parties’ consensus recommendation that a per capita goal-setting method is inappropriate moving forward,⁹⁴ and we will instead rely on a retail sales baseline that accounts for weather-normalization.⁹⁵ *Third*, we find that a continued reliance on a three-year program and planning cycle strikes an appropriate balance between accountability and flexibility. Thus, while today we establish annual incremental targets, the Utilities will ultimately be assessed against a three-year average percentage goal. *Fourth*, we accept the recommendation by OPC and the Coalition to establish a trajectory so that the Utilities ultimately achieve annual incremental gross

⁹² Coalition Comments at 18.

⁹³ While we decline to establish separate residential and C&I goals, we note that the Utilities’ performance will continue to be evaluated using the approved forecasts, which do include sector-specific breakdowns.

⁹⁴ As noted by MEA, “a top down goal introduces uncertainty” and “[i]t is important for the utilities to have measureable goals based on factors they can influence.” MEA Comments at 18.

⁹⁵ The majority of states utilize an annual energy savings goal relative to retail electricity sales. Staff Comments at 8.

energy savings of 2% of their weather-normalized gross retail sales baseline.⁹⁶ In establishing this trajectory we adopt a modest ramp-up rate of 0.20% per year starting with the approved 2016 plans,⁹⁷ and escalating until such time that the utility achieves the 2% annual target. So that we may assess whether the goals established herein require the Utilities to enhance their 2017 program offerings, the Utilities are directed to file no later than September 1, 2015 a table depicting forecasted gross electric savings for the 2015 – 2017 program cycle as a percentage of the individual utility’s 2013 weather-normalized gross retail sales.

Because the establishment of this new goal structure occurs midstream in the 2015 – 2017 program cycle, we recognize that from a practical perspective the full deployment of this new goal structure will occur as part of the 2018 – 2020 program cycle. Consistent with the existing statutory directive, the Utilities are directed to submit plans to the Commission no later than September 1, 2017 for this subsequent program cycle. At such time, annual incremental savings targets shall be calculated as a percentage of the individual utility’s 2016 weather-normalized gross retail sales baseline. While annual incremental targets will be tracked and measured, achievement of the goal will be decided on the basis of a three-year average.

Also raised for our consideration as part of the prospective goal allocation methodology discussion were two additional topics pertaining to goal-setting and measurement. The parties sought guidance and clarification on these issues given the

⁹⁶ An illustration of the new goal structure is depicted in Appendix 1.

⁹⁷ The “ramp-up rate” refers to the rate or pace of improvement. In a recent U.S. EPA survey of existing state energy efficiency programs, the Agency identified ten states with clear energy efficiency schedules and calculated the average rate of improvement for each, finding the average rate of improvement of incremental annual savings rate to be 0.21% per year. See *Technical Support Document: GHG Abatement Measures*, U.S. Environmental Protection Agency Office of Air and Radiation (June 10, 2014), at 5-34 – 5-35.

perception that their resolution would impact the magnitude of post-2015 electric goals. Specifically, parties questioned whether it is appropriate to continue using annualized first-year energy savings to derive and measure post-2015 goals. We concur with the recommendation of OPC, Delmarva, Pepco, and PE that it is appropriate to continue with this practice. Specifically, we agree with OPC's perspective that the consistency and simplicity of deriving goals from incremental annual savings is preferable, and that routine monitoring of the Utilities' portfolios will ensure that the measure mix does not become overly dependent upon short-lived measures.⁹⁸

Parties also questioned whether it is appropriate to continue permitting the attribution of energy savings from non-EmPOWER funded measures (*e.g.* high-efficiency transformer projects, dynamic pricing programs, etc...) toward goal progress. We concur with PE that "the State should count and take credit for savings...regardless of the cost recovery mechanism."⁹⁹ Neither MEA nor Staff objected to the continuation of this practice, subject to the reflection of the non-EmPOWER funded measure potential in the goal-setting process.¹⁰⁰ However, at this time we decline to make a specific adjustment to the annual incremental electric energy savings goals established herein to specifically reflect the potential of non-EmPOWER funded measures, although we will permit the Utilities to continue reporting such savings under the EmPOWER umbrella. In recognition of the concern raised by Staff and MEA, we direct Staff to analyze separately each utility's progress towards its 2016 and 2017 goal using savings

⁹⁸ OPC Comments at 4. We also note that Staff's concern regarding the need to reflect the expiration of measure savings over time is not applicable given that we have opted to establish annual incremental savings targets (rather than a cumulative savings goal). Staff Comments at 17.

⁹⁹ PE Comments at 10.

¹⁰⁰ MEA Comments at 24.

attributable to EmPOWER funded versus non-EmPOWER funded measures so that we may consider whether to adjust subsequent program cycle goals accordingly.

2. Natural Gas Energy Efficiency Goals

Although the current 2015 EmPOWER Maryland goals measure progress on the basis of *electricity* energy savings and demand reductions, the guiding statute states that, “[s]ubject to review and approval by the Commission, each *gas company* and electric company shall develop and implement programs and services to encourage and promote the efficient use and conservation of energy by consumers, gas companies, and electric companies.”¹⁰¹ (emphasis added). As the EmPOWER programs have ramped-up, some stakeholders have encouraged the formulation of separate natural gas usage reduction goals.¹⁰² Other stakeholders have focused on the possibility of cost-effective electric savings resulting from the conversion of electric usage to direct usage of natural gas.¹⁰³ In December 2014, we directed the formation of the Natural Gas – Electric Efficiency Coordination Work Group to address in part this identified fuel conversion potential, and more broadly to develop program coordination strategies that reflect the overlap of electric and natural gas service territories and corresponding energy efficiency programs.¹⁰⁴

While the Coalition and OPC both recommended the formulation of post-2015 natural gas energy savings goals as part of our February 2015 proceeding,¹⁰⁵ Staff and MEA cautioned that the topic required further consideration in light of the ongoing

¹⁰¹ PUA § 7-211(d).

¹⁰² ML#148544: MEA Request Proposal for EmPOWER Planning (“MEA Proposal”) (July 16, 2013) at Attachment 2: 2-3.

¹⁰³ See Order No. 86366 (May 28, 2015) at 23.

¹⁰⁴ Order No. 86785 (Dec. 23, 2014) at 28.

¹⁰⁵ Coalition Comments at 22; OPC Comments at 8.

discussions by the Natural Gas – Electric Efficiency Coordination Work Group.¹⁰⁶ On April 15, 2015, we received an update on the Work Group’s progress toward completing the tasks assigned to it by our December 23, 2014 order.¹⁰⁷ The Work Group’s report indicated several recommended next steps, most prominently requesting a Commission decision as to whether natural gas utilities will be required to offer energy efficiency programs moving forward.¹⁰⁸

We find, however, that such a determination is unnecessary given that the statute speaks directly to this point, stating in part that “each gas company ... shall develop and implement programs and services to encourage and promote the efficient use and conservation of energy.”¹⁰⁹ As observed by WGL, “the three largest natural gas distribution companies [WGL, BGE, and Columbia Gas] all have approved energy efficiency programs.”¹¹⁰ Therefore, the question before us is not whether natural gas utilities must develop and implement energy efficiency programs in the first instance, but rather whether a goal for the reduction of natural gas usage is necessary to drive further progress, innovation, and accountability. We find that development of a natural gas usage reduction goal is consistent with codified State public policy goals, and is also imperative to support an overall strategy of efficient energy usage rather than simply a shifting of demand between two fuel sources.

¹⁰⁶ Staff Comments at 16; MEA Comments at 25.

¹⁰⁷ ML#167111: *Workgroup Summary Report* (April 15, 2015) at Attachment E.

¹⁰⁸ *Id.* at 16.

¹⁰⁹ PUA § 7-211(d). Furthermore, “gas company” is defined by PUA § 1-101(k).

¹¹⁰ WGL Comments at 2.

While we conclude that the formulation of a natural gas usage reduction goal for all gas companies¹¹¹ in the State is appropriate, we are not at this time prepared to establish specific targets due to the ongoing discussions occurring at the Natural Gas – Electric Efficiency Coordination Work Group. However, by this Order we establish a timeline for development of these goals and prescribe certain minimum parameters that must be observed during this process. *First*, Staff is directed to engage all affected natural gas companies in the State as part of this process. *Second*, we direct the Work Group to structure the natural gas usage reduction goals in the same manner prescribed herein for the electric energy savings goals, meaning that goals should be established: in conjunction with three-year program cycles; at the gross wholesale level; and utility-wide (rather than sector-specific). *Third*, the natural gas usage reduction goal should be formulated as a percentage of retail sales using a consistent sales baseline. While the parties may rely on external tools such as a potential study to derive this percentage, we concur with the Coalition that the completion of such a study “should not be a barrier to establishing targets for EmPOWER.”¹¹² Instead, the parties are encouraged to look to other sources, such as achieved reductions by existing EmPOWER natural gas measures, and natural gas usage reduction goals adopted by leading states in our region.¹¹³ Staff, on behalf of the Natural Gas – Electric Efficiency Coordination Work Group, is directed to file proposed natural gas usage reduction goals for year 2017 and the subsequent program cycle no later than February 1, 2016.

¹¹¹ “Gas company” is defined by PUA § 1-101(k).

¹¹² Coalition Comments at 22.

¹¹³ As noted by the Coalition in its comments, ACEEE reported in its *2014 State Energy Efficiency Scorecard* that the ten leading states in gas energy efficiency achieved between 0.73% and 1.47% of savings as a percentage of retail sales. Coalition Comments at 22.

3. Limited-Income Energy Efficiency Goals

Improving the energy efficiency of limited-income households remains a critical area of focus for the State. In recent orders we have established a framework of accountability to increase the reach of the EmPOWER limited-income programs to as many eligible participants as possible using the allocated funding.¹¹⁴ To further encourage services to this critical sector, the Coalition advocated that we establish a minimum investment target for the EmPOWER Maryland limited-income programs moving forward.¹¹⁵

While the Coalition (and all other parties) agreed that there should be no residential or C&I sector-specific goals established for the Utilities, the Coalition did recommend that we establish a separate limited-income program energy savings goal that the Maryland Department of Housing and Community Development (“DHCD”), rather than the Utilities, would be responsible for attaining.¹¹⁶ We concur that the program implementer is the appropriate entity with whom responsibility for goal attainment should lie, and we also find that the establishment of a separate limited-income goal is appropriate given our decision to apply unique treatment to this sub-portfolio with respect to the cost-effectiveness screening process.

However, despite our interest in setting a post-2015 energy savings goal for our limited-income programs, the record is underdeveloped on this point, and importantly, does not contain input from the current limited-income program implementer. We therefore direct the Limited-Income Work Group to consider this issue and develop a

¹¹⁴ See, e.g. Order No. 86785 (Dec. 23, 2014) at 21.

¹¹⁵ Coalition Comments at 17.

¹¹⁶ *Id.*

recommended post-2015 goal for the EmPOWER limited-income programs no later than February 1, 2016, subject to the following parameters. At a minimum, the Limited-Income Work Group should consider: the total number of customers in each service territory eligible to qualify for benefits under the Electric Universal Service Program; the historical production rate of EmPOWER-funded limited-income weatherization programs; associated bill impacts, assuming an investment per household amount equivalent to the soft cap established in Order No. 86785; and the overlap of electric and natural gas utility service territories. Until such time that we adopt a post-2015 goal specific to the limited-income programs, we will continue to evaluate program performance in light of DHCD's approved 2015 – 2017 program cycle proposal.

4. Multifamily Energy Efficiency Goals

We continue to acknowledge the importance of extending EmPOWER programs to all market segments, although we note that no party recommended the establishment of a separate post-2015 energy efficiency goal specific to the multifamily sector. We note that the absence of such a recommendation aligns with the more general consensus of the parties to establish a single utility-wide goal (rather than a separate goal for the residential and C&I sectors), and is appropriate given that the funding for multifamily initiatives is drawn from both the residential and C&I surcharges at present. To-date, the multifamily sector has been primarily addressed in the EmPOWER context through the Multifamily Energy Efficiency and Housing Affordability ("MEEHA") program implemented by DHCD. However, several of the Utilities developed in recent years

programs within their residential and C&I sub-portfolios that specifically target multifamily dwellings and master-metered units.¹¹⁷

While we decline to establish a post-2015 goal specific to the multifamily sector (just as we decline to establish a post-2015 goal specific to the residential and C&I sectors), we concur with the recommendation by Staff and others that sector progress should continue to be tracked to ensure the equitable distribution of utility resources.¹¹⁸ To the extent that Staff requires the Utilities and DHCD to supplement forecasts or analyses with respect to the 2015 – 2017 program cycle in order to assess the appropriate distribution of resources to the multifamily and master-metered sector, the Utilities and DHCD are directed to do so.

B. Post-2015 Demand Reduction Goals

Since 2009, the Utilities have collectively achieved 1,743 MW of demand reduction through implementation of EmPOWER Maryland programs, serving to mitigate capacity market prices and to offset critical winter and summer peak loads. While we continue to stress the importance of such demand reduction measures, we concur with Staff's observation that several recent and ongoing developments (such as the litigation surrounding FERC Order 745 and the PJM Capacity Performance Proposal) are complicating the formulation of post-2015 demand savings targets.¹¹⁹ Additionally, the Utilities have reported an increasing level of market saturation with respect to their direct load control programs in recent years, and are also grappling with customer

¹¹⁷ BGE and Pepco administer a residential multifamily new construction program, while BGE, Delmarva, Pepco, and SMECO each began implementing a C&I master-metered multifamily program in the 2015 – 2017 program cycle.

¹¹⁸ Staff Comments at 14.

¹¹⁹ *Id.* at 14-15.

engagement issues and the interface of these traditional demand response programs with emerging initiatives such as dynamic pricing.¹²⁰

In light of these observations, we find that the prospect of establishing post-2015 specific and robust demand reduction goals is not yet ripe for our consideration. We will, however, continue to evaluate the Utilities' achieved demand savings in light of the approved 2015 – 2017 program cycle proposals.¹²¹ This approach provides that the Utilities will maintain demand reduction capability and continue to work towards achieving their 2016 and 2017 approved targets during this period of market transformation. The EmPOWER Maryland Planning Work Group is encouraged to continuing monitoring the developments in this arena so that a demand reduction goal could be established in conjunction with the subsequent program cycle, as appropriate.

IT IS THEREFORE, this 16th day of July, in the year Two Thousand Fifteen, by the Maryland Public Service Commission,

ORDERED: (1) That the Societal Cost Test and the Total Resource Cost Test shall be used as the assessment tools for cost-effectiveness screening on a prospective basis;

(2) That cost-effectiveness screening should occur at the sub-portfolio level subject to the guidance provided herein;

(3) That, for the 2015 – 2017 program cycle, the Energy and Capacity DRIPE methodologies proposed as part of the Exeter Avoided Cost Study shall be reflected in

¹²⁰ *Id.*

¹²¹ See Order No. 86785 (Dec. 23, 2014).

the cost-effectiveness screening tools, subject to the modified assumption of a four-year Capacity DRIPE;

(4) That the Utilities' individual weighted average cost of capital shall be the assumed discount rate for purposes of the Total Resource Cost test;

(5) That a 4.7% nominal discount rate shall be assumed for purposes of the Societal Cost Test;

(6) That the Itron quantified business-as-usual valuation of non-energy comfort benefits and non-energy commercial and industrial operations and maintenance benefits shall be included in both the Total Resource Cost test and the Societal Cost Test;

(7) That the Itron quantified business-as-usual valuation of non-energy avoided air emissions benefits shall be included in the Societal Cost Test;

(8) That the Itron quantified non-energy 2% increase in benefits associated with reduced customer arrearages shall be included in the Total Resource Cost test and the Societal Cost Test with respect to the limited-income sub-portfolio;

(9) That BGE, Delmarva, Pepco, PE, and SMECO are directed to file no later than September 1, 2015 a table depicting Commission-approved forecasted gross electric savings for the 2015 – 2017 program cycle as a percentage of their respective 2013 weather-normalized gross retail sales;

(10) That post-2015 electric energy efficiency goals are established: utility-wide; at the gross wholesale level; calculated as a percentage of the individual utility's weather-normalized gross retail sales baseline; and on a trajectory to achieve an annual incremental gross energy savings of 2.0% per year using a ramp-up rate of 0.20% per year;

(11) That Staff, on behalf of the Natural Gas – Electric Efficiency Coordination Work Group, is directed to file no later than February 1, 2016 proposed natural gas usage reduction goals for year 2017 and the subsequent program cycle consistent with the guidance provided herein; and

(12) That Staff, on behalf of the Limited-Income Work Group, is directed to develop and submit a post-2015 energy savings goal for the EmPOWER Maryland limited-income programs no later than February 1, 2016.

/s/ W. Kevin Hughes

/s/ Harold D. Williams

/s/ Lawrence Brenner

/s/ Anne E. Hoskins

Commissioners¹²²

¹²² Commissioner Jeannette M. Mills did not participate in this decision.

APPENDIX 1

Appendix 1: Post-2015 Electric Energy Efficiency Goal Structure Illustration

Hypothetical: Utility A, Utility B, and Utility C each received Commission approval for their 2015 – 2017 program cycle proposals. Translating the gross savings forecasted by the 2015 – 2017 approved plans into a percentage of their individual 2013 weather-normalized gross retail sales yields the following results depicted in Table 1.

*Table 1: Forecasted Gross Savings from the Approved 2015 – 2017 Program Cycle Plans
As a Percentage of 2013 Weather-Normalized Gross Retail Sales*

	2015	2016	2017
Utility A	1.50%	1.50%	1.50%
Utility B	1.20%	1.25%	1.10%
Utility B	1.30%	1.35%	1.55%

Following issuance of the Commission’s Order, both Utility A and Utility B need to supplement their approved calendar year 2017 plans to reflect a ramp-up rate of 0.20%. The approved plan for Utility C, however, already reflects a 0.20% ramp-up rate between calendar year 2016 and 2017, and thus Utility C does not need to take any additional action during this program cycle.

*Table 2: Revised 2015 – 2017 Program Cycle Goals
Annual Incremental Gross Savings as a Percentage of
2013 Weather-Normalized Gross Retail Sales*

	2015	2016	2017
Utility A	1.50%	1.50%	1.70%
Utility B	1.20%	1.25%	1.45%
Utility C	1.30%	1.35%	1.55%

No later than September 1, 2017, all three utilities must file new electric energy efficiency plans for the 2018 – 2020 program cycle. The gross savings projected by the utilities’ proposals must be translated into a percentage of the individual utility’s 2016 weather-normalized gross retail sales baseline. Utility A, Utility B, and Utility C must propose plans that continue to ramp-up targeted annual incremental gross savings until reaching the targeted 2.0% annual incremental savings goal as a percentage of the specified retail sales baseline. While each utility’s progress will be measured against the annual targets, achievement of the goal will be measured using an average of the utility’s three-year program cycle annual targets.

*Table 3: 2018 – 2020 Program Cycle Electric Goals
Annual Incremental Gross Savings as a Percentage of
2016 Weather-Normalized Gross Retail Sales*

	2018	2019	2020	2018 - 2020 Goal
Utility A	1.90%	2.00%	2.00%	1.97%
Utility B	1.65%	1.85%	2.00%	1.83%
Utility C	1.75%	1.95%	2.00%	1.90%

Promising Practices Clearinghouse for Professionals

Ending Stigma Around Receiving Benefits

Jun 01, 2016 | 3 min read



Key Takeaways

Stigma, both internal and external, is a common reason many eligible older adults don't apply for benefits.

Benefits counselors can mitigate stigma through improved communication about the value of benefits.

Our research report explains more about stigma, its effects, and how to message around it.

Stigma is best understood as a negative reputation that creates real costs—emotional, social, physical, time, and financial—or the perception that costs will be incurred.

In 2015 to 2016, NCOA conducted in-depth interviews with 40 benefits counselors to better understand the phenomenon of stigma, how it manifests among their clients, and the strategies that they utilize to counter stigma during the benefits application process. The

findings from this effort are detailed in the report, [An End to Stigma <https://assets-us-01.kc-usercontent.com/ffacfe7d-10b6-0083-2632-604077fd4eca/140b47de-067d-4baa-bc73-6fce03ccac40/An-End-to-Stigma-Issue-Brief-NCOA.pdf>](https://assets-us-01.kc-usercontent.com/ffacfe7d-10b6-0083-2632-604077fd4eca/140b47de-067d-4baa-bc73-6fce03ccac40/An-End-to-Stigma-Issue-Brief-NCOA.pdf), and summarized briefly here.

How stigma manifests

Stigma manifests itself in two primary ways:

- **Internal stigma** arises from negative perceptions or connotations about oneself that occur when deciding to learn about, apply for, and participate in benefits programs. Shame and embarrassment about participation in the program are the most common manifestations of internal stigma.
- **External stigma** arises from experiences or perceptions about the benefits themselves. Administrative burdens, such as long applications or difficult-to-reach social service agencies, and misconceptions about the value of a given benefit may lead eligible people to decide the reward is not worth the cost.

The primary consequence of stigma is that low-income older adults do not apply for public benefits for which they are eligible, thereby foregoing a crucial form of financial assistance, [which can impact levels of debt](#) and, ultimately, their health and independence.

Messages to counter stigma

Counselors who educate and assist older adults and people with disabilities to apply for benefits are on the frontline in the fight to overcome stigma and encourage people to get the public assistance for which they are eligible. Some of their successful strategies for overcoming stigma, which are outlined further in the report, included:

1. Challenging the narrative of “deserving” and “undeserving” poor
2. Focusing on the structure of the program
- 3.

Correcting misconceptions about the benefit

4. Providing person-centered benefits enrollment assistance
5. Demonstrating the value of a benefit

In addition, there is a role for agency administrators and policymakers to help improve enrollment processes through existing waiver programs such as shorter applications, experimenting with new processes, and improving data-sharing between agencies.

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Absenteeism in the Workplace: Impact, Causes, Policies & Solutions

hrlineup

10–12 minutes

Absenteeism in the workplace is a pervasive issue that affects organizations across industries and sectors. It refers to the habitual or intentional absence of employees from work, often without prior notice or valid reasons. This phenomenon can have profound implications for both employees and employers, leading to decreased productivity, increased operational costs, and a negative impact on workplace morale. In this comprehensive exploration, we will delve into the meaning of absenteeism, its effects, impact on organizations, underlying causes, existing policies, and potential solutions to mitigate its adverse consequences.

Meaning of Absenteeism

Absenteeism is defined as the frequent and intentional non-attendance of employees at their workplace. This behavior can manifest in various forms, including unscheduled or unauthorized leave, excessive sick days, and unexplained absences. While occasional absenteeism is a natural part of any workforce, persistent and widespread absenteeism can become a significant concern for employers.

Effects of Absenteeism in the Workplace

- **Productivity Loss:** One of the primary effects of absenteeism is a decline in overall productivity. When employees are absent, the workflow is disrupted, and the remaining staff may have to take on additional responsibilities, leading to a decrease in efficiency.
- **Financial Impact:** Absenteeism can result in increased operational costs for organizations. Hiring temporary staff to fill in for absent employees, paying overtime to existing staff, and the costs associated with decreased productivity can contribute to financial strain.
- **Workplace Morale:** A consistent pattern of absenteeism can negatively impact the morale of the remaining employees. They may feel overburdened, demotivated, or frustrated, leading to a decline in teamwork and collaboration.
- **Customer Service Impact:** In customer-facing industries, absenteeism can directly affect the quality of service provided. Customers may experience delays, reduced responsiveness, and overall dissatisfaction with the organization.

Impact of Absenteeism on Organizations

- **Strain on Human Resources:**

Excessive absenteeism places a strain on human resources departments as they need to [manage leave requests](#), find suitable replacements, and address the challenges posed by a fluctuating workforce.

- **Increased Workload on Colleagues:**

Absenteeism often results in an increased workload for employees who are present. This can lead to burnout, decreased job satisfaction, and a higher likelihood of these employees also succumbing to absenteeism.

- **Negative Impact on Company Culture:**

A culture of frequent absenteeism can contribute to a negative work environment. It may erode trust, hinder collaboration, and diminish the sense of accountability among employees.

Top Causes of Absenteeism at Work

Understanding the underlying causes is crucial for implementing effective strategies to reduce absenteeism. Here are some of the top causes:

- **Health Issues:**

Physical and mental health problems can lead to absenteeism. Chronic conditions, such as back pain, stress, anxiety, and depression, may result in employees taking frequent sick leave.

- **Workplace Stress:**

High levels of stress due to heavy workloads, unrealistic deadlines, or a lack of support can contribute to absenteeism. A stressful work environment can negatively impact both physical and [mental well-being](#).

- **Poor Work-Life Balance:**

Employees facing challenges in balancing work and personal life may experience burnout, leading to increased absenteeism. Employers promoting a healthy work-life balance can mitigate this issue.

- **Job Dissatisfaction:**

Employees who are dissatisfied with their jobs or feel undervalued may be more likely to take time off. Addressing concerns related to

job satisfaction and [employee engagement](#) can positively impact attendance.

- **Inadequate Leadership and Management:**

Poor leadership and management practices can create a negative workplace culture, fostering absenteeism. Effective leadership, communication, and a supportive management style are essential in preventing this issue.

- **Lack of Flexibility:**

A rigid work environment with limited flexibility in terms of work hours or remote work options may contribute to absenteeism. Offering flexible work arrangements can help employees better manage their responsibilities.

- **Workplace Bullying and Harassment:**

Instances of bullying and harassment can create a hostile work environment, leading to stress and anxiety. Establishing a zero-tolerance policy and fostering a respectful workplace culture can help combat this issue.

- **Poor Job Security:**

Employees facing uncertainty about their job security may experience increased stress and anxiety, leading to absenteeism. Transparent communication about organizational stability can help alleviate these concerns.

- **Personal Issues:**

Personal challenges, such as family issues, childcare problems, or financial difficulties, can impact an employee's ability to attend work regularly. Implementing supportive policies and employee

assistance programs can be beneficial.

- **Inadequate Benefits and Wellness Programs:**

Companies that do not offer comprehensive health and wellness programs may find their employees more susceptible to health issues. Providing access to wellness initiatives and healthcare resources can contribute to a [healthier workforce](#).

- **Lack of Recognition and Reward:**

Employees who feel unrecognized or unrewarded for their efforts may become disengaged and less motivated to attend work consistently. Acknowledging and rewarding employees for their contributions can boost morale.

Workplace Policies Addressing Absenteeism

- **Comprehensive Leave Policies:** Implementing clear and flexible leave policies that include sick leave, personal days, and vacation time can help employees manage their time off more effectively.
- **Wellness Programs:** Introducing wellness programs that focus on both physical and mental health can contribute to a healthier workforce, reducing the instances of absenteeism due to health issues.
- **Flexible Work Arrangements:** Offering flexible work arrangements, such as telecommuting or flexible hours, can enhance employee satisfaction and reduce absenteeism related to work-life balance issues.
- **Employee Assistance Programs (EAPs):** Providing access to [EAPs](#) can offer employees resources and support for managing personal and work-related challenges, potentially reducing stress-related absenteeism.

Solutions to Mitigate Absenteeism

- **Promote a Positive Work Environment:**

Fostering a positive and inclusive workplace culture can [improve job satisfaction](#) and employee engagement, reducing the likelihood of absenteeism.

- **Training and Development Opportunities:**

Providing opportunities for skill development and career advancement can increase employee motivation and commitment to the organization.

- **Regular Health Check-ups:**

Encouraging regular health check-ups and preventive care can help identify and address health issues early on, reducing the impact of absenteeism due to illness.

- **Communication and Feedback Channels:**

Establishing open communication channels and providing constructive feedback can help address concerns before they escalate, contributing to a healthier work environment.

Absenteeism in the Workplace Examples

Let's explore some examples of absenteeism and its potential impact on the workplace.

1. Health-Related Absenteeism:

One common cause of absenteeism is health issues. Employees may frequently miss work due to illnesses, chronic conditions, or mental health concerns. For instance, an employee dealing with recurring migraines or anxiety may find it challenging to maintain

regular attendance. Employers should be aware of these issues and create a supportive environment that encourages employees to prioritize their well-being.

2. Family Obligations:

Employees may face absenteeism due to family-related responsibilities, such as caring for a sick family member, attending to childcare needs, or dealing with unexpected family emergencies. While these are legitimate reasons, it's essential for organizations to establish clear policies and provide flexibility to accommodate employees facing such challenges.

3. Burnout and Work-Related Stress:

Work-related stress and burnout can lead to absenteeism as employees may feel overwhelmed or exhausted. Long hours, excessive workload, and a lack of work-life balance contribute to this issue. Employers should promote a healthy work environment, encourage open communication, and implement measures to prevent burnout.

4. Lack of Engagement:

Employees who feel disengaged or uninterested in their work are more likely to be absent. This disengagement can result from factors such as a lack of recognition, limited career growth opportunities, or ineffective communication within the organization. Implementing employee engagement strategies, recognizing achievements, and fostering a positive work culture can help address this form of absenteeism.

5. Unscheduled Leaves and Tardiness:

Some employees may frequently take unscheduled leaves or arrive

late to work without valid reasons. This can disrupt workflow, affect team dynamics, and impact overall productivity. Implementing attendance policies, providing clear expectations, and addressing underlying issues with individual employees can help mitigate this type of absenteeism.

6. Presenteeism as a Symptom:

In some cases, absenteeism may not manifest as employees being physically absent but rather as [presenteeism](#)—employees showing up to work while not being fully engaged or productive. This can be a sign of underlying issues such as job dissatisfaction, lack of motivation, or unresolved conflicts within the workplace.

Conclusion

Absenteeism is a multifaceted issue that requires a comprehensive approach for effective management. By understanding the meaning, effects, impact, causes, and potential solutions, organizations can develop strategies to mitigate the negative consequences of absenteeism and create a healthier and more productive workplace. Implementing supportive policies, fostering a [positive work environment](#), and addressing the root causes of absenteeism are essential steps in building a resilient and engaged workforce.

**NATIONAL ENERGY ASSISTANCE
DIRECTORS' ASSOCIATION**

**2011 NATIONAL ENERGY ASSISTANCE SURVEY
FINAL REPORT**

November 2011

The National Energy Assistance Directors' Association

The National Energy Assistance Directors' Association (NEADA) represents the state directors of the Low Income Home Energy Assistance Program (LIHEAP). NEADA is a nonprofit educational and policy organization based in Washington, DC. Its mission is to support the delivery of LIHEAP services by state agencies and programs.

This report has been prepared by APPRISE for NEADA under Grant No. 90XP0249 through the Administration for Children and Families (ACF), U.S. Department of Health and Human Services. The statements, findings, conclusions, and recommendations do not necessarily reflect the views of ACF.

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The study would not have been possible without the participation of the directors and staff at the state LIHEAP offices in:

California	Iowa	Montana	New York
Connecticut	Maine	North Carolina	Ohio
Delaware	Minnesota	New Mexico	Pennsylvania
Georgia			

Mark Wolfe
Executive Director
National Energy Assistance Directors' Association

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Executive Summary

The National Energy Assistance Directors' Association (NEADA), representing the state LIHEAP directors, received a grant through the Administration for Children and Families (ACF), U.S. Department of Health and Human Services to update the information about LIHEAP-recipient households that was collected in the 2003, 2005, 2008 and 2009 NEA Surveys. This survey documented changes in the affordability of energy bills, the need for LIHEAP, and the choices that low-income households make when faced with unaffordable energy bills.

The 2011 Survey included 13 states with an oversample in Connecticut, as in the 2009 Survey. Stratified samples of fiscal year 2011 LIHEAP recipients were chosen from each of the state LIHEAP databases. This report presents the findings from the 2011 NEA Survey and provides comparisons to the 2003, 2008, and 2009 NEA Surveys. The survey and report were prepared for NEADA by APPRISE.

During the period of study, low-income households across the country continued to face a difficult economic climate and continued to deal with high energy costs. The survey substantiated these issues – showing that 35 percent were unemployed at some point during the year and that 52 percent reported it was more difficult to pay energy bills than it was the previous year.

LIHEAP Recipient Households

The study confirmed that LIHEAP recipient households are likely to be vulnerable to temperature extremes.

- 40 percent had a senior in the household aged 60 or older.
- 42 percent had a disabled household member.
- 41 percent had a child 18 or younger.
- 89 percent had at least one vulnerable household member.

The study also provided information on challenges that these households faced.

- 35 percent were unemployed at some point during the previous year.
- 72 percent had a serious medical condition.
- 26 percent used medical equipment that requires electricity.

Energy Costs

LIHEAP recipients reported that they faced high energy costs.

- 45 percent reported that their energy bills were more than \$2,000 in the past year.
- Pre-LIHEAP energy burden averaged 16 percent and post-LIHEAP energy burden averaged 12 percent for these households, compared to 7 percent for all households in the U.S. and 4 percent for non low-income households in the U.S.¹
- 52 percent said that energy bills were more difficult to pay than in the previous year.

¹ Source: 2008 LIHEAP Notebook.

- 48 percent of those who said that it was more difficult to pay their energy bills reported that the main reason was their financial situation.

LIHEAP benefits decreased due to the smaller appropriation in FY 2011. Mean heating benefits were \$424 in FY 2011, compared to \$483 in FY 2009.

Responses to High Energy Costs

Households reported that they took several actions to make ends meet.

- 39 percent closed off part of their home.
- 23 percent kept their home at a temperature that was unsafe or unhealthy.
- 21 percent left their home for part of the day.
- 33 percent used their kitchen stove or oven to provide heat.

Inability to Pay Energy Bills

Many LIHEAP recipients were unable to pay their energy bills.

- 49 percent skipped paying or paid less than their entire home energy bill.
- 37 percent received a notice or threat to disconnect or discontinue their electricity or home heating fuel.
- 11 percent had their electric or natural gas service shut off in the past year due to nonpayment.
- 24 percent were unable to use their main source of heat in the past year because their fuel was shut off, they could not pay for fuel delivery, or their heating system was broken and they could not afford to fix it.
- 17 percent were unable to use their air conditioner in the past year because their electricity was shut off or their air conditioner was broken and they could not afford to fix it.

Housing and Financial Problems

Many LIHEAP recipients had problems paying for housing in the past five years, due at least partly to their energy bills.

- 31 percent did not make their full mortgage or rent payment.
- 6 percent were evicted from their home or apartment.
- 4 percent had a foreclosure on their mortgage.
- 14 percent moved in with friends or family.
- 4 percent moved into a shelter or were homeless.
- 13 percent got a payday loan in the past five years.

Medical and Health Problems

Many of the LIHEAP recipients faced significant medical and health problems in the past five years, partly as a result of high energy costs.

- 24 percent went without food for at least one day.
- 37 percent went without medical or dental care.

- 34 percent did not fill a prescription or took less than the full dose of a prescribed medication.
- 19 percent had someone in the home become sick because the home was too cold.

The Need for LIHEAP

Households reported enormous challenges despite the fact that they received LIHEAP. However, they reported that LIHEAP was extremely important.

- 65 percent of those who did not keep their home at unsafe or unhealthy temperatures said they would have done so if LIHEAP had not been available.
- 63 percent of those who did not have their electricity or home heating fuel discontinued said that they would have if it had not been for LIHEAP.

It is clear that many of these households will continue to need LIHEAP to meet their energy and other essential needs.

I. Introduction

The National Energy Assistance Directors' Association (NEADA), representing the state LIHEAP directors, received a grant through the Administration for Children and Families (ACF), U.S. Department of Health and Human Services to update the information about LIHEAP-recipient households that was collected in the 2003, 2005, 2008, and 2009 NEA Surveys. This survey documented changes in the affordability of energy bills, the need for LIHEAP, and the choices that low-income households make when faced with unaffordable energy bills.

The 2011 NEA Survey selected a new sample of 2011 LIHEAP recipients to document changes in the need for LIHEAP and changes in the choices that low-income households make when faced with unaffordable energy bills. This report presents the findings from the 2011 NEA Survey and provides comparisons to the 2003, 2008 and 2009 NEA Surveys. The survey and report were prepared for NEADA by APPRISE.

A. *Low Income Home Energy Assistance Program (LIHEAP)*

The Low Income Home Energy Assistance Program (LIHEAP) is administered by the U.S. Department of Health and Human Services (HHS). The purpose of LIHEAP is “to assist low-income households, particularly those with the lowest incomes, that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs.” The LIHEAP statute defines home energy as “a source of heating or cooling in residential dwellings.”²

Federal dollars for LIHEAP are allocated by the U.S. Department of Health and Human Services to the grantees (i.e., the 50 states, District of Columbia, 128 tribes and tribal organizations, and five insular areas) as a block grant. Program funds are distributed by a formula, which is weighted towards relative cold-weather conditions.

Program funds are disbursed to LIHEAP income-eligible households under programs designed by the individual grantees. Section 2605(b)(2) allows LIHEAP grantees to use two income-related standards in determining household eligibility for LIHEAP assistance:

- Categorical eligibility for households with one or more individuals receiving Temporary Assistance for Needy Families, Supplemental Security Income payments, Food Stamps, or certain needs-tested veterans' and survivors' payments, without regard for household income.

² The statutory intent of LIHEAP is to reduce home heating and cooling costs for low-income households. However, information on total residential energy costs is more accessible and more apparent to LIHEAP-recipient respondents. Moreover, any reduction in home heating and cooling costs leads to a direct reduction in total residential energy costs. Therefore, this report addresses total residential energy costs.

- Income eligibility for households with incomes that do not exceed the greater of an amount equal to 150 percent of the federal poverty level³, or an amount equal to 60 percent of the state median income. Grantees may target assistance to poorer households by setting lower income eligibility levels. Grantees are prohibited from setting income eligibility levels lower than 110 percent of the poverty level. Eligibility priority may be given to households with high energy burden or need.⁴

B. 2011 National Energy Assistance Survey

The 2011 NEA Survey aimed to update the information about LIHEAP-recipient households that was collected in the 2003, 2008, and 2009 NEA Surveys. Stratified samples of 2011 LIHEAP recipients were selected to collect new information about the consequences of high energy bills for low-income households. The 2011 National Energy Assistance Survey collected the following information from LIHEAP-recipient households:

- Demographic, energy expenditure, and income information
- Healthy home behaviors
- History of LIHEAP participation
- Constructive actions taken to meet energy expenses
- Signs of unaffordable energy bills
- Health and safety consequences of unaffordable energy bills
- Effects of unaffordable energy bills on housing
- Changes in financial situation and affordability of home energy bills
- Impact and importance of LIHEAP benefits for recipient households

The 2011 Survey included the 13 states that were included in the 2009 Survey and a larger sample of CT LIHEAP recipients, as a result of additional funding that was allocated for a special study in CT.

C. Organization of the Report

This report has six sections that follow this introduction.

- *Section II: Survey Methodology* – Presents the methodology used.
- *Section III: LIHEAP Recipients* – Presents demographic and income information for LIHEAP-recipient households that completed the 2011 NEA Survey.

³ Most states use the 150 percent of federal poverty level maximum as the guideline. 150 percent of federal poverty in FY2011 is \$16,470 for a single person and \$33,660 for a family of four. The 60 percent-of-SMI limit was raised to 75 percent of SMI for Federal Fiscal Years (FFYs) 2009 and 2010.

⁴ Description of LIHEAP information obtained from “Low Income Home Energy Assistance Program. Report to Congress for Fiscal Year 2001.” U.S. Department of Health and Human Services, Administration for Children and Families, Office of Community Services, Division of Energy Assistance. Additional information regarding the LIHEAP program can be found on the World Wide Web at: <http://www.acf.hhs.gov/programs/liheap/>.

- *Section IV: Problems Faced in Meeting Energy Needs* – Presents information about actions that LIHEAP-recipient households take to meet their energy needs, household necessities, and health and wellness in the face of significant financial constraints.
- *Section V: The Need For LIHEAP* – Presents information about the impact and importance of LIHEAP on recipient households.
- *Section VI: Regional Analysis* – Presents analysis of the problems faced by low-income households in the Northeast, Midwest, West, and South.
- *Section VII: Conclusion* – Presents a summary of the key findings in this report.

II. Survey Methodology

This section describes the methodology for the 2011 NEA Survey, including procedures for sample selection, survey implementation, and weighting.

A. *Survey Implementation*

A survey advance letter was sent to the sample of selected LIHEAP recipients from the 13 participating states. This letter announced the survey, notified potential respondents that they might be called to participate in the survey, explained the purpose of the survey, and gave potential respondents the option to call the phone center to complete the survey at their convenience.

APPRISE retained Issues and Answers to conduct the telephone survey through its call center. A researcher from APPRISE trained Issues and Answers' employees on the survey instrument and monitored survey implementation. I&A's manager in charge of the survey instructed interviewers how to use the computerized version of the survey to record customer responses.

Interviewer training consisted of two hour-long sessions – one for English-language interviews and one for the Spanish-language interviewer. This training session provided interviewers with an overview of the project, purpose behind questions asked, and strategies to provide accurate clarification and elicit acceptable responses through neutral probing techniques.

Interviewer monitoring allowed APPRISE researchers to both listen to the way interviewers conducted surveys and see the answers they chose on the computerized data entry form. I&A's manager facilitated open communication between the monitors and interviewers, which allowed the monitors to instruct interviewers on how to implement the survey and accurately record customer responses.

Telephone interviews were conducted between May 2, 2011 and July 3, 2011. During this time period, 1,768 interviews were completed.

B. *Sample Selection and Response Rates*

LIHEAP recipients were selected from each of the 13 states chosen to participate in the survey. Because of a congressional earmark for Connecticut, a special study was conducted for Connecticut. Table II-1 details the number of LIHEAP recipients selected to complete the survey, number of completed interviews, cooperation rates, and response rates for the national sample. Table II-1 presents the following information.

- **Number selected:** Initially, approximately 220 households were selected in each state, or for each district in Connecticut. An additional sample of 180 was initially selected for New York because of lower response rates experienced for that state in previous studies.

Due to the high number of non-interviews and unusable telephone numbers, an additional sample of 40 cases were selected for California, 50 for New York, and 50 for North Carolina. In Connecticut, an additional sample of 50 was selected for Districts 1, 3 and 4, and an additional sample of 40 was selected for District 5. The final sample consisted of 4,250 cases.

- **Unusable:** There were 1,066 cases deemed unusable because no one was present in the home during the survey who was able to complete the survey, or because phone numbers were missing, unavailable, disconnected, or incorrect. These households are not included in the denominator of the response rate or the cooperation rate. They are included in the denominator of the completed interview rate.
- **Non-Interviews:** There were 128 cases classified as non-interviews because the qualified respondent refused to complete the interview, or because the respondent asked the interviewer to call back to complete the interview at a later time, but did not complete the interview during the field period. These households are included in the denominator of the cooperation rate, the response rate, and the completed interview rate.
- **Unknown eligibility:** There were 1,288 cases that were determined to have unknown eligibility to complete the interview, due to answering machines, no answers, and language barriers.⁵ These households are not included in the denominator of the cooperation rate. They are included in the denominator of the response rate and the completed interview rate.
- **Completed interviews:** The completed interviews are households that were reached and that answered the full set of survey questions by telephone. In total, 1,768 interviews were completed.
- **Cooperation rate:** The cooperation rate is the percent of eligible households contacted who completed the survey. This is calculated as the number of completed interviews divided by the interviews plus the number of non-interviews (refusals plus non-completed call backs⁶). Overall, this survey achieved a 93 percent cooperation rate.
- **Response rate:** The response rate is the number of completed interviews divided by the number of completed interviews plus the number of non-interviews (refusals plus non-completed call backs) plus all cases of unknown eligibility (due to answering machines and language barriers). This survey attained a 56 percent response rate.

⁵ The telephone interview center conducted interviews with respondents with a language barrier who spoke Spanish, in all but two cases. However, there were 104 cases in which an interview could not be completed due to a language barrier for a language other than Spanish.

⁶ Non-completed callbacks include respondents who asked the interviewer to call back at a later time to complete the interview, but did not complete the interview by the end of the field period.

- **Completed Interview Rate:** The completed interview rate is the percentage of households selected that completed the survey. This survey attained a 42 percent completed interview rate.

Table II-1
Sample and Response Rates

	Total Sample Statistics
Number Selected	4,250
Unusable	1,066
Non-Interviews	128
Unknown Eligibility	1,288
Completed Interviews	1,768
Cooperation Rate	93%
Response Rate	56%
Completed Interview Rate	42%

Table II-2 displays the number of interviews completed by state. The response rate ranged from 41 percent in New York to 69 percent in New Mexico.

Table II-2
Number of Completed Interviews by State

State	Total Selected	Completed Interviews	Response Rate
California	260	103	48%
Connecticut	1,290	495	48%
Delaware	220	100	63%
Georgia	220	105	59%
Iowa	220	102	65%
Maine	220	133	68%
Minnesota	220	105	60%
Montana	220	102	62%
New Mexico	220	102	69%
New York	450	101	41%
North Carolina	270	97	60%
Ohio	220	111	67%
Pennsylvania	220	112	62%
TOTAL	4,250	1,768	56%

Table II-3 displays the number of interviews completed by district in CT. The response rate ranged from 44 percent in District 1 to 52 percent in District 2.

Table II-3
Connecticut Number of Completed Interviews by District

Connecticut	Total Selected	Completed Interviews	Response Rate
District 1	270	95	44%
District 2	220	102	52%
District 3	270	93	45%
District 4	270	103	48%
District 5	260	102	50%

C. Weights

Two sets of weights were used to ensure that state-level data represents each state and that the overall findings are representative of the national LIHEAP population. First, weights were applied within states. The purpose of these weights was to adjust for selection and response rate variation within poverty group and vulnerable status. A second set of weights was used so that the sum of the state weights was proportional to the strata size from which it was drawn. In the estimates presented in this report, the total weight, comprised of these two separate weights, is used. This results in a nationally representative sample of 2011 LIHEAP recipients.

III. LIHEAP Recipient Households

The 2011 National Energy Assistance Survey included a series of questions about household demographics.

Table III-1 displays information on the number of household members. The table shows that 36 percent of LIHEAP recipients live in single person households and 58 percent have two or fewer household members.

Table III-1
Number of Household Members

Number of Household Members	Percent of Respondents
1	36%
2	22%
3	14%
4	12%
5	8%
6 or more	7%

Table III-2 displays information on the presence of vulnerable household members. The table shows that 40 percent have a senior in the home, 42 percent have a disabled household member, 41 percent have a child age 18 or younger, and 21 percent have a child age five or younger. Eight-nine percent had at least one vulnerable member (elderly, disabled, or child).

Table III-2
Vulnerable Groups

	Senior ≥60	Disabled	Child ≤18	Young Child ≤5	Single Parent
Yes	40%	42%	41%	21%	15%
No	59%	56%	58%	78%	85%
Don't Know/ Refused	2%	2%	2%	2%	--

Table III-3 shows that 89 percent of LIHEAP recipients have at least one vulnerable household member.

Table III-3
Households with at Least One Vulnerable Member

	Percent of Respondents
At Least One Vulnerable Member	89%
No Vulnerable Members	11%

Respondents were asked whether they own or rent their home. Table III-4 shows that 46 percent of LIHEAP recipients own their homes.

**Table III-4
Home Ownership**

Home Ownership	Percent of Respondents
Own	46%
Rent	49%
Other	3%
Don't Know/Refused	2%

Table III-5 displays the annual household income distribution for LIHEAP-recipient households. The table shows that 36 percent have income of less than or equal to \$10,000 and only two percent have income above \$40,000.

**Table III-5
Annual Income**

Annual Income	Percent of Respondents
≤ \$ 10,000	36%
\$ 10,001 - \$ 20,000	41%
\$ 20,001 - \$ 30,000	16%
\$ 30,001 - \$ 40,000	5%
More than \$ 40,000	2%
Don't Know	1%

Table III-6A shows that 19 percent had income at or below 50 percent of the poverty level and 61 percent had income at or below the poverty level. Only 11 percent had income above 150 percent of the poverty level.

**Table III-6A
Poverty Level**

Poverty Level	Percent of Respondents
0%-50%	19%
51%-100%	42%
101%-125%	15%
126%-150%	13%
>150%	11%

Table III-6B displays the household poverty level by vulnerable group. The table shows that households with children and non-vulnerable households are more likely than households with seniors and with disabled members to have income at or below 50 percent of the poverty level.

Table III-6B
Poverty Level by Vulnerable Group

	Senior	Disabled	Child 18 or Younger	Child 5 or Younger	Single Parent Household ¹	Non-Vulnerable
Number of Respondents	705	738	722	344	275	195
0% - 50%	9%	13%	28%	35%	36%	32%
51% - 100%	42%	49%	36%	38%	33%	36%
101% - 150%	36%	29%	25%	19%	17%	20%
> 150%	13%	10%	11%	8%	13%	11%

¹ Defined as households with only one adult residing with one or more children.

Respondents were asked about the type of income and benefits received in the past year. Table III-7 shows that 33 percent reported that they received employment income, 38 percent said that they received retirement income, 32 percent reported that they received public assistance, and 63 percent reported that they received non-cash benefits, including food stamps or public housing.

Table III-7
Types of Income and Benefits Received

	Wages or Self-Employment Income	Retirement Income	Public Assistance	Non-cash benefits
Yes	33%	38%	32%	63%
No	65%	58%	63%	34%
Don't Know /Refused	2%	3%	4%	3%

Respondents were asked whether they had been unemployed at some time during the year. Table III-8A shows that 35 percent reported that they had been unemployed at some point during the past year. This compares to 31 percent in 2003, 29 percent in 2008, and 36 percent in 2009.

Table III-8A
Unemployed During the Year

	2003	2008	2009	2011
Yes	31%	29%	36%	35%
No	69%	70%	63%	62%
Don't Know / Refused	0%	1%	1%	3%

Table III-8B displays the percent of respondents who were unemployed during the past year by vulnerable group. The table shows that households with children under 18 and non-vulnerable households were most likely to report that they had been unemployed. Fifty-three percent of households with children reported that they had been unemployed.

Table III-8B
Unemployed During the Year
By Vulnerable Group

	Senior	Disabled	Child ≤18	Non-Vulnerable
Number of Respondents	705	738	722	195
Yes	17%	26%	53%	49%
No	81%	72%	46%	35%
Don't Know / Refused	2%	1%	1%	15%

Table III-8C displays the percent of respondents who reported that they had been unemployed in the past year by poverty level. The table shows that 59 percent of respondents with income at or below 50 percent of the poverty level reported that they had been unemployed, compared to 30 percent between 51 and 100 percent of poverty, 28 percent between 101 and 150 percent of poverty, and 32 percent above 150 percent of poverty.

Table III-8C
Unemployed During the Year
By Poverty Level

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Yes	59%	30%	28%	32%
No	33%	68%	71%	66%
Don't Know / Refused	7%	2%	1%	2%

Respondents were asked several questions about different medical conditions that members of their households had. Table III-9A shows that 40 percent had asthma, 22 percent had breathing-related conditions, and 52 percent had heart disease.

Table III-9A
Medical Conditions: Someone in the Household Had or
Had Symptoms of These Medical Conditions

	Asthma or Symptoms of Asthma	Chronic Bronchitis, Emphysema, COPD	Hypertension, Heart Disease, Heart Attack, or Stroke
Yes	40%	22%	52%
No	59%	77%	47%
Don't Know/ Refused	1%	2%	1%

Table III-9B displays the percent of respondents who had each of these medical conditions, by vulnerable group. The table shows that the rates of these conditions vary by vulnerable group.

Households with disabled members and households with children under 18 are most likely to have asthma and breathing conditions. Households with seniors and disabled members are most likely to have heart disease.

Table III-9B
Medical Conditions: Someone in the Household Had, or
Had Symptoms of These Medical Conditions
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Asthma or Symptoms of Asthma	35%	50%	50%	22%
Chronic Bronchitis, Emphysema, COPD	26%	36%	18%	11%
Hypertension, Heart Disease, Heart Attack, or Stroke	74%	67%	33%	38%

Table III-9C displays the percent of respondents who had medical conditions by poverty level. The table shows that there is not a clear relationship between poverty level and these symptoms.

Table III-9C
Medical Conditions: Someone in the Household Had, or
Had Symptoms of These Medical Conditions
By Poverty Level

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Asthma or Symptoms of Asthma	44%	42%	34%	42%
Chronic Bronchitis, Emphysema, COPD	19%	26%	19%	18%
Hypertension, Heart Disease, Heart Attack, or Stroke	40%	54%	59%	51%

Table III-10A displays the percent of respondents who reported that they had any of the conditions shown in the previous tables. The table shows that 72 percent reported that someone in the household had at least one of these conditions.

Table III-10A
Medical Conditions: Someone in the Household Had, or Had Symptoms of Allergies, Asthma, Chronic Bronchitis, Emphysema, COPD, High Blood Pressure, Heart Disease, a Heart Attack, or Stroke

	Presence of Medical Condition
Yes	72%
No	28%
Don't Know/ Refused	<1%

Table III-10B shows the percent of respondents who reported any of these conditions by vulnerable group. The table shows that households with seniors and households with disabled members were most likely to report these conditions. Eighty-five percent of households with a senior reported that they had one of these conditions and 87 percent with a disabled household member reported that they had one of these conditions.

Table III-10B
Medical Conditions: Someone in the Household Had, or Had Symptoms of Allergies, Asthma, Chronic Bronchitis, Emphysema, COPD, High Blood Pressure, Heart Disease, a Heart Attack, or Stroke By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Yes	85%	87%	62%	48%
No	15%	13%	38%	48%
Don't Know/Refused	0%	0%	0%	4%

Table III-10C displays the percent of respondents who reported any of these conditions by poverty group. The table shows that households in the middle poverty level groups have a slightly higher prevalence of these conditions.

Table III-10C
Medical Conditions: Someone in the Household Had, or Had Symptoms of Allergies, Asthma, Chronic Bronchitis, Emphysema, COPD, High Blood Pressure, Heart Disease, a Heart Attack, or Stroke By Poverty Level

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Yes	63%	75%	74%	70%
No	35%	25%	26%	29%
Don't Know/Refused	2%	0%	0%	1%

Table III-11 displays the percent of respondents who had a breathing condition and who needed to go to the hospital for the condition during the past year. This table shows that 19 percent had the condition and needed to go to the hospital for the condition. Of those who had the condition, 42 percent needed to go to the hospital.

Table III-11
Medical Conditions: Someone in the Household Had Asthma, Symptoms of Asthma, or had Chronic Bronchitis, Emphysema, or Chronic Obstructive Pulmonary Disease (COPD) And Needed to Go to the Hospital for This Health Problem in the Past Year

	Needed to Go to Hospital	Of those whose household have condition
Number of Respondents	1,768	816
Yes	19%	42%
No	27%	57%
Don't Know / Refused	<1%	1%
Does Not Have Condition	54%	--

Respondents were asked whether they use any medical equipment that requires the use of electricity. Table III-12A shows that 26 percent of respondents reported that they use such equipment.

Table III-12A
Someone in the Household Utilizes Necessary Medical Equipment that Uses Electricity

Someone in the Household Utilizes Necessary Medical Equipment that Uses Electricity	Percent of Respondents
Yes	26%
No	72%
Don't Know/Refused	2%

Table III-12B displays the percent who reported the use of such medical equipment by vulnerable group. The table shows that 36 percent of households with a disabled member and 32 percent of households with children reported that they use this equipment. Households that did not have vulnerable members were least likely to report the use of this equipment.

Table III-12B
Member of Household Utilizes Medical Equipment that Requires Electricity
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Yes	24%	36%	32%	7%
No	76%	63%	67%	78%
Don't Know / Refused	1%	1%	<1%	15%

Respondents were asked to report the primary fuel used to heat their home. Table III-13 shows that 43 percent use natural gas, 23 percent use electricity, 16 percent use fuel oil or kerosene, and nine percent use LPG.

Table III-13
Primary Fuel Used for Home Heating

Primary Fuel Used for Home Heating	Percent of Respondents
Natural Gas	43%
Electricity	23%
Fuel Oil or Kerosene	16%
Bottled Gas (LPG or Propane)	9%
Wood	2%
Solar Energy	0%
Other Fuel	1%
No Fuel Used	<1%
Don't Know/Refused	3%

Table III-14 shows that seven percent of respondents who do not own their own home have their heat included in their rent.

Table III-14
Heat included in Rent

Heat included in Rent	Percent of Respondents
Number of Respondents	978
Yes	7%
No	87%
Do Not Pay Rent	3%
Don't Know/Refused	3%

IV. Problems Meeting Energy Needs

This section examines the financial challenges and difficult choices made by the LIHEAP recipients to manage their total residential energy costs.

A. *Increased Utility Bills and Increased Need*⁷

Respondents were asked to report their annual energy costs. Table IV-1 shows that 45 percent of the respondents reported that their bills were over \$2,000.

Table IV-1
Annual Total Residential Energy Costs

Annual Energy Costs	Percent of Respondents
Less than \$500	2%
\$501 - \$1,000	8%
\$1,001 - \$1,500	10%
\$1,501 - \$2,000	12%
Over \$2,000	45%
Don't Know/Refused	22%

Table IV-2 displays the distribution of LIHEAP heating benefits in FY2008, FY2009 and FY2011. Twenty-eight percent received \$250 or less in FY2011, compared with 18 percent who received \$250 or less in FY2009. Mean heating benefits were lower than in 2009 but higher than in 2008.

Table IV-2
LIHEAP Heating Benefits Distribution

Benefit Amount	Percent Received		
	2008	2009	2011
Number of Respondents	1,256	1,828	1,667
≤ \$100	6%	<u>5%</u>	<u>7%</u>
\$101-\$250	<u>25%</u>	<u>13%</u>	<u>21%</u>
\$251-\$500	<u>39%</u>	45%	<u>43%</u>
\$501-\$750	<u>11%</u>	<u>21%</u>	<u>16%</u>
\$751-\$1,000	6%	7%	7%
≥ \$1,000	<u>3%</u>	6%	<u>5%</u>
Did Not Receive Heating Benefit	<u>9%</u>	4%	<u>2%</u>

⁷ In this section, there are several instances where 1,667 respondents out of 1,768 respondents are included because LIHEAP benefit information could not be obtained. In these cases, the number of respondents is noted.

	Percent Received		
Benefit Amount	2008	2009	2011
Number of Respondents	1,256	1,828	1,667
Mean Benefits	\$388	\$483	\$424

Note: 2011 statistically significant differences at the 95% level from 2008 and 2009 are underlined.

Pre-LIHEAP energy burden was calculated by dividing the respondents' energy costs by their total household income and post-LIHEAP energy burden was calculated by subtracting LIHEAP benefits from energy costs and then dividing these net energy costs by total household income. Table IV-3A shows that LIHEAP benefits had a big impact on the households' energy burden. Prior to receiving LIHEAP, 22 percent of households had an energy burden higher than 20 percent. After receiving LIHEAP, 13 percent had an energy burden that was this high. Additionally, LIHEAP benefits increased the percentage with burdens below five percent from 9 percent of recipients to 26 percent.

Table IV-3A
Total Residential Energy Burden

	Total Residential Energy Burden	
	Pre-LIHEAP	Post-LIHEAP
Number of Respondents	1,275	1,275
0-5%	9%	26%
6%-10%	32%	32%
11-15%	23%	20%
16-20%	13%	9%
21-25%	9%	5%
>25%	13%	8%

Table IV-3B displays pre and post LIHEAP average energy burdens by vulnerable group. The table shows that non-vulnerable and single parent households had the greatest pre-LIHEAP energy burden, averaging 21 percent. LIHEAP benefits reduce mean energy burden by between four and five percentage points for all groups of households. While the pre-LIHEAP energy burden average ranged from 14 percent to 21 percent, the post-LIHEAP energy burden average ranged from 10 percent to 16 percent.

Table IV-3B
Mean Total Residential Energy Burden
By Vulnerable Group

	All	Senior	Disabled	Child Under 18	Child Under 6	Single Parent	Non-Vulnerable
Number of Respondents	1,275	469	533	563	271	216	127
Pre-LIHEAP Burden	16%	14%	16%	16%	16%	21%	21%
Post-LIHEAP Burden	12%	10%	12%	12%	12%	16%	16%

Table IV-3C displays the energy burden distribution by vulnerable group. The table shows that about a quarter of each group had an energy burden at or below five percent after receipt of LIHEAP. However, nine to 25 percent of all groups had an energy burden of more than 20 percent even after receipt of LIHEAP.

Table IV-3C
Residential Energy Burden Distribution
By Vulnerable Group

	Senior		Disabled		Child Under 18		Non-Vulnerable	
	Pre-LIHEAP	Post-LIHEAP	Pre-LIHEAP	Post-LIHEAP	Pre-LIHEAP	Post-LIHEAP	Pre-LIHEAP	Post-LIHEAP
Number of Respondents	469	469	533	533	563	563	127	127
0-5%	10%	25%	9%	26%	12%	31%	6%	24%
6%-10%	31%	32%	29%	29%	38%	33%	22%	23%
11-15%	25%	25%	21%	20%	20%	16%	24%	19%
16-20%	16%	9%	17%	12%	9%	6%	14%	9%
21-25%	11%	6%	14%	6%	7%	4%	6%	8%
>25%	8%	3%	11%	6%	14%	10%	28%	17%

Respondents were asked whether they had a more or less difficult time paying their energy bills in the past year, as compared to the previous year. Table IV-4A shows that 52 percent said they had a more difficult time and 12 percent said they had a less difficult time.

Table IV-4A
Change in Difficulty in Paying Energy Bills

Change in Difficulty in Paying Energy Bills	Percent of Respondents
More Difficult	52%
Same	31%
Less Difficult	12%
Don't Know/Refused	5%

Table IV-4B displays the change in difficulty paying energy bills by vulnerable group. The table shows that households with children were most likely to say they had a more difficult time and households with seniors were least likely to say they had a more difficult time.

Table IV-4B
Change in Difficulty in Paying Energy Bills

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
More Difficult	48%	55%	58%	51%
Same	37%	29%	24%	35%
Less Difficult	10%	13%	14%	4%
Don't Know/ Refused	4%	3%	5%	10%

Respondents who said that they had a more difficult time paying their energy bills were asked why it was more difficult. Table IV-5A shows that 48 percent said it was due to a worse financial situation and 42 percent said it was due to an increased energy bill.

Table IV-5A
Reasons for Increased Difficulty in Paying Energy Bills

	Main Reason (Unprompted)
Number of Respondents	940
Lower Income/Lost Job/ Worse Economic Situation	48%
Increased Energy Bill	42%
Increased Other Bills	6%
Increased Medical Expenses	2%
Other	1%
Don't Know/Refused	1%

Table IV-5B compares responses for 2008, 2009 and 2011. Table IV-5B shows that 37 percent said they had increased difficulty paying their energy bills due to their economic situation in FY 2008, compared with 60 percent in FY 2009 or 48 percent in FY 2011. Households were more likely to say the cause of their difficulty was their high energy bills in FY 2008 than in FY 2009 or FY 2011.

Table IV-5B
Reasons for Increased Difficulty in Paying Energy Bills

	2008	2009	2011
Number of Respondents	543	747	940
Lower Income/Lost Job/Worse Economic Situation	<u>37%</u>	<u>60%</u>	<u>48%</u>
Increased Energy Bill	<u>50%</u>	<u>21%</u>	<u>42%</u>

Note: Differences are statistically significant at the 99 percent level.

B. Signs of the Problem

Respondents were asked whether they reduced expenses for household necessities due to not having enough money to pay their energy bill during the past year. Table IV-6A shows that 72 percent said that they took this action.

Table IV-6A
Reduced Expenses for Household Necessities Due to Not Having Enough Money for the Energy Bill During the Past Year

	Percent of Respondents
Almost Every Month	37%
Some Months	26%
1 or 2 Months	9%
Never / No	25%
Don't Know	2%

Table IV-6B shows that households with children and households without vulnerable members were most likely to report that they reduced expenses for household necessities. The table shows that 82 percent of households with children under 18 and 77 percent of households without vulnerable members said that they faced this problem.

Table IV-6B
Reduced Expenses for Household Necessities Due to Not Having Enough Money for the Energy Bill During the Past Year By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	31%	36%	43%	41%
Some Months	24%	29%	29%	26%
1 or 2 Months	9%	9%	10%	10%
Never / No	34%	25%	16%	20%
Don't Know	2%	2%	2%	3%

Table IV-6C shows that households with income below 50 percent of the poverty level were most likely to say that they reduced expenses for household necessities. Seventy-nine percent of those with income below 50 percent of the poverty level said that they reduced these expenses.

Table IV-6C
Reduced Expenses for Household Necessities Due to Not Having Enough
Money for the Energy Bill During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	44%	33%	38%	39%
Some Months	27%	26%	27%	26%
1 or 2 Months	8%	10%	9%	11%
Never / No	19%	30%	24%	23%
Don't Know / Refused	2%	2%	2%	1%

Table IV-7 compares responses to questions about signs of unaffordable energy bills for the 2003, 2008, 2009 and 2011 surveys. The table shows that approximately the same percentage of respondents faced these problems in all three years.

Table IV-7
Signs of the Problem
Comparison of Survey Results

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Reduced Expenses for Household Necessities	78%	80%	79%	72%

C. Responses to the Problem

This section examines how households have responded to the problem of unaffordable energy bills.

Respondents were asked whether they closed off part of their home during the past year because they could not afford to heat or to cool it. Table IV-8A shows that 39 percent of respondents said that they took this action.

Table IV-8A
Closed Off Part of Home Because Could Not Afford to Heat or Cool It
Due to Not Having Enough Money for the Energy Bill During the Past Year

	Percent of Respondents
Almost Every Month	11%
Some Months	22%
1 or 2 Months	6%
Never / No	61%
Don't Know / Refused	<1%

Table IV-8B displays the percent of respondents who said that they closed off part of their home because they could not afford to heat or to cool it. Households with disabled members were most likely to say they took this action.

Table IV-8B
Closed Off Part of Home Because Could Not Afford to Heat or Cool It
Due to Not Having Enough Money for the Energy Bill During Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	12%	15%	8%	13%
Some Months	23%	25%	22%	20%
1 or 2 Months	5%	6%	7%	5%
Never / No	58%	53%	63%	62%
Don't Know/Refused	1%	<1%	0%	<1%

Table IV-8C shows that the percent of respondents who closed off part of their home does not vary by poverty level.

Table IV-8C
Closed Off Part of Home Because Could Not Afford to Heat or Cool It
Due to Not Having Enough Money for the Energy Bill During Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	9%	13%	10%	10%
Some Months	23%	20%	23%	27%
1 or 2 Months	6%	6%	6%	4%
Never / No	62%	60%	61%	59%
Don't Know	<1%	<1%	<1%	<1%

Respondents were asked whether they kept their home at a temperature that they felt was unsafe or unhealthy due to not having enough money for the energy bill during the past year. Table IV-9A shows that 23 percent of the respondents said that they took this action.

Table IV-9A
Kept Home at Temperature You Felt Was Unsafe or Unhealthy Due to Not
Having Enough Money for the Energy Bill During Past Year

	Percent of Respondents
Almost Every Month	5%
Some Months	11%
1 or 2 Months	7%
Never / No	77%
Don't Know / Refused	1%

Table IV-9B shows the percent that kept their home at an unsafe or unhealthy temperature during the past year by vulnerable group.

Table IV-9B
Kept Home at Temperature You Felt Was Unsafe or Unhealthy Due to Not
Having Enough Money for the Energy Bill During Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	4%	5%	4%	8%
Some Months	10%	12%	13%	8%
1 or 2 Months	6%	9%	7%	9%
Never / No	78%	72%	74%	75%
Don't Know/Refused	1%	2%	2%	1%

Table IV-9C shows that households above 150 percent of the poverty level were less likely to keep home at a temperature that they felt was unsafe or unhealthy due to not having enough money for the energy bill during the past year.

Table IV-9C
Kept Home at Temperature You Felt Was Unsafe or Unhealthy Due to Not
Having Enough Money for the Energy Bill During Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	3%	6%	5%	3%
Some Months	13%	10%	11%	5%
1 or 2 Months	8%	7%	8%	5%
Never / No	75%	76%	75%	85%
Don't Know/Refused	1%	2%	1%	2%

Table IV-10A shows that 21 percent of respondents said that they left their home for part of the day because it was too hot or too cold in the past year.

Table IV-10A
Left Home for Part of the Day Because it was Too Hot or Too Cold
Due to Not Having Enough Money for the Energy Bill During the Past Year

	Left Home for Part of the Day Because Home was Too Hot or Too Cold
Almost Every Month	2%
Some Months	10%
1 or 2 Months	9%
Never / No	78%
Don't Know / Refused	1%

Table IV-10B shows that households with disabled members and households with children were most likely to leave home for part of the day because the home was too hot or cold.

Table IV-10B
Left Home for Part of the Day Because it was Too Hot or Too Cold
Due to Not Having Enough Money for the Energy Bill During the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	1%	2%	2%	4%
Some Months	7%	11%	14%	7%
1 or 2 Months	6%	11%	11%	4%
Never / No	85%	76%	73%	84%
Don't Know	<1%	1%	1%	2%

Households with income below the poverty level were more likely to say that they left their home because it was too hot or too cold. Table IV-10C shows that 23 percent of those with income below the poverty level said that they took this action.

Table IV-10C
Left Home for Part of the Day Because it was Too Hot or Too Cold
Due to Not Having Enough Money for the Energy Bill During Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	2%	2%	2%	<1%
Some Months	11%	10%	10%	9%
1 or 2 Months	10%	11%	6%	6%
Never / No	77%	76%	82%	84%
Don't Know	<1%	1%	<1%	0%

Households sometimes take the dangerous action of using their kitchen oven or stove to provide heat when they cannot afford their energy bill. Table IV-11A shows that about one third of respondents said that they took this action during the past year.

Table IV-11A
Used Kitchen Stove or Oven to Provide Heat Due to Not
Having Enough Money for the Energy Bill During Past Year

	Percent of Respondents
Almost Every Month	2%
Some Months	15%
1 or 2 Months	16%
Never / No	67%
Don't Know	1%

Table IV-11B shows that percent who said that they used their kitchen stove or oven for heat in the past year by vulnerable group.

Table IV-11B
Used Kitchen Stove or Oven to Provide Heat Due to Not
Having Enough Money for the Energy Bill During the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	<1%	2%	2%	5%
Some Months	11%	17%	19%	15%
1 or 2 Months	16%	17%	18%	17%
Never / No	73%	63%	62%	62%
Don't Know/Refused	<1%	1%	0%	1%

Table IV-11C shows that the percent who reported that they used their kitchen stove or oven for heat by poverty level.

Table IV-11C
Used Kitchen Stove or Oven to Provide Heat Due to Not
Having Enough Money for the Energy Bill During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	2%	2%	2%	2%
Some Months	18%	16%	13%	10%
1 or 2 Months	16%	15%	16%	19%
Never / No	63%	67%	69%	69%
Don't Know	1%	<1%	<1%	0%

Table IV-12 compares the responses to these issues over the past several surveys. The percentages in 2011 were approximately the same as in 2009.

Table IV-12
Responses to the Problem
Comparison of Survey Results

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Closed Off Part of Home	39%	<u>44%</u>	36%	<u>39%</u>
Kept Home at Temperature You Felt was Unsafe or Unhealthy	<u>25%</u>	<u>28%</u>	<u>26%</u>	<u>23%</u>
Left Home for Part of the Day	<u>24%</u>	23%	20%	<u>21%</u>
Used Kitchen Stove or Oven to Provide Heat	31%	33%	33%	33%

Note: 2011 statistically significant differences at the 95% level from 2003, 2008 and 2009 are underlined.

D. Inability to Pay Energy Bills

Respondents were asked several questions about the inability to pay their home energy bill.

Table IV-13A shows that 49 percent of respondents said that they skipped paying or paid less than their entire home energy bill during the past year due to not having enough money to pay the bill.

Table IV-13A
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill During Past Year

	Percent of Respondents
Almost Every Month	13%
Some Months	21%
1 or 2 Months	15%
Never / No	51%
Don't Know	1%

Table IV-13B shows that households with children were most likely to say that they skipped paying their home energy bill. Sixty-three percent of households with children said that they skipped paying their entire home energy bill at least once in the past year.

Table IV-13B
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill During Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	8%	12%	17%	13%
Some Months	11%	22%	29%	26%
1 or 2 Months	13%	14%	17%	15%
Never / No	67%	51%	36%	45%
Don't Know	1%	2%	1%	2%

Table IV-13C shows that households with income below 50 percent of the poverty level were most likely to say that they skipped paying the home energy bill. Sixty-three percent of these households said that they skipped paying or paid less than the entire amount on their energy bill sometime in the past year.

Table IV-13C
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	19%	12%	11%	10%
Some Months	27%	18%	19%	24%
1 or 2 Months	17%	14%	15%	11%
Never / No	35%	54%	55%	54%
Don't Know / Refused	1%	1%	1%	2%

Respondents were asked whether they received a notice or threat to disconnect or discontinue their electricity or home heating fuel due to not having enough money for the energy bill during the past year. The table shows that 37 percent said that they received a notice or threat.

Table IV-14A
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill During the Past Year

	Percent of Respondents
Almost Every Month	4%
Some Months	13%
1 or 2 Months	20%
Never / No	62%
Don't Know	1%

Table IV-14B shows the percent who received a threat of service termination by vulnerable group. The table shows that households with children were most likely to face this problem. Over half of these households received a notice or threat to disconnect or discontinue their service in the past year.

Table IV-14B
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill During Past Year By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Almost Every Month	1%	4%	6%	6%
Some Months	6%	13%	16%	18%
1 or 2 Months	10%	17%	31%	18%
Never / No	82%	64%	46%	58%
Don't Know	1%	2%	1%	1%

Table IV-14C shows that households with income below 50 percent of poverty were most likely to report that they received a notice or threat to disconnect or discontinue their electricity or home heating fuel. The table shows that 53 percent of these households said that they faced this problem in the past year.

Table IV-14C
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Almost Every Month	6%	3%	5%	2%
Some Months	19%	11%	8%	16%
1 or 2 Months	28%	19%	19%	14%
Never / No	45%	66%	68%	67%
Don't Know / Refused	2%	1%	<1%	2%

Table IV-15A shows that nine percent of respondents had their electricity shut off due to nonpayment, six percent had their gas service shut off, and 11 percent had at least one of the two shut off during the past year.

Table IV-15A
Utility Service Was Shut Off Due to Nonpayment During the Past Year

	Percent of Respondents
Electricity	9%
Gas	6%
Electricity or Gas	11%

Table IV-15B displays the percent that had their utility service shut off by vulnerable group. The table shows that households with children were most likely to face these problems. Nineteen percent of households with children had their electricity and/or gas shut off due to nonpayment in the past year.

Table IV-15B
Utility Service Was Shut Off Due to Nonpayment During the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Electricity	3%	8%	16%	9%
Gas	2%	5%	9%	9%
Electricity or Gas	5%	10%	19%	14%

Table IV-15C displays the percent of households who had utility service terminated by poverty group. The table shows that households with income below 50 percent of the poverty level were most likely to have had their service terminated. Twenty percent of

households with income below 50 percent of the poverty level had their gas and/or electric utility service terminated in the past year.

Table IV-15C
Utility Service Was Shut Off Due to Nonpayment During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Electricity	16%	9%	6%	7%
Gas	9%	5%	4%	4%
Electricity or Gas	20%	11%	7%	8%

Table IV-16A shows the percent of households who were unable to use their main source of heat during the past year. The table shows that 13 percent were unable to use their main source of heat due to the system being broken, 10 percent due to an inability to pay for a fuel delivery, and seven percent due to an electric or gas service termination. Twenty-four percent of households were unable to use their main source of heat during the past year for any of the three reasons.

Table IV-16A
Unable to Use Main Source of Heat During the Past Year

	Percent of Respondents
Heating System Broken	13%
Unable to Pay for Fuel Delivery	10%
Gas or Electric Service Discontinued	7%
Any of the Three Reasons	24%

Table IV-16B displays the percent of respondents who said that they were unable to use their main source of heat during the past year by vulnerable group. The table shows that households with children and households with disabled members were most likely to face this problem. Thirty-one percent of households with children and households with disabled members could not use their main source of heat during the past year because their heating system was broken, they were unable to pay for a fuel delivery, or their gas or electric service was discontinued due to nonpayment.

Table IV-16B
Unable to Use Main Source of Heat During the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Heating System Broken	11%	17%	15%	11%
Unable to Pay for Fuel Delivery	8%	14%	12%	9%
Gas or Electric Service Discontinued	3%	8%	11%	8%
Any of the Three Reasons	18%	31%	31%	24%

Table IV-16C displays the percent of respondents who were unable to use their main source of heat during the past year by poverty group. The table shows that households with income below 50 percent of the poverty level were most likely to face this problem. Thirty-one percent of households with income below 50 percent of the poverty level were unable to use their main source of heat at some point during the past year.

Table IV-16C
Unable to Use Main Source of Heat During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Heating System Broken	18%	12%	12%	9%
Unable to Pay for Fuel Delivery	8%	12%	9%	12%
Gas or Electric Service Discontinued	12%	7%	5%	6%
Any of the Three Reasons	31%	24%	21%	22%

Table IV-17A displays the percent of respondents who were unable to use their air conditioner during the past year because it was broken or they had their electric service discontinued for nonpayment. The table shows that 14 percent could not use their air conditioner because it was broken and five percent could not use it because their electric service was discontinued. Seventeen percent could not use their air conditioner for at least one of those two reasons.

Table IV-17A
Unable to Use Air Conditioner During the Past Year

	Percent of Respondents
Air Conditioner Broken	14%
Electric Service Discontinued	5%
Either Reason	17%

Table IV-17B displays the percent of respondents who were unable to use their air conditioner in the past year by vulnerable group. The table shows that households with children and disabled members were most likely to face this problem.

Table IV-17B
Unable to Use Air Conditioner During the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Air Conditioner Broken	11%	17%	19%	11%
Electric Service Discontinued	2%	4%	8%	5%
Either Reason	11%	20%	23%	14%

Table IV-17C displays the percent of households that were unable to use their air conditioner during the past year by poverty group. The table shows that households below 50 of the poverty level were most likely to face this problem. Twenty-one percent of households with income below 50 percent of poverty were unable to use their air conditioner at some point during the past year.

Table IV-17C
Unable to Use Air Conditioner During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Air Conditioner Broken	17%	14%	12%	10%
Electric Service Discontinued	8%	5%	3%	5%
Either Reason	21%	17%	14%	14%

Table IV-18A displays the percent of respondents who had to use candles or lanterns due to lack of lights. The table shows that 26 percent of respondents who had utilities shutoff in past 12 months had to go without lights at some point in the past year.

Table IV-18A
Had to Use Candles or Lanterns Due to Lack of Lights
During the Past Year

	Percent of Respondents
Number of Respondents	378
Had to Use Candles or Lanterns Due to Lack of Lights	26%

Table IV-18B displays the percent of respondents who had to go without lights during the past year by vulnerable group.

Table IV-18B
Had to Use Candles or Lanterns Due to Lack of Lights During the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	93	167	214	49
Had to Use Candles or Lanterns Due to Lack of Lights	22%	27%	25%	29%

Table IV-18C displays the percent of households who had to go without lights during the past year by poverty group. The table shows that households below the poverty level are somewhat more likely to face this problem. Thirty-six percent of those below 50 percent of the poverty level had to use candles or lanterns due to lack of lights during the past year.

Table IV-18C
Had to Use Candles or Lanterns Due to Lack of Lights During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	80	149	89	57
Had to Use Candles or Lanterns Due to Lack of Lights	36%	25%	17%	24%

Table IV-19A displays the percent of respondents who had their utility service shut off at the time of the survey. The table shows that two percent of respondents had their electricity or gas shut off at the time of the survey.

Table IV-19A
Utility Service Shut Off at Time of Survey

	Percent of Respondents
Electricity	1%
Gas	1%
Electricity or Gas	2%

Table IV-19B shows that four percent of households without vulnerable members had their electricity or gas service shut off at the time of the survey.

Table IV-19B
Utility Service Shut Off at Time of Survey
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Electricity	<1%	1%	1%	2%
Gas	<1%	1%	2%	3%
Electricity or Gas	1%	1%	2%	4%

Table IV-19C shows that households below 50 percent of the poverty level were more likely to have their utility service shut off at the time of the survey. Four percent of those below 50 percent of the poverty level had their electric and/or gas shut off at the time of the survey, compared with one to two percent for the other poverty level groups.

Table IV-19C
Utility Service Shut Off at Time of Survey
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Electricity	3%	1%	3%	0%
Gas	3%	1%	1%	1%
Electricity or Gas	4%	1%	2%	1%

Table IV-20 compares the responses about service disruptions across the 2003, 2008, 2009, and 2011 surveys. The table shows that in most cases there has not been a significant change, but there are a few declines in the incidence of some of these problems.

Table IV-20
Inability to Pay Energy Bills During Past Year
Comparison of Survey Results

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Skipped Paying or Paid Less than Entire Home Energy Bill	52%	47%	50%	49%
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel	38%	37%	36%	37%
Electricity Shut off Due to Nonpayment	8%	9%	9%	9%
Gas Shut off Due to Nonpayment	--	6%	7%	6%
Electricity or Gas Shut off Due to Nonpayment	--	12%	12%	11%

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Heating System Broken and Unable to Pay for Repair or Replacement	<u>10%</u>	13%	13%	<u>13%</u>
Unable to Use Main Source of Heat Because Unable to Pay for a Fuel Delivery	10%	13%	11%	10%
Unable to Use Main Source of Heat Because Utility Company Discontinued Gas or Electric Service Due to Nonpayment	<u>11%</u>	<u>13%</u>	11%	<u>7%</u>
Unable to Use Air Conditioner Because it was Broken and Unable to Pay for Repair or Replacement	12%	12%	12%	14%
Unable to Use Air Conditioner Because Utility Company Discontinued Electric Service Due to Nonpayment	6%	<u>7%</u>	<u>8%</u>	<u>5%</u>
Had to Use Candles or Lanterns Due to Lack of Lights	<u>8%</u>	<u>7%</u>	<u>8%</u>	<u>5%</u>

Note: 2011 statistically significant differences at the 95% level from 2003, 2008, and 2009 are underlined.

E. Housing Problems

This section examines housing problems that respondents have faced in the past five years due to unaffordable energy bills.

Table IV-21A shows that 31 percent skipped a mortgage payment, 14 percent moved in with friends or family, six percent were evicted, and four percent moved into a shelter or were homeless. While four percent reported that they had a mortgage foreclosure in the past five years, three percent reported that they had a foreclosure in the past year.

Table IV-21A
Housing Problems Due to Energy Bills in the Past Five Years

	Percent of Respondents
Did not Make Full Rent or Mortgage Payment	31%
Moved in With Friends or Family	14%
Evicted from Home or Apartment	6%
Had Mortgage Foreclosure	4%
Moved into Shelter or Was Homeless	4%

Table IV-21B displays the results by vulnerable group. The table shows that households with children were most likely to face these problems. Forty-five percent of households with children did not make a full rent or mortgage payment, 18 percent moved in with friends or family at some point in the past five years, and eight percent were evicted.

Table IV-21B
Housing Problems Due to Energy Bills in the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Did not Make Full Rent or Mortgage Payment	16%	30%	45%	32%
Moved in With Friends or Family	8%	14%	18%	11%
Evicted from Home or Apartment	4%	5%	8%	6%
Had Mortgage Foreclosure	3%	5%	7%	3%
Moved into Shelter or Was Homeless	2%	5%	6%	4%

Table IV-21C displays the results by poverty group. The table shows that the lowest poverty group was most likely to face these housing problems. Thirty-eight percent of households below 50 percent of the poverty level did not make a full rent or mortgage payment in the past five years and 24 percent had to move in with friends or family at some point in the past five years.

Table IV-21C
Housing Problems Due to Energy Bills in the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Did not Make Full Rent or Mortgage Payment	38%	31%	24%	37%
Moved in With Friends or Family	24%	12%	9%	12%
Evicted from Home or Apartment	12%	6%	3%	3%
Moved into Shelter or Was Homeless	8%	4%	1%	4%
Had Mortgage Foreclosure	6%	3%	4%	5%

Table IV-21D displays the percent of respondents with housing problems by whether or not they own their home. The table shows that respondents who do not own their homes were more likely to face these problems.

Table IV-21D
Housing Problems Due to Energy Bills in the Past Five Years
By Home Ownership

	Own Home	Does Not Own Home
Number of Respondents	790	920
Did not Make Full Rent or Mortgage Payment	26%	36%
Evicted from Home or Apartment	3%	8%
Had Mortgage Foreclosure	5%	3%
Moved in With Friends or Family	9%	18%
Moved into Shelter or Was Homeless	2%	6%

Table IV-22 compares results with respect to housing problems from the 2003, 2008, 2009 and 2011 surveys. The table shows that the prevalence of these issues are about the same as in the 2009 survey, but somewhat higher than in the 2008 survey.

Table IV-22
Housing Problems During Past Five Years
Comparison of Survey Results

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Did Not Make Full Rent or Mortgage Payment	<u>28%</u>	28%	31%	<u>31%</u>
Evicted from Home or Apartment	<u>4%</u>	<u>4%</u>	5%	<u>6%</u>
Moved in with Friends or Family	<u>9%</u>	<u>11%</u>	12%	<u>14%</u>
Moved into Shelter or Was Homeless	4%	3%	3%	4%

Note: 2011 statistically significant differences at the 95% level from 2003, 2008 and 2009 are underlined.

F. Financial Problems

This section examines one particular financial problem that respondents may have faced in the past five years due to their energy bills. Table IV-23A shows that 13 percent reported that they took out a payday loan in the past five years, compared to 11 percent who said they took out a payday loan in the past year.

Table IV-23A
Financial Problems Due to Energy Bills
In the Past Five Years

	Percent of Respondents	
	Past Year	Past Five Years
Payday Loan	11%	13%

Table IV-23B displays the percent of respondents who had financial problems in the past five years due to unaffordable energy bills by vulnerable group. The table shows that households with children were most likely to report that they obtained a payday loan.

Table IV-23B
Financial Problems Due to Energy Bills
In the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Payday Loan	9%	14%	17%	11%

Table IV-23C displays the percent of respondents who had financial problems in the past five years due to unaffordable energy bills by poverty level. The table shows that there is not significant variation by poverty level.

Table IV-23C
Financial Problems Due to Energy Bills
In the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Payday Loan	14%	14%	11%	12%

G. Medical and Health Problems

This section examines the medical and health problems that respondents faced in the past five years due to unaffordable energy bills.

Table IV-24A shows that 24 percent went without food for at least one day, 37 percent went without medical or dental care, and 34 percent did not fill a prescription or took less than their full dose of prescribed medication.

Table IV-24A
Medical and Health Problems Due to Energy Bills
In the Past Year and the Past Five Years

	Percent of Respondents	
	Past Year	Past Five Years
Went Without Food for at Least One Day	25%	24%
Went Without Medical or Dental Care	41%	37%
Didn't Fill Prescription or Took Less Than Full Dose	--	34%

Table IV-24B examines medical and health problems by vulnerable group. The table shows that households with a disabled member and without vulnerable members were most likely to go without food for at least one day.

Table IV-24B
Medical and Health Problems Due to Energy Bills
In the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Went Without Food for at Least One Day	22%	31%	23%	29%
Went Without Medical or Dental Care	36%	41%	38%	42%
Didn't Fill Prescription or Took Less Than Full Dose	28%	41%	37%	35%

Table IV-24C displays responses to questions about medical and health problems by poverty group. The table shows that for the most part there is not a strong relationship between poverty level and the presence of these problems. However, higher poverty level groups were more likely to report that they went without medical or dental care.

Table IV-24C
Medical and Health Problems Due to Energy Bills
In the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Went Without Food for at Least One Day	24%	28%	21%	18%
Went Without Medical or Dental Care	24%	36%	38%	43%
Didn't Fill Prescription or Took Less Than Full Dose	33%	33%	34%	36%
Unable to Pay Energy Bill Due to Medical Expenses	19%	20%	22%	21%

Table IV-25A displays the percent of respondents who became sick and needed to go to the doctor or hospital because the home was too cold. The table shows that 13 percent became sick and needed to go to the doctor or hospital because the home was too cold, and 3 percent became sick and needed to go to the doctor or hospital because the home was too hot.

Table IV-25A
Someone in Household Became Sick Because Home was Too Cold or Too Hot
In the Past Five Years

	Became Sick	Became Sick and Needed to Go to the Doctor or Hospital
Home Was Too Cold	19%	13%
Home Was Too Hot	6%	3%

Table IV-25B displays the percent of those who became sick and needed to go to the doctor or hospital because the home was too cold by vulnerable group. The table shows that households with children and disabled members were most likely to become sick and need to go to the doctor or hospital because the home was too cold.

Table IV-25B
Someone in Household Became Sick Because Home was Too Cold
In the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Became Sick	13%	23%	25%	15%
Became Sick and Needed to Go to the Doctor or Hospital	7%	17%	19%	10%

Table IV-26A compares the percent of respondents who had medical and health problems in the 2003 survey, the 2008 survey, the 2009 survey, and the 2011 survey. The table shows that for the most part, the medical and health problems are less prevalent than in 2009 and 2008.

Table IV-26A
Medical and Health Problems During the Past Five Years
Comparison of Survey Results

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Went Without Food for At Least One Day	22%	<u>32%</u>	<u>30%</u>	<u>24%</u>
Went Without Medical or Dental Care	38%	<u>42%</u>	<u>41%</u>	<u>37%</u>
Did Not Fill Prescription or Took Less Than Full Dose	<u>30%</u>	<u>38%</u>	33%	<u>34%</u>
Became Sick Because Home was Too Cold	21%	<u>24%</u>	<u>25%</u>	<u>19%</u>
Became Sick Because Home was Too Hot	7%	6%	<u>4%</u>	<u>6%</u>

Note: 2011 statistically significant differences at the 95% level from 2003, 2008 and 2009 are underlined.

Table IV-26B compares the percent of respondents with seniors in the household who had medical and health problems in the 2003 survey, the 2008 survey, the 2009 survey, and the 2011 survey. The table shows that the medical and health problems are significantly higher for seniors than in 2009.

Table IV-26B
Medical and Health Problems During the Past Five Years
Comparison of Survey Results
By Vulnerable Group – Senior Member in Household

	2003	2008	2009	2011
Number of Respondents	888	542	757	705
Went Without Food for At Least One Day	<u>11%</u>	24%	20%	<u>22%</u>
Went Without Medical or Dental Care	<u>29%</u>	32%	<u>29%</u>	<u>36%</u>
Did Not Fill Prescription or Took Less Than Full Dose	<u>23%</u>	31%	26%	<u>28%</u>
Became Sick Because Home was Too Cold	<u>11%</u>	15%	<u>15%</u>	<u>19%</u>
Became Sick Because Home was Too Hot	<u>6%</u>	5%	4%	<u>3%</u>

Note: 2011 statistically significant differences at the 95% level from 2003, 2008 and 2009 are underlined.

V. The Need For LIHEAP

This section examines the history of LIHEAP receipt, utility bill payment problems and payment arrangements, and the importance of LIHEAP in helping recipients meet their needs.

A. History of LIHEAP Receipt

Respondents were asked whether they had received LIHEAP benefits in the year prior to the survey. Since the survey sample was drawn from state LIHEAP databases FY 2011 LIHEAP recipients, all respondents received LIHEAP in the past year. However, because LIHEAP is often paid directly on the household's utility bill, respondents are often not aware that they received these benefits. Table V-1A shows that 93 percent of the respondents reported that they had received LIHEAP in the past year.

Table V-1A
Received LIHEAP During Past Year⁸

	Percent of Respondents
Yes	93%
No	5%
Don't Know	2%

Table V-1B displays the percent of respondents who reported that they received LIHEAP during the past year by vulnerable group. Households with no vulnerable members were more likely than some of the other groups to report that they received LIHEAP, perhaps because they are less likely to have received these benefits automatically through participation in another program.

Table V-1B
Received LIHEAP During Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
Yes	91%	92%	94%	96%
No	7%	6%	5%	3%
Don't Know / Refused	2%	2%	1%	1%

⁸ Interviewers used the name for the LIHEAP program particular to the state of the recipient interviewed. If the respondent was initially confused or did not recall the program based on the state-designated name, interviewers were trained to assist their memory by describing energy assistance benefits, and using the term energy assistance throughout the survey instead of the state-designated LIHEAP name.

Table V-1C displays the percent of respondents who reported that they received LIHEAP in the past year by poverty level. The table shows that there are not significant differences by poverty group.

Table V-1C
Received LIHEAP During Past Year
By Poverty Level

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
Yes	94%	94%	93%	91%
No	6%	5%	5%	8%
Don't Know / Refused	<1%	2%	2%	1%

Respondents were asked to report the number of times in the past five years that they received LIHEAP. Table V-2A shows that about one quarter said they only received benefits in one of the past five years, and about one fifth said that they received benefits in each of the past five years.

Table V-2A
Number of Years Received LIHEAP in the Past Five Years

Number of Years Received LIHEAP	Percent of Respondents
1	23%
2	22%
3	17%
4	7%
5	20%
Don't Know / Refused	11%

Table V-2B displays the number of years that respondents reported LIHEAP receipt by vulnerable group. The table shows that households without vulnerable members were most likely to report that they only received benefits in one of the past five years and were least likely to report that they received LIHEAP in each of the past five years. These households appeared to be more likely to be facing temporary financial problems.

Table V-2B
Number of Years Received LIHEAP in the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	705	738	722	195
1	16%	17%	27%	37%
2	20%	20%	26%	23%
3	15%	17%	18%	11%
4	8%	8%	5%	7%
5	26%	28%	15%	11%
Don't Know / Refused	15%	11%	9%	10%

Table V-2C displays the number of years respondents reported they received LIHEAP by poverty group. The table shows that households with income above 150 percent of poverty were most likely to report that they received LIHEAP in only one of the past five years.

Table V-2C
Number of Years Received LIHEAP in the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	306	648	523	283
1	24%	21%	22%	32%
2	28%	19%	22%	26%
3	15%	19%	17%	13%
4	6%	9%	5%	6%
5	14%	23%	21%	14%
Don't Know / Refused	13%	10%	12%	9%

Table V-3 compares recall of LIHEAP benefits across the surveys. The table shows that a greater percentage of recipients were aware of the benefit in the current year than in previous years. This may relate to the timing of the survey, as it was conducted in the Spring, immediately following the LIHEAP season, as opposed to prior to the season starting, as in previous years.

Table V-3
LIHEAP Receipt
Comparison of Survey Results

	2003	2008	2009	2011
Number of Respondents	2,161	1,256	1,828	1,768
Recalled Receipt of LIHEAP	<u>84%</u>	<u>86%</u>	<u>86%</u>	<u>93%</u>
Percent That Reported They Received LIHEAP in Each of the Past Five Years	21%	<u>26%</u>	<u>25%</u>	<u>20%</u>

Note: 2011 statistically significant differences at the 95% level from 2003, 2008 and 2009 are underlined.

B. Utility Payment Arrangements

This section examines respondents' need for utility payment arrangements and resources available to assist with preventing service terminations. Table V-4 shows that 52 percent of respondents reported that they tried to work out a payment arrangement in the past year, and 84 percent of those who tried to work out a payment arrangement were able to do so. This is similar to the findings from the 2008 and 2009 surveys.

Table V-4
Payment Arrangement with Gas or Electric Company
In the Past Year

	2008 Survey		2009 Survey		2011 Survey	
	Tried to Work Out Payment Arrangement	Was Able to Work Out Payment Arrangement	Tried to Work Out Payment Arrangement	Was Able to Work Out Payment Arrangement	Tried to Work Out Payment Arrangement	Was Able to Work Out Payment Arrangement
Number of Respondents	1,256	682	1,828	976	1,768	966
Yes	54%	84%	51%	86%	52%	84%
No	45%	15%	48%	14%	47%	14%
Don't Know	1%	1%	1%	1%	1%	2%

C. Problems that Would Have Been Faced in the Absence of LIHEAP

Respondents who said that they did not face some problems with their energy bills were asked whether they felt they would have faced such problems if LIHEAP assistance had not been available. Table V-5 shows that 65 percent said they would have had to keep their home at an unsafe or unhealthy temperature if LIHEAP assistance had not been available, and 63 percent said they would have had their electricity or home heating fuel discontinued if LIHEAP assistance had not been available.

Table V-5
If LIHEAP Had Not Been Available, Problems that May Have Been Faced

	Kept Home at Unsafe or Unhealthy Temperature	Had Electricity or Home Heating Fuel Discontinued
Number of Respondents	1,250	1,267
Yes	65%	63%
No	30%	32%
Don't Know / Refused	4%	5%

Table V-6 compares responses about problems that would have been faced in the absence of LIHEAP between 2003, 2008, 2009 and 2011. The table shows that respondents were more likely in 2011 than in 2009 to say that they would have had their electricity or home heating fuel discontinued in the absence of LIHEAP.

Table V-6
If LIHEAP Had Not Been Available, Problems that May Have Been Faced
Comparison of Survey Results

	2003 Survey		2008 Survey		2009 Survey		2011 Survey	
	Respondents	%	Respondents	%	Respondents	%	Respondents	%
Kept Home at Unsafe or Unhealthy Levels	1,392	<u>54%</u>	761	63%	1,134	64%	1,250	<u>65%</u>
Had Electricity or Home Heating Fuel Discontinued	1,555	<u>48%</u>	845	59%	1,175	<u>53%</u>	1,267	<u>63%</u>

Note: 2011 statistically significant differences at the 95% level from 2003, 2008 and 2009 are underlined.

D. LIHEAP Restored Heat

Respondents were asked whether LIHEAP helped to restore heat due to shutoff or broken equipment. The table shows that 12 percent said that LIHEAP restored heat due to a shutoff and seven percent said that LIHEAP restored heat due to broken equipment.

Table V-7
LIHEAP Helped to Restore Heat Due to Shutoff or Broken Equipment

	Restored Heat Due to Shutoff			Restored Heat Due to Broken Equipment		
	2008	2009	2011	2008	2009	2011
Yes	12%	12%	12%	<u>9%</u>	7%	<u>7%</u>
No	<u>8%</u>	<u>6%</u>	<u>3%</u>	5%	5%	5%
Don't Know	<1%	<1%	<1%	<1%	<1%	1%
Did Not Experience Loss of Heat/or Did Not Receive LIHEAP	<u>81%</u>	81%	<u>84%</u>	86%	87%	87%

Note: 2011 statistically significant differences at the 95% level from 2008 and 2009 are underlined.

VI. Regional Analysis

This section provides a regional analysis of some of the information that was presented in this report.

A. *Demographic Characteristics*

Table VI-1 displays the percent of respondents with children and the percent in single family households. The table shows that households in the West are most likely to include children, but households in the South are most likely to be single parent households.

Table VI-1
Presence of Children Under 18 and Single-Parent Households
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Percent with Children	38%	39%	43%	46%
Single Parent Household	14%	12%	20%	14%

Table VI-2 displays the poverty level of LIHEAP recipients by region.

Table VI-2
Poverty Level
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
0%-50%	19%	16%	22%	20%
51%-100%	39%	41%	47%	42%
101%-150%	30%	32%	21%	27%
>150%	13%	11%	9%	11%

Table VI-3 shows that recipients in the West are most likely to have employment income, recipients in the Northeast are most likely to have retirement income, recipients in the West are most likely to receive public assistance, and recipients in the South are most likely to receive non-cash benefits.

Table VI-3
Types of Income and Benefits Received
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Wages or Self-Employment Income	34%	34%	28%	37%
Retirement Income	42%	39%	36%	34%
Public Assistance	27%	34%	33%	41%
Non-Cash Benefits	59%	61%	68%	64%

Table VI-4 displays the percent of respondents who were unemployed during the year. The table shows that LIHEAP recipients in the West were most likely to be unemployed.

Table VI-4
Unemployed During the Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Yes	31%	34%	38%	44%
No	64%	65%	60%	53%
Don't Know / Refused	5%	<1%	2%	2%

B. Energy Burden and Energy Bill Payment Problems

Table VI-5 displays mean pre- and post-LIHEAP energy burden by region. The table shows that recipients in the South have the highest energy burdens on average.

Table VI-5
Mean Energy Burden
By Region

	Northeast	Midwest	South	West
Number of Respondents	543	255	239	238
Pre-LIHEAP	14%	16%	19%	13%
Post-LIHEAP	9%	12%	15%	10%

Table VI-6 shows that LIHEAP recipients in the West, South, and Northeast were more likely than those in the Midwest to report that they left their home for part of the day because it was too hot or too cold.

Table VI-6
Left Home for Part of the Day Because it was Too Hot or Too Cold
Due to Not Having Enough Money for the Energy Bill
During Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Almost Every Month	2%	1%	3%	1%
Some Months	12%	6%	12%	12%
1 or 2 Months	8%	7%	9%	13%
Never / No	78%	85%	75%	74%
Don't Know / Refused	1%	1%	1%	<1%

Table VI-7 shows that the percentage of respondents who reported that they used their kitchen oven or stove to provide heat in the past year ranged from 28 percent in the West to 37 percent in the South.

Table VI-7
Used Kitchen Stove or Oven to Provide Heat
Due to Not Having Enough Money for the Energy Bill
During Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Almost Every Month	2%	1%	3%	2%
Some Months	17%	11%	18%	11%
1 or 2 Months	16%	17%	16%	15%
Never / No	64%	70%	63%	72%
Don't Know / Refused	<1%	1%	<1%	<1%

Table VI-8 shows that respondents in the West were most likely to report that they skipped paying or paid less than their entire home energy bill during the past year.

Table VI-8
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill
During Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Almost Every Month	12%	9%	14%	21%
Some Months	21%	18%	22%	25%
1 or 2 Months	14%	16%	15%	13%
Never / No	52%	56%	48%	40%
Don't Know / Refused	1%	1%	1%	2%

Table VI-9 shows that 33 to 42 percent of respondents reported that they received a notice or threat to disconnect their electricity or home heating fuel in the past year.

Table VI-9
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel
Due to Not Having Enough Money for the Energy Bill
During Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Almost Every Month	6%	2%	6%	3%
Some Months	12%	13%	12%	13%
1 or 2 Months	19%	18%	21%	26%
Never / No	62%	65%	61%	58%
Don't Know / Refused	1%	2%	<1%	<1%

Table VI-10 displays the percent of respondents who had their electricity and gas utility service terminated during the past year. Service termination ranged from eight percent in the Midwest to 16 percent in the South.

Table VI-10
Utility Service Terminations
During Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Electricity	8%	6%	14%	9%
Gas	5%	5%	6%	7%
Electricity or Gas	10%	8%	16%	12%

C. Housing, Health, and Medical Problems

Table VI-11 displays the percent of those who did not make their full rent or mortgage payment in the past five years. The table shows that respondents in the South and West were somewhat more likely to report this problem.

Table VI-11
Did Not Make Full Rent or Mortgage Payment Due to Energy Bills
In the Past Five Years
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Yes	30%	29%	34%	34%
No	67%	70%	65%	65%
Don't Know /Refused	3%	1%	1%	1%

Table VI-12 displays the percent of respondents who reported that they went without food for at least one day in the past five years. The table shows that respondents in the West and South were most likely to report this problem.

Table VI-12
Went Without Food for at Least One Day Due to Energy Bills
In the Past Five Years
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Yes	22%	21%	28%	30%
No	77%	79%	72%	70%
Don't Know /Refused	1%	<1%	0%	<1%

Table VI-13 shows that respondents in the South were most likely to report that they went without medical or dental care due to their energy bills in the past five years.

Table VI-13
Went Without Medical or Dental Care Due to Energy Bills
In the Past Five Years
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Yes	30%	33%	48%	42%
No	70%	67%	51%	57%
Don't Know /Refused	0%	<1%	1%	1%

Table VI-14 shows that respondents in the West and South were most likely to report that they did not fill their prescription or took less than the full dose of a prescribed medication due to their energy bills in the past five years.

Table VI-14
Didn't Fill Prescription or Took Less Than the Full Dose of
Prescribed Medicine Due to Energy Bills
In the Past Five Years
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Yes	30%	33%	37%	39%
No	69%	66%	62%	60%
Don't Know /Refused	1%	<1%	1%	2%

Table VI-15 shows that respondents in the West were most likely to report that someone in the home became sick because the home was too cold.

Table VI-15
Someone in Household Became Sick Because Home was Too Cold
In the Past Five Years
By Region

	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
Yes	19%	16%	20%	24%
No	80%	83%	79%	75%
Don't Know /Refused	2%	1%	1%	2%

D. LIHEAP Receipt

Table VI-16 displays the number of years that respondents reported LIHEAP receipt out of the past five years. The table shows that respondents in the South were most likely to report that they received LIHEAP in only one of the past five years and respondents in the Northeast and Midwest were most likely to report that they received LIHEAP in each of the past five years.

Table VI-16
Number of Years Received LIHEAP
In the Past Five Years
By Region

	2011 Survey			
	Northeast	Midwest	South	West
Number of Respondents	841	318	302	307
1	19%	18%	33%	26%
2	19%	23%	25%	23%
3	19%	15%	16%	19%
4	7%	11%	3%	5%
5	24%	23%	11%	18%
Don't Know / Refused	12%	9%	9%	10%

VII. Conclusion

The 2011 NEADA study confirmed that LIHEAP recipient households are likely to be vulnerable to temperature extremes. They are likely to have seniors, disabled members, or children in the home. Over 89 percent of LIHEAP recipients had at least one of these vulnerable household members. The study also showed that these households face many challenges in addition to their energy bills, including unemployment, unhealthy home conditions, and medical issues.

Energy Costs

LIHEAP recipients reported that they faced high energy costs. Forty-five percent of the respondents reported energy costs over \$2,000 in the past year and 52 percent said that their energy bills were more difficult to pay. Almost half of those who said that their energy bills were more difficult to pay said that the increased difficulty was due to a worsened financial situation.

Responses to High Energy Costs

Households reported that they took several actions to make ends meet, including closing off part of the home and leaving the home for part of the day. Some of the actions were unsafe and could lead to injury or illness, such as keeping the home at a temperature that was unsafe or unhealthy or using the kitchen stove or oven to provide heat.

Inability to Pay Energy Bills

Despite the assistance that they received, many LIHEAP recipients were unable to pay their energy bills. Almost half of the respondents reported that they had skipped paying or paid less than their entire home energy bill in the past year and more than one third said that they received a notice or threat to disconnect or discontinue their electricity or home heating fuel.

Households went without utility service and sacrificed heating and cooling their home. Eleven percent had their electric or natural gas service shut off in the past year due to nonpayment. Almost one quarter reported that they were unable to use their main source of heat in the past year because their fuel was shut off, they could not pay for fuel delivery, or their heating system was broken and they could not afford to fix it. Seventeen percent reported that they were unable to use their air conditioner in the past year because their electricity was shut off or their air conditioner was broken and they could not afford to fix it.

Housing and Financial Problems

Many LIHEAP recipients had problems paying for housing in the past five years, due at least partly to their energy bills. Almost one third did not make their full mortgage or rent payment. Six percent were evicted from their home or apartment and four percent had a foreclosure on their mortgage.

Medical and Health Problems

Many of the LIHEAP recipients faced significant medical and health problems in the past five years, partly as a result of high energy costs. Nearly one quarter reported that they went without

food, 37 percent sacrificed medical/dental care, and one fifth had someone in the home become sick because the home was too cold.

The Need for LIHEAP

Households reported enormous challenges despite the fact that they received LIHEAP. However, they reported that LIHEAP was extremely important. Many reported that they would have kept their home at unsafe or unhealthy temperatures and/or had their electricity or home heating fuel discontinued if it had not been for LIHEAP.

It is clear that many of these households will continue to need LIHEAP to meet their energy and other essential needs.

Appendix A: Survey Instrument



NEADA 2011 National Energy Assistance SURVEY FINAL INSTRUMENT

Screenener

Hello. This is (INTERVIEWER) from Issues and Answers calling for (NAME) regarding the National Energy Assistance study.

{Interviewer Note: The goal is to conduct the survey with either (NAME) or that person's spouse/partner. If (NAME) is not home / unavailable, politely ask, "May I speak with the spouse or partner of (NAME)".}

You should have received a letter in the mail from the National Energy Assistance Directors' Association about this survey. I'm calling to ask you a few brief questions about your energy bills. In the survey, we will also talk about **(state specific LIHEAP name)**. By **(state specific LIHEAP name)**, we mean the home energy assistance benefits that your household received through your Community-Based Organization. Your responses will help us better understand the need for **(state specific LIHEAP name)** energy assistance, and the problems caused by high energy bills. All your responses will be kept confidential and will not affect your energy assistance benefits.

S1. {Interviewer: DO NOT READ, Whom are you speaking to?}

- 01 NAME
- 02 Spouse/Partner
- 03 Caretaker/Guardian
- 04 Other/Don't Know

[ASK if S1=04]

S2. When can I call back to speak with (NAME) or the spouse or partner of (NAME)? _____ WRITE DATE AND TIME FOR CALLBACK

S3. Did you receive **(STATE SPECIFIC LIHEAP NAME)** in the past 12 months?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

A. Experience with Energy Assistance

A1. In how many of the past 5 years have you received (**STATE SPECIFIC LIHEAP NAME**)?

- 01 ONE YEAR
- 02 TWO YEARS
- 03 THREE YEARS
- 04 FOUR YEARS
- 05 FIVE YEARS
- 07 DON'T KNOW
- 08 REFUSED

B. Actions taken to meet energy expenses

Energy bills can take up a large part of a family's budget, and households often find it necessary to make choices about what bills they will pay or what needs they will meet. In this section of the survey, we ask some questions about actions that your household may have taken when it was difficult to meet all of your expenses.

In the past year, have you or any member of your family taken any of the following actions or experienced any of the following due to your energy bills:

1. Past Year	01	02	07	08
B3a. Had a foreclosure on your mortgage?	YES	NO	DON'T KNOW	REFUSED
B6a. Got a payday loan to cover your expenses?	YES	NO	DON'T KNOW	REFUSED
B7a. Went without food for at least one day?	YES	NO	DON'T KNOW	REFUSED
B8a. Went without medical or dental care?	YES	NO	DON'T KNOW	REFUSED

In the past 5 years, have you or any member of your family taken any of the following actions or experienced any of the following due to your energy bills:

2. Housing Problems	01	02	07	08
B1. Didn't make full rent or mortgage payment?	YES	NO	DON'T KNOW	REFUSED
B2. Was evicted from home or apartment?	YES	NO	DON'T KNOW	REFUSED
B3. Had a foreclosure on your mortgage?	YES	NO	DON'T KNOW	REFUSED
B4. Moved in with friends or family?	YES	NO	DON'T KNOW	REFUSED
B5. Moved into a shelter or been homeless?	YES	NO	DON'T KNOW	REFUSED

3. Financial	01	02	07	08
B6. Got a payday loan to cover your expenses?	YES	NO	DON'T KNOW	REFUSED

4. Other Expenses	01	02	07	08
B7. Went without food for at least one day?	YES	NO	DON'T KNOW	REFUSED
B8. Went without medical or dental care?	YES	NO	DON'T KNOW	REFUSED
B9. Didn't fill a prescription or took less than the full dose of a prescribed medicine?	YES	NO	DON'T KNOW	REFUSED

5. Utility Service and Health	01	02	07	08
B10. Had someone in your household get sick	YES	NO	DON'T KNOW	REFUSED

B11.	because your home was too cold? (Ask if B10=1, YES) Did someone in the household need to go to the doctor or hospital because of this illness?	YES	NO	DON'T KNOW	REFUSED
B12.	Had someone in your household get sick because your home was too hot?	YES	NO	DON'T KNOW	REFUSED
B13.	(Ask if B12=1, YES) Did someone in the household need to go to the doctor or hospital because of this illness?	YES	NO	DON'T KNOW	REFUSED

6. Utility Payment

01 02 07 08

B14.	In the past year, have you tried to work out a payment arrangement with your gas or electric utility company?	YES	NO	DON'T KNOW	REFUSED
B15.	(Ask if B14=1, YES) Were you able to work out a payment arrangement?	YES	NO	DON'T KNOW	REFUSED

C. Energy Insecurity Scale

In the past 12 months, did you almost every month, some months, only in 1 or 2 months, or never do the following because there wasn't enough money for your energy bill?

(INTERVIEWER NOTE: IF ASKED, ALMOST EVERY MONTH MEANS 10 OR MORE MONTHS, AND SOME MONTHS MEANS 3 TO 9 MONTHS.)

		01	02	03	04	07	08
C2.	Did you reduce your expenses for what you consider to be basic household necessities?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C4.	Did you skip paying your home energy bill or pay less than your whole home energy bill?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C5.	Did you have a supplier of your electric or home heating service threaten to disconnect your electricity or home heating fuel service, or discontinue making fuel deliveries?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C6.	Did you close off part of your home because you could not afford to heat or cool it?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C7.	Did you keep your home at a temperature that you felt was unsafe or unhealthy at any time of the year?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C8.	Did you leave your home for part of the day because it was too hot or too cold?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C9.	Did you use your kitchen stove or oven to provide heat?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C10a.	In the past 12 months, was your electricity ever shut off because you were unable to pay your electric bill?		01 YES	02 NO		07 DON'T KNOW	08 REFUSED
C10b.	ASK C10b if C10a=01, YES. Is your electricity service shut off now?		YES	NO		DON'T KNOW	REFUSED
C10c.	In the past 12 months, was your natural gas ever shut off because you were unable to pay your gas bill?		YES	NO		DON'T KNOW	REFUSED
C10d.	ASK C10d if C10c=01, YES. Is your gas service shut off now?		YES	NO		DON'T KNOW	REFUSED

Was there ever a time during the past 12 months when you wanted to use your main source of heat, but could not for one or more of the following reasons?

		01	02	07	08
C11.	Your heating system was broken and you were unable to pay for its repair or replacement?	YES	NO	DON'T KNOW	REFUSED
C12.	You ran out of fuel oil, kerosene, LPG, propane, coal, or	YES	NO	DON'T KNOW	REFUSED

Appendix A: Survey Instrument

- wood because you were unable to pay for a delivery?
- C13. The utility company discontinued your gas or electric service because you were unable to pay your bill? YES NO DON'T KNOW REFUSED

(Ask C14 if C11=1, YES, OR C12=1, YES, OR C13=1, YES)

- C14. Did (STATE SPECIFIC LIHEAP NAME) help you to restore use of your main source of heat? 01 YES 02 NO 07 DON'T KNOW 08 REFUSED

Was there ever a time during the past 12 months when you wanted to use your air conditioner, but could not for one or more of the following reasons?

- C15. Your air conditioner was broken and you were unable to pay for its repair or replacement? 01 YES 02 NO 07 DON'T KNOW 08 REFUSED
- C16. The utility company discontinued your electric service because you were unable to pay your bill? YES NO DON'T KNOW REFUSED

(ASK C19 IF C12=1, YES OR C13=1, YES, OR C16=1, YES, OR C10A=1, YES, OR C10C=1, YES)

Was there ever a time during the past 12 months when you had to do the following because the utility company discontinued your gas or electric service or because you ran out of fuel and could not pay for a delivery?

- 01 02 07 08
- C19. Did you have to use candles or lanterns because you didn't have lights? YES NO DON'T KNOW REFUSED

(READ IF S3=1 AND [C7=4, NEVER OR [C12=2, NO, AND C13=2, NO, AND C16=2, NO, AND C10A=2, NO, AND C10C=2, NO]]) ELSE SKIP TO NEXT SECTION

You stated that you did not face some of these problems that we asked about in the past year. In the next few questions we ask whether you think you may have had some of these problems if (STATE SPECIFIC LIHEAP NAME) assistance had not been available.

- 01 02 07 08
- C21. (Ask if C7=4, NEVER) Would you have needed to keep your home at a temperature that you felt was unsafe or unhealthy at any time of the year if (STATE SPECIFIC LIHEAP NAME) assistance had not been available? YES NO DON'T KNOW REFUSED
- C22. (Ask if [C12=2, NO, AND C13=2, NO, AND C16=2, NO, AND C10A=2, NO, AND C10C=2, NO]) Would you have had your electricity or home heating fuel shut off or discontinued during a time when you needed it to heat or cool your home if (STATE SPECIFIC LIHEAP NAME) assistance had not been available? YES NO DON'T KNOW REFUSED

D. Change in Circumstances

D4. How difficult is it for you to pay your energy bills compared to last year? (DO NOT READ LIST EXCEPT TO PROMPT) **VARY THE ORDER OF RESPONSES

- 01 SAME
- 02 MORE DIFFICULT
- 03 LESS DIFFICULT
- 07 DON'T KNOW
- 08 REFUSED

(Ask D5 if D4=2, "More difficult")

D5. What do you feel is the main reason that it is more difficult to pay your energy bills this year? (DO NOT PROMPT. INTERVIEWER NOTE: IF RESPONDENT SAYS "BILLS/RATES WENT UP", SAY: "Are you referring to your energy bills/rates or some other bill?")

- 01 INCREASED ENERGY BILL
- 02 INCREASED OTHER BILLS
- 03 INCREASED PROPERTY TAXES
- 04 INCREASED RENT
- 05 INCREASED MEDICAL EXPENSES
- 06 INCREASED PRESCRIPTION DRUGS
- 07 LOWER INCOME/LOST JOB/WORSE ECONOMIC SITUATION
- 95 OTHER_____**
- 97 DON'T KNOW**
- 98 REFUSED

E. Healthy Homes

E7. Does anyone in the home have symptoms of asthma, including coughing, wheezing, shortness of breath, chest tightness, or phlegm production?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

E8. Does anyone in the home have chronic bronchitis, emphysema, or chronic obstructive pulmonary disease (COPD)?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

(Ask E9 if E7=1, YES OR E8=1, YES)

E9. Has anyone in the home gone to the emergency room or urgent care center for asthma, bronchitis, emphysema, or chronic obstructive pulmonary disease (COPD) in the past year?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

E10. Does anyone in the home have high blood pressure (hypertension), heart disease, heart attack, or stroke?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F. Demographics

F1. Do you own or rent your home?

- 01 OWN
- 02 RENT
- 03 OTHER _____
- 07 DON'T KNOW
- 08 REFUSED

F2. Including yourself, how many people normally live in this household? (Interviewer instruction: if someone asks if a child who is away at college should be included, instruct them that the child should only be included if he/she is listed as a dependent on the household's tax form.) (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ OCCUPANTS

F3. How many are 60 or older? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ OCCUPANTS OVER AGE 60

SKIP IF F2=F3

F4. How many are 18 or under? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ CHILDREN 18 OR UNDER

(ASK F5 IF F4 ≠ 0, SKIP IF F2=F3)

F5. How many are 5 or under? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ CHILDREN 5 OR UNDER

F6. How many are disabled? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ DISABLED OCCUPANTS

F7. Which fuel is used most for heating your home? (DO NOT READ LIST EXCEPT TO PROMPT)

- 01 GAS; FROM UNDERGROUND PIPES SERVING THE NEIGHBORHOOD
- 02 GAS: BOTTLED, TANK OR LPG, OR PROPANE

- 03 ELECTRICITY
- 04 FUEL OIL, KEROSENE, ETC.
- 05 COAL OR COKE
- 06 WOOD
- 07 SOLAR ENERGY
- 08 OTHER FUEL
- 09 NO FUEL USED
- 97 DON'T KNOW
- 98 REFUSED

[ASK IF F1 ≠ 01]

F8. Is heat included in your rent?

- 01 YES
- 02 NO
- 03 DO NOT PAY RENT
- 07 DON'T KNOW
- 08 REFUSED

F10. In the past 12 months, what was the cost of electricity, gas, and other fuels (oil, coal, kerosene, wood, etc.) for your home? (IF NECESSARY: Please provide your best guess. IF RESPONDENT STILL STRUGGLES: give option to provide average monthly cost) (DO NOT READ LIST EXCEPT TO PROMPT.)

- 01 ≤\$500 (MONTHLY: ≤41.67)
- 02 \$501 - \$1,000 (MONTHLY: 41.68 – 83.33)
- 03 \$1,001 - \$1,500 (MONTHLY: 83.34 – 125.00)
- 04 \$1,501 - \$2,000 (MONTHLY: 125.01 – 166.67)
- 05 \$2001 OR MORE (MONTHLY: 166.68 OR MORE)
- 07 DON'T KNOW
- 08 REFUSED

F11. In the past 12 months, did you not pay your home energy bill or not pay your bill in full because of expenses for medical bills or prescription medicine?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F12. In the past 12 months, did any member of your household have any necessary medical equipment that uses electricity?

(OPTIONAL INTERVIEWER NOTE: I WOULD LIKE YOU TO THINK ABOUT ANY NECESSARY MEDICAL EQUIPMENT THAT USES ELECTRICITY, SUCH AS AN OXYGEN MACHINE OR A NEBULIZER.)

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F13. In the past 12 months, did you or any member of your household receive employment income from wages and salaries or self-employment income from a business or farm?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F14. In the past 12 months, was any member of your household unemployed and looking for work?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F15. In the past 12 months, did you or any member of your household receive retirement income from Social Security or pensions and other retirement funds?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F16. In the past 12 months, did you or any member of your household receive benefits from Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), or general assistance or public assistance?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F17. In the past 12 months, did you or any member of your household receive Food Stamps or live in public or subsidized housing?

- 01 YES

- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

F18. What is your household's annual income? (give option to provide monthly income) (DO NOT READ LIST EXCEPT TO PROMPT.)

- 01 ≤\$5,000 (MONTHLY: ≤416.67)
- 02 \$5,001 - \$10,000 (MONTHLY: 416.68 – 833.33)
- 03 \$10,001 - \$15,000 (MONTHLY: 833.34 - 1,250.00)
- 04 \$15,001 - \$20,000 (MONTHLY: 1,250.01 – 1,666.67)
- 05 \$20,001 - \$25,000 (MONTHLY: 1,666.68 – 2,083.33)
- 06 \$25,001 - \$30,000 (MONTHLY: 2,083.34 – 2,500.00)
- 07 \$30,001 - \$35,000 (MONTHLY: 2,500.01 – 2,916.67)
- 08 \$35,001 - \$40,000 (MONTHLY: 2,916.68 – 3,333.33)
- 09 >\$40,000 (MONTHLY: >3,333.33)
- 97 DON'T KNOW
- 98 REFUSED

That was my last question. Thank you very much for your time and cooperation. Have a pleasant day/evening.

**NATIONAL ENERGY ASSISTANCE
DIRECTORS' ASSOCIATION**

**2018 NATIONAL ENERGY ASSISTANCE SURVEY
FINAL REPORT**

December 2018

The National Energy Assistance Directors' Association

The National Energy Assistance Directors' Association (NEADA) represents the state directors of the Low-Income Home Energy Assistance Program (LIHEAP). NEADA is a nonprofit educational and policy organization based in Washington, DC. Its mission is to support the delivery of LIHEAP services by state agencies and programs.

This report has been prepared by APPRISE for NEADA with support provided by the National Energy and Utility Affordability Coalition (NEUAC).

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- California
- Connecticut
- Georgia
- Iowa
- Indiana
- Louisiana
- Pennsylvania

Mark Wolfe
Executive Director
National Energy Assistance Directors' Association

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Executive Summary

The National Energy Assistance Directors' Association (NEADA), representing the state LIHEAP directors, received funding from the National Energy & Utility Affordability Coalition (NEUAC) to update the information about that was collected in the 2003, 2005, 2008, 2009, and 2011 National Energy Assistance (NEA) Surveys. This survey documented the need for LIHEAP, the choices that low-income households make when faced with unaffordable energy bills, and the impact of LIHEAP.

The 2018 Survey included seven states. Stratified samples of fiscal year 2018 LIHEAP recipients were chosen from each of the state LIHEAP databases. This report presents the findings from the 2018 NEA Survey and provides comparisons to the previous NEA Surveys. The survey and report were prepared for NEADA by APPRISE.

During the period of study, low-income households across the country continued to face challenges with their energy bills. While there are many anecdotal stories about households that forego basic needs and face tragedies due to a lack of electricity or heating fuel, this survey quantifies the problem. The survey showed that 26 percent of the LIHEAP recipients were unemployed at some point during the year, 82 percent had annual household income below \$20,000, and that 15 percent had their electric or gas service shut off in the past year.

LIHEAP Recipient Households

The study confirmed that LIHEAP recipient households are likely to be vulnerable to temperature extremes.

- 46 percent had a senior in the household aged 60 or older.
- 52 percent had a disabled household member.
- 36 percent had a child 18 or younger.
- 92 percent had at least one vulnerable household member.

The study also provided information on challenges that these households faced.

- 26 percent were unemployed at some point during the previous year.
- 28 percent used medical equipment that requires electricity.

Energy Costs

LIHEAP recipients reported that they faced high energy costs.

- 39 percent reported that their energy bills were more than \$2,000 in the past year.
- Pre-LIHEAP energy burden averaged 23 percent and post-LIHEAP energy burden averaged 19 percent for these households, compared to 9 percent for all households in the U.S. and three percent for non low-income households in the U.S.¹

¹ Source: 2014 LIHEAP Notebook.

LIHEAP benefits decreased due to the smaller appropriation in FY 2018. Mean heating benefits were \$307 in FY 2018, compared to \$424 in FY 2011.

Inability to Remain Safe due to High Energy Costs

Households reported that they took several actions to make ends meet.

- 37 percent closed off part of their home.
- 25 percent kept their home at a temperature that was unsafe or unhealthy.
- 30 percent used their kitchen stove or oven to provide heat.
- 48 percent of respondents who had utilities shutoff had to use candles or lanterns and seven percent of all respondents had this problem.

Inability to Pay Energy Bills

Many LIHEAP recipients were unable to pay their energy bills.

- 49 percent skipped paying or paid less than their entire home energy bill.
- 34 percent received a notice or threat to disconnect or discontinue their electricity or home heating fuel.
- 15 percent had their electric or natural gas service shut off in the past year due to nonpayment.
- 30 percent were unable to use their main source of heat in the past year because their fuel was shut off, they could not pay for fuel delivery, or their heating system was broken and they could not afford to fix it.
- 27 percent were unable to use their air conditioner in the past year because their electricity was shut off or their air conditioner was broken and they could not afford to fix it.

Housing and Financial Problems

Many LIHEAP recipients had problems paying for housing in the past five years, due at least partly to their energy bills.

- 17 percent moved in with friends or family.
- 6 percent moved into a shelter or were homeless.

In the past year, LIHEAP recipients faced financial problems.

- 13 percent needed to obtain a payday loan.

Food and Medical Insecurity

Many of the LIHEAP recipients faced significant medical and health problems in the past year, partly as a result of high energy costs.

- 36 percent went without food for at least one day.
- 41 percent went without medical or dental care.
- 31 percent did not fill a prescription or took less than the full dose of a prescribed medication in the past five years.

The Need for LIHEAP

Households reported enormous challenges despite the fact that they received LIHEAP. However, they reported that LIHEAP was extremely important.

- 54 percent of those who did not keep their home at unsafe or unhealthy temperatures said they would have done so if LIHEAP had not been available.
- 59 percent of those who did not have their electricity or home heating fuel discontinued said that they would have if it had not been for LIHEAP.

It is clear that many of these households will continue to need LIHEAP to meet their energy and other essential needs.

I. Introduction

The National Energy Assistance Directors' Association (NEADA), representing the state LIHEAP directors, received funding from the National Energy & Utility Affordability Coalition (NEUAC) to update the information about that was collected in the 2003, 2005, 2008, 2009, and 2011 National Energy Assistance (NEA) Surveys. This survey documented the need for LIHEAP, the choices that low-income households make when faced with unaffordable energy bills, and the impact of LIHEAP.

The 2018 Survey included seven states. Stratified samples of fiscal year 2018 LIHEAP recipients were chosen from each of the state LIHEAP databases. This report presents the findings from the 2018 NEA Survey and provides comparisons to the previous NEA Surveys. The survey and report were prepared for NEADA by APPRISE.

A. *Low Income Home Energy Assistance Program (LIHEAP)*

The Low Income Home Energy Assistance Program (LIHEAP) is administered by the U.S. Department of Health and Human Services (HHS). The purpose of LIHEAP is “to assist low-income households, particularly those with the lowest incomes, that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs.” The LIHEAP statute defines home energy as “a source of heating or cooling in residential dwellings.”²

Federal dollars for LIHEAP are allocated by the U.S. Department of Health and Human Services to the grantees (i.e., the 50 states, District of Columbia, 128 tribes and tribal organizations, and five insular areas) as a block grant. Program funds are distributed by a formula, which is weighted towards relative cold-weather conditions.

Program funds are disbursed to LIHEAP income-eligible households under programs designed by the individual grantees. Section 2605(b)(2) allows LIHEAP grantees to use two income-related standards in determining household eligibility for LIHEAP assistance:

- Categorical eligibility for households with one or more individuals receiving Temporary Assistance for Needy Families, Supplemental Security Income payments, Food Stamps, or certain needs-tested veterans' and survivors' payments, without regard for household income.
- Income eligibility for households with incomes that do not exceed the greater of an amount equal to 150 percent of the federal poverty level³, or an amount equal to 60

² The statutory intent of LIHEAP is to reduce home heating and cooling costs for low-income households. However, information on total residential energy costs is more accessible and more apparent to LIHEAP-recipient respondents. Moreover, any reduction in home heating and cooling costs leads to a direct reduction in total residential energy costs. Therefore, this report addresses total residential energy costs.

³ Most states use the 150 percent of federal poverty level maximum as the guideline. 150 percent of federal poverty in FY2018 is \$18,210 for a single person and \$37,650 for a family of four.

percent of the state median income. Grantees may target assistance to poorer households by setting lower income eligibility levels. Grantees are prohibited from setting income eligibility levels lower than 110 percent of the poverty level. Eligibility priority may be given to households with high energy burden or need.⁴

B. 2018 National Energy Assistance Survey

The 2018 NEA Survey aimed to update the information about LIHEAP-recipient households that was collected in the previous NEA Surveys. Stratified samples of 2018 LIHEAP recipients were selected to collect new information about the consequences of high energy bills for low-income households. The 2018 National Energy Assistance Survey collected the following information from LIHEAP-recipient households:

- Demographic, energy expenditure, and income information
- Healthy home behaviors
- History of LIHEAP participation
- Constructive actions taken to meet energy expenses
- Signs of unaffordable energy bills
- Health and safety consequences of unaffordable energy bills
- Effects of unaffordable energy bills on housing
- Impact and importance of LIHEAP benefits for recipient households

The 2018 Survey included seven states, representing each region of the U.S.

C. Organization of the Report

This report has six sections that follow this introduction.

- *Section II: Survey Methodology* – Presents the methodology used.
- *Section III: LIHEAP Recipients* – Presents demographic and income information for LIHEAP-recipient households that completed the 2018 NEA Survey.
- *Section IV: Problems Faced in Meeting Energy Needs* – Presents information about actions that LIHEAP-recipient households take to meet their energy needs, household necessities, and health and wellness in the face of significant financial constraints.
- *Section V: The Need for LIHEAP* – Presents information about the impact and importance of LIHEAP on recipient households.

⁴ Description of LIHEAP information obtained from “Low Income Home Energy Assistance Program. Report to Congress for Fiscal Year 2014.” U.S. Department of Health and Human Services, Administration for Children and Families, Office of Community Services, Division of Energy Assistance. Additional information regarding the LIHEAP program can be found on the World Wide Web at: <http://www.acf.hhs.gov/programs/liheap/>.

- *Section VI: Regional Analysis* – Presents analysis of the problems faced by low-income households in the Northeast, Midwest, West, and South.
- *Section VII: Conclusion* – Presents a summary of the key findings in this report.

II. Survey Methodology

This section describes the methodology for the 2018 NEADA Survey, including procedures for sample selection, survey implementation, and weighting.

A. Survey Implementation

A survey advance letter was sent to the sample of selected LIHEAP recipients from the seven participating states. This letter announced the survey, notified potential respondents that they would be called to participate in the survey, explained the purpose of the survey, and gave potential respondents the option to call the phone center to complete the survey at their convenience.

APPRISE staff conducted the telephone survey. A researcher from APPRISE trained interviewers on the survey instrument and monitored survey implementation. This training session provided interviewers with an overview of the project, purpose behind questions asked, and strategies to provide accurate clarification and elicit acceptable responses through neutral probing techniques. In addition, interviewers were trained on how to use the computerized version of the survey to record customer responses.

Telephone interviews were conducted between June 22, 2018 and August 17, 2018. During this time period, 624 interviews were completed.

B. Sample Selection and Response Rates

LIHEAP recipients were selected from each of the seven states chosen to participate in the survey. Table II-1 details the number of LIHEAP recipients selected to complete the survey, number of completed interviews, cooperation rates, and response rates for the national sample. Table II-1 presents the following information.

- **Number selected:** Approximately 228 households were selected in each state. The final sample consisted of 1,594 cases.
- **Unusable:** There were 218 cases deemed unusable because phone numbers were missing, unavailable, disconnected, or incorrect. These households are not included in the denominator of the response rate or the cooperation rate. They are included in the denominator of the completed interview rate.
- **Non-Interviews:** There were 228 cases classified as non-interviews because the qualified respondent refused to complete the interview, because the respondent couldn't complete the interview due to a language barrier, or because the respondent asked the interviewer to call back to complete the interview at a later time but did not complete the interview during the field period. These households are included in the denominator of the cooperation rate, the response rate, and the completed interview rate.

- **Unknown eligibility:** There were 524 cases that were determined to have unknown eligibility to complete the interview, due to answering machines and no answers. These households are not included in the denominator of the cooperation rate. They are included in the denominator of the response rate and the completed interview rate.
- **Completed interviews:** The completed interviews are households that were reached and that answered the full set of survey questions by telephone. In total, 624 interviews were completed. Sixteen of these interviews were completed in Spanish.
- **Cooperation rate:** The cooperation rate is the percent of eligible households contacted who completed the survey. This is calculated as the number of completed interviews divided by the interviews plus the number of non-interviews (refusals plus non-completed call backs⁵). Overall, this survey achieved a 77 percent cooperation rate.
- **Response rate:** The response rate is the number of completed interviews divided by the number of completed interviews plus the number of non-interviews (refusals plus non-completed call backs) plus all cases of unknown eligibility (due to answering machines and language barriers). This survey attained a 48 percent response rate.
- **Completed Interview Rate:** The completed interview rate is the percentage of households selected that completed the survey. This survey attained a 39 percent completed interview rate.

Table II-1
Sample and Response Rates

	Total Sample Statistics
Number Selected	1,594
Unusable	218
Non-Interviews	228
Unknown Eligibility	524
Completed Interviews	624
Cooperation Rate	77%
Response Rate	48%
Completed Interview Rate	39%

Table II-2 displays the number of interviews completed by state. The response rate ranged from 37 percent in Connecticut to 53 percent in Indiana and Louisiana.

⁵ Non-completed callbacks include respondents who asked the interviewer to call back at a later time to complete the interview, but did not complete the interview by the end of the field period.

Table II-2
Number of Completed Interviews by State

State	Total Selected	Completed Interviews	Response Rate
California	215	83	46%
Connecticut	226	74	37%
Georgia	215	89	50%
Iowa	238	90	50%
Indiana	233	99	53%
Louisiana	232	93	53%
Pennsylvania	235	96	50%
TOTAL	1,594	624	48%

C. Weights

Two sets of weights were used to ensure that state-level data represents each state and that the overall findings are representative of the national LIHEAP population. First, weights were applied within states. The purpose of these weights was to adjust for selection and response rate variation within poverty group and vulnerable status. A second set of weights was used so that the sum of the state weights was proportional to the strata size from which it was drawn. In the estimates presented in this report, the total weight, comprised of these two separate weights, is used. This results in a nationally representative sample of 2018 LIHEAP recipients.

III. LIHEAP Recipient Households

The 2018 National Energy Assistance Survey included a series of questions about household demographics.

Table III-1 displays information on the number of household members. The table shows that 43 percent of LIHEAP recipients live in single person households and 66 percent have two or fewer household members.

**Table III-1
Number of Household Members**

Number of Household Members	Percent of Respondents
1	43%
2	23%
3	14%
4	9%
5	6%
6 or more	5%

Table III-2 displays information on the presence of vulnerable household members. The table shows that 46 percent have a senior in the home, 52 percent have a disabled household member, 36 percent have a child age 18 or younger, and 15 percent have a child age five or younger.

**Table III-2
Vulnerable Groups**

	Senior ≥ 60	Disabled	Child ≤ 18	Young Child ≤ 5	Single Parent
Yes	46%	52%	36%	15%	17%
No	54%	48%	64%	85%	83%
Don't Know/Refused	0%	0%	0%	0%	0%

Table III-3 shows that 92 percent of LIHEAP recipients have at least one vulnerable household member (elderly, disabled, or child 18 or younger) and 80 percent have a least one vulnerable household member when households with children five or younger are included.

**Table III-3
Households with at Least One Vulnerable Member**

	Elderly, Disabled, or Child ≤ 18	Elderly, Disabled, or Child ≤ 5
At Least One Vulnerable Member	92%	80%
No Vulnerable Members	8%	20%

Respondents were asked whether they own or rent their home. Table III-4 shows that 45 percent of LIHEAP recipients own their homes.

**Table III-4
Home Ownership**

Home Ownership	Percent of Respondents
Own	45%
Rent	54%
Other	1%
Don't Know/Refused	0%

Table III-5 displays the annual household income distribution for LIHEAP-recipient households based on information in the state LIHEAP databases. The table shows that 35 percent have income of less than or equal to \$10,000 and only three percent have income above \$40,000.

**Table III-5
Annual Income**

Annual Income	Percent of Respondents
≤ \$ 10,000	35%
\$ 10,001 - \$ 20,000	47%
\$ 20,001 - \$ 30,000	11%
\$ 30,001 - \$ 40,000	4%
More than \$ 40,000	3%

Table III-6A shows (from state LIHEAP databases) that 20 percent had income at or below 50 percent of the poverty level and 61 percent had income at or below the poverty level. Only nine percent had income above 150 percent of the poverty level.

**Table III-6A
Poverty Level**

Poverty Level	Percent of Respondents
0%-50%	20%
51%-100%	41%
101%-150%	30%
>150%	9%

Table III-6B displays the household poverty level by vulnerable group. The table shows that households with children and non-vulnerable households are more likely than households with seniors and with disabled members to have income at or below 50 percent of the poverty level.

Table III-6B
Poverty Level by Vulnerable Group

	Senior	Disabled	Child 18 or Younger	Child 5 or Younger	Single Parent Household ¹	Non-Vulnerable
Number of Respondents	294	347	212	85	98	48
0% - 50%	9%	15%	35%	37%	45%	31%
51% - 100%	46%	49%	32%	28%	36%	25%
101% - 150%	36%	29%	25%	23%	16%	34%
> 150%	10%	7%	9%	11%	3%	10%

¹ Defined as households with only one adult residing with one or more children.

Respondents were asked about the type of income and benefits received in the past year. Table III-7 shows that 27 percent reported that they received employment income, 39 percent said that they received retirement income, 65 percent reported that they received public assistance, and 61 percent received Medicaid or disability insurance. Public assistance included TANF, SSI, Food Stamps, and general and public assistance.

Table III-7
Types of Income and Benefits Received

	Wages or Self-Employment Income	Retirement Income	Public Assistance	Medicaid or Disability Assistance
Yes	27%	39%	65%	61%
No	73%	60%	35%	38%
Don't Know /Refused	<1%	1%	1%	1%

Respondents were asked whether they had been unemployed at some time during the year. Table III-8A shows that 26 percent reported that they had been unemployed at some point during the past year. This compares to 31 percent in 2003, 29 percent in 2008, 36 percent in 2009, and 35 percent in 2011, and 26 percent in 2018.

Table III-8A
Unemployed during the Year

	2003	2008	2009	2011	2018
Yes	31%	29%	36%	35%	26%
No	69%	70%	63%	62%	74%
Don't Know / Refused	0%	1%	1%	3%	0%

Table III-8B displays the percent of respondents who were unemployed during the past year by vulnerable group. The table shows that households with children under 18 and non-vulnerable households were most likely to report that they had been unemployed. Forty-seven percent of households with children reported that they had been unemployed.

Table III-8B
Unemployed during the Year
By Vulnerable Group

	Senior	Disabled	Child ≤18	Non-Vulnerable
Number of Respondents	294	347	212	48
Yes	12%	18%	47%	44%
No	88%	82%	54%	56%
Don't Know / Refused	0%	0%	0%	0%

Table III-8C displays the percent of respondents who reported that they had been unemployed in the past year by poverty level. The table shows that 51 percent of respondents with income at or below 50 percent of the poverty level reported that they had been unemployed, compared to 19 percent between 51 and 100 percent of poverty, 22 percent between 101 and 150 percent of poverty, and 24 percent above 150 percent of poverty.

Table III-8C
Unemployed during the Year
By Poverty Level

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Yes	51%	19%	22%	24%
No	49%	81%	78%	76%
Don't Know / Refused	0%	0%	0%	0%

Table III-8D displays the percent of respondents who reported that they had wages, retirement income, or had been unemployed in the past year. The table shows that 74 percent of all respondents fell into one of these categories. While only 63 percent of households with disabled members did, 82 percent of households with children fell into one of these categories.

Table III-8D
Working & Unemployed during the Year
By Vulnerable Group

	All	Senior	Disabled	Child ≤18	Non-Vulnerable
Number of Respondents	624	294	347	212	48
Wages	27%	7%	14%	49%	60%
Retirement Income	39%	69%	45%	17%	8%
Unemployed	26%	12%	18%	47%	44%
Either Wages, Retirement Income, or Unemployed	74%	78%	63%	82%	78%

Respondents were asked whether there was a veteran in the household, whether the veteran served abroad, and whether the veteran was disabled as a result of an injury sustained during service. Table III-9A shows that six percent of households had a veteran, three percent had a veteran who served abroad, and two percent had a veteran who was disabled as a result of an injury sustained during service.

Table III-9A
Households with Veteran Members

	Household with Veteran Member	Household with Veteran who Served Abroad	Household with Veteran Disabled as a Result of Injury During Service
Yes	6%	3%	2%
No	94%	97%	98%
Don't Know/ Refused	0%	<1%	0%

Table III-9B displays information on where the veterans served.

Table III-9B
Households with Veteran Members
Where Did They Serve?⁶

	Percent
Number of Respondents	36
Vietnam	11%
Germany	11%
Iraq	10%
Afghanistan	6%
Korea	6%
Other	19%
Did Not Serve Abroad	51%

Respondents were asked whether they use any medical equipment that requires the use of electricity. Table III-10A shows that 28 percent of respondents reported that they use such equipment.

⁶ Respondents could indicate more than one country where they had performed their service, so the percentages in this table add up to more than 100 percent.

Table III-10A
Someone in the Household Utilizes Necessary Medical Equipment that Uses Electricity

Someone in the Household Utilizes Necessary Medical Equipment that Uses Electricity	Percent of Respondents
Yes	28%
No	72%
Don't Know/Refused	0%

Table III-10B displays the percent who reported the use of such medical equipment by vulnerable group. The table shows that 40 percent of households with a disabled member, 30 percent with a senior, and 29 percent of households with children reported that they use this equipment. Households that did not have vulnerable members were least likely to report the use of this equipment.

Table III-10B
Member of Household Utilizes Medical Equipment that Requires Electricity
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Yes	30%	40%	29%	11%
No	70%	60%	71%	89%
Don't Know / Refused	0%	0%	0%	0%

Respondents were asked to report the primary fuel used to heat their home. Table III-11 shows that 41 percent use natural gas, 38 percent use electricity, nine percent use fuel oil or kerosene, and five percent use LPG or propane.

Table III-11
Primary Fuel Used for Home Heating

Primary Fuel Used for Home Heating	Percent of Respondents
Natural Gas	41%
Electricity	38%
Fuel Oil or Kerosene	9%
Bottled Gas (LPG or Propane)	5%
Wood	1%
Coal, Coke	1%
Other Fuel	<1%
No Fuel Used	<1%
Don't Know/Refused	4%

Table III-12 shows that 11 percent of respondents who do not own their own home have their heat included in their rent.

Table III-12
Heat included in Rent

Heat included in Rent	Percent of Respondents
Number of Respondents	335
Yes	11%
No	88%
Don't Know/Refused	1%

IV. Problems Meeting Energy Needs

This section examines the financial challenges and difficult choices made by the LIHEAP recipients to manage their total residential energy costs.

A. Utility Bills and Energy Burden

Respondents were asked to report their annual energy costs. Table IV-1 shows that 39 percent of the respondents reported that their bills were over \$2,000.^{7,8}

Table IV-1A
Annual Total Residential Energy Costs

Annual Energy Costs	Percent of Respondents
Less than \$500	2%
\$501 - \$1,000	11%
\$1,001 - \$1,500	17%
\$1,501 - \$2,000	17%
Over \$2,000	39%
Don't Know/Refused	13%

Table IV-2 displays the distribution of LIHEAP heating benefits as reported in the state LIHEAP data. While 11 percent received benefits of less than \$100, 21 percent received benefits between \$101 and \$250, 56 percent received benefits between \$251 and \$500, and 12 percent received benefits over \$500. Mean benefits in 2018 were lower than in the previous years.

⁷ LIHEAP benefit data were not obtained from California. California households are excluded from the tables that rely on these data, and the number of respondents is noted.

⁸ In this section, there are several instances where 476 respondents out of 624 respondents are included because LIHEAP benefit and energy expenditure information were not obtained. In these cases, the number of respondents is noted.

Table IV-2
LIHEAP Heating Benefits Distribution⁹

Benefit Amount	Percent Received			
	2008	2009	2011	2018
Number of Respondents	1,256	1,828	1,667	541
≤ \$100	6%	5%	7%	11%
\$101-\$250	25%	13%	21%	21%
\$251-\$500	39%	45%	43%	56%
\$501-\$750	11%	21%	16%	11%
\$751-\$1,000	6%	7%	7%	1%
≥ \$1,000	3%	6%	5%	0%
Did Not Receive Heating Benefit	9%	4%	2%	0%
Mean Benefits	\$388	\$483	\$424	\$307

Pre-LIHEAP energy burden was calculated by dividing the respondents' reported energy costs by their total household income from the state LIHEAP databases. Post-LIHEAP energy burden was calculated by subtracting LIHEAP benefits from energy costs and then dividing these net energy costs by total household income. Table IV-3A shows that LIHEAP benefits had a big impact on the households' energy burden. Prior to receiving LIHEAP, 39 percent of households had an energy burden higher than 15 percent. After receiving LIHEAP, 26 percent had an energy burden that was this high. Additionally, LIHEAP benefits increased the percentage with burdens at or below five percent from 12 percent of recipients to 21 percent.

Table IV-3A
Total Residential Energy Burden

	Total Residential Energy Burden	
	Pre-LIHEAP	Post-LIHEAP
Number of Respondents	476	476
0-5%	12%	21%
6%-10%	24%	31%
11-15%	25%	22%
16-20%	16%	11%
21-25%	9%	2%
>25%	14%	13%

Table IV-3B displays pre- and post-LIHEAP average energy burdens by vulnerable group. The table shows that non-vulnerable and single parent households had the greatest pre-

⁹ Iowa did not specify whether the benefit amount in their system corresponded to Heating Assistance, or to the Total LIHEAP benefit. The calculation of the percentages in Table IV-2 included Iowa recipients.

LIHEAP energy burden, averaging 35 and 36 percent. LIHEAP benefits reduced mean energy burden by between three and four percentage points for all groups of households. While the pre-LIHEAP energy burden average ranged from 16 percent to 36 percent, the post-LIHEAP energy burden average ranged from 12 percent to 32 percent.

Table IV-3B
Mean Total Residential Energy Burden
By Vulnerable Group

	All	Senior	Disabled	Child Under 18	Child Under 6	Single Parent	Non-Vulnerable
Number of Respondents	476	207	264	176	71	88	39
Pre-LIHEAP Burden	23%	16%	19%	28%	28%	36%	35%
Post-LIHEAP Burden	19%	12%	15%	25%	24%	32%	31%

Table IV-3C displays the energy burden distribution by vulnerable group. The table shows that 20 to 26 of each group had an energy burden at or below five percent after receipt of LIHEAP except for the non-vulnerable.

Table IV-3C
Residential Energy Burden Distribution
By Poverty Level

	Senior		Disabled		Child Under 18		Non-Vulnerable	
	Pre-LIHEAP	Post-LIHEAP	Pre-LIHEAP	Post-LIHEAP	Pre-LIHEAP	Post-LIHEAP	Pre-LIHEAP	Post-LIHEAP
Number of Respondents	207	207	264	264	176	176	39	39
0-5%	9%	26%	8%	20%	12%	21%	2%	4%
6%-10%	25%	31%	21%	27%	23%	31%	14%	36%
11-15%	33%	24%	26%	26%	21%	15%	28%	26%
16-20%	15%	12%	21%	16%	12%	8%	22%	7%
21-25%	11%	3%	14%	3%	8%	3%	5%	0%
>25%	6%	4%	10%	8%	24%	22%	28%	27%

Louisiana was the only state that provided data on household energy costs. Table IV-4A displays the pre- and post-LIHEAP energy burden for the LIHEAP recipients in Louisiana. The table shows that while two percent had an energy burden below five percent prior to receipt of LIHEAP, ten percent had an energy burden below five percent after receipt of LIHEAP. Twenty-five percent still had an energy burden above 25 percent after receipt of LIHEAP.

Table IV-4A
Total Residential Energy Burden - Louisiana

	Total Residential Energy Burden	
	Pre-LIHEAP	Post-LIHEAP
Number of Respondents	93	93
0-5%	2%	10%
6%-10%	12%	20%
11-15%	21%	23%
16-20%	19%	14%
21-25%	15%	7%
>25%	31%	25%

Table IV-4B displays pre- and post-LIHEAP average energy burdens for Louisiana recipients by vulnerable group for those groups with at least 25 respondents. The table shows that households with children had the greatest energy burdens.

Table IV-4B
Mean Total Residential Energy Burden - Louisiana
By Vulnerable Group

	All	Senior	Disabled	Child Under 18
Number of Respondents	93	44	61	30
Pre-LIHEAP Burden	28%	18%	23%	32%
Post-LIHEAP Burden	23%	14%	17%	27%

B. Signs of the Problem

Respondents were asked whether they reduced expenses for household necessities due to not having enough money to pay their energy bill during the past year. Table IV-5A shows that 72 percent said that they took this action.

Table IV-5A
Reduced Expenses for Household Necessities Due to Not Having Enough Money for the Energy Bill during the Past Year

	Percent of Respondents
Almost Every Month	32%
Some Months	29%
1 or 2 Months	11%
Never / No	26%
Don't Know	3%

Table IV-5B shows that households with elderly members were less likely to report that they reduced expenses for household necessities than other types of households. The table shows that 81 percent of households with children under 18, 75 percent of households without vulnerable members, 75 percent of households with disabled members, and 63 percent of households with seniors said that they faced this problem.

Table IV-5B
Reduced Expenses for Household Necessities Due to Not Having
Enough Money for the Energy Bill during the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Almost Every Month	23%	36%	37%	35%
Some Months	29%	30%	35%	18%
1 or 2 Months	11%	9%	9%	22%
Never / No	33%	22%	18%	24%
Don't Know	4%	2%	2%	0%

Table IV-5C shows that households with income below 50 percent of the poverty level were most likely to say that they reduced expenses for household necessities. Eighty-four percent of those with income below 50 percent of the poverty level said that they reduced these expenses.

Table IV-5C
Reduced Expenses for Household Necessities Due to Not Having Enough
Money for the Energy Bill during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Almost Every Month	39%	32%	30%	21%
Some Months	34%	26%	28%	35%
1 or 2 Months	11%	12%	8%	16%
Never / No	15%	27%	32%	22%
Don't Know / Refused	1%	2%	2%	7%

Table IV-6 compares responses to questions about signs of unaffordable energy bills for the 2003, 2008, 2009, 2011, and 2018 surveys. The table shows that approximately the same percentage of respondents faced these problems in 2018 as in 2011, which was somewhat lower than in the previous years.

Table IV-6
Signs of the Problem
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Reduced Expenses for Household Necessities	78%	80%	79%	72%	72%

C. Inability to Remain Safe due to High Energy Costs

This section examines how households have responded to the problem of unaffordable energy bills.

Respondents were asked whether they closed off part of their home during the past year because they could not afford to heat or to cool it. Table IV-7A shows that 36 percent of respondents said that they took this action.

Table IV-7A
Closed Off Part of Home Because Could Not Afford to Heat or Cool It
Due to Not Having Enough Money for the Energy Bill during the Past Year

	Percent of Respondents
Almost Every Month	10%
Some Months	16%
1 or 2 Months	10%
Never / No	63%
Don't Know / Refused	<1%

Table IV-7B displays the percent of respondents who said that they closed off part of their home because they could not afford to heat or to cool it. Households with disabled members and non-vulnerable households were most likely to say they took this action.

Table IV-7B
Closed Off Part of Home Because Could Not Afford to Heat or Cool It
Due to Not Having Enough Money for the Energy Bill During Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Almost Every Month	10%	14%	8%	12%
Some Months	16%	22%	14%	14%
1 or 2 Months	11%	8%	11%	14%
Never / No	64%	57%	66%	59%
Don't Know/Refused	0%	0%	<1%	0%

Table IV-7C shows that households with income below 50 percent of the poverty level were most likely to report that they closed off part of their home. Forty-six percent of these households reported that they closed off part of their home because they did not have enough money for their energy bill during the past year.

Table IV-7C
Closed Off Part of Home Because Could Not Afford to Heat or Cool It
Due to Not Having Enough Money for the Energy Bill during Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Almost Every Month	10%	14%	7%	8%
Some Months	24%	13%	14%	20%
1 or 2 Months	12%	10%	11%	3%
Never / No	54%	63%	67%	69%
Don't Know	0%	0%	<1%	0%

Respondents were asked whether they kept their home at a temperature that they felt was unsafe or unhealthy due to not having enough money for the energy bill during the past year. Table IV-8A shows that 26 percent of the respondents said that they took this action.

Table IV-8A
Kept Home at Temperature You Felt Was Unsafe or Unhealthy Due to Not Having Enough Money for the Energy Bill during Past Year

	Percent of Respondents
Almost Every Month	4%
Some Months	13%
1 or 2 Months	9%
Never / No	74%
Don't Know / Refused	1%

Table IV-8B shows the percent that kept their home at an unsafe or unhealthy temperature during the past year by vulnerable group. While 30 percent of households with disabled members reported that they did so, 27 percent of non-vulnerable households reported that they did so.

Table IV-8B
Kept Home at Temperature You Felt Was Unsafe or Unhealthy Due to Not Having Enough Money for the Energy Bill during Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Almost Every Month	4%	5%	4%	5%
Some Months	11%	14%	12%	16%
1 or 2 Months	8%	11%	8%	6%
Never / No	76%	69%	74%	71%
Don't Know/Refused	1%	1%	1%	3%

Table IV-8C shows that households below 50 percent and above 150 percent of the poverty level were more likely to keep home at a temperature that they felt was unsafe or unhealthy due to not having enough money for the energy bill during the past year.

Table IV-8C
Kept Home at Temperature You Felt Was Unsafe or Unhealthy Due to Not
Having Enough Money for the Energy Bill during Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Almost Every Month	8%	3%	3%	5%
Some Months	18%	12%	10%	13%
1 or 2 Months	7%	8%	9%	13%
Never / No	67%	76%	76%	69%
Don't Know/Refused	0%	1%	2%	0%

Households sometimes take the dangerous action of using their kitchen oven or stove to provide heat when they cannot afford their energy bill. Table IV-9A shows that 30 percent of respondents said that they took this action during the past year.

Table IV-9A
Used Kitchen Stove or Oven to Provide Heat Due to Not
Having Enough Money for the Energy Bill during Past Year

	Percent of Respondents
Almost Every Month	1%
Some Months	11%
1 or 2 Months	18%
Never / No	70%
Don't Know	<1%

Table IV-9B shows that percent who said that they used their kitchen stove or oven for heat in the past year by vulnerable group. Households without vulnerable members were most likely to report that they did so. While 38 percent of non-vulnerable reported that they used their kitchen stove or oven for heat, 33 percent of households with children, 32 percent of households with disabled members, and 23 percent of households with seniors reported that they did so.

Table IV-9B
Used Kitchen Stove or Oven to Provide Heat Due to Not
Having Enough Money for the Energy Bill during the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Almost Every Month	<1%	1%	2%	2%
Some Months	9%	12%	11%	15%
1 or 2 Months	14%	19%	20%	21%
Never / No	76%	67%	68%	62%
Don't Know/Refused	1%	1%	0%	0%

Table IV-9C shows that the percent who reported that they used their kitchen stove or oven for heat by poverty level. Households below 50 percent of the poverty level were most likely to report that they did so. The table shows that 37 percent of households with income below 50 percent of the poverty level reported that they used their kitchen stove or oven to provide heat.

Table IV-9C
Used Kitchen Stove or Oven to Provide Heat Due to Not
Having Enough Money for the Energy Bill during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Almost Every Month	1%	1%	1%	0%
Some Months	14%	11%	8%	14%
1 or 2 Months	22%	19%	14%	17%
Never / No	63%	69%	77%	69%
Don't Know	0%	0%	1%	0%

Table IV-10 compares the responses to these issues over the past several surveys. The percentages in 2018 were approximately the same as in 2011 and 2009.

Table IV-10
Responses to the Problem
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Closed Off Part of Home	39%	44%	36%	39%	37%
Kept Home at Temperature You Felt was Unsafe or Unhealthy	25%	28%	26%	23%	25%
Used Kitchen Stove or Oven to Provide Heat	31%	33%	33%	33%	30%

D. Inability to Pay Energy Bills

Respondents were asked several questions about the inability to pay their home energy bill.

Table IV-11A shows that 49 percent of respondents said that they skipped paying or paid less than their entire home energy bill during the past year due to not having enough money to pay the bill.

Table IV-11A
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill during Past Year

	Percent of Respondents
Almost Every Month	11%
Some Months	21%
1 or 2 Months	17%
Never / No	49%
Don't Know / Refused	2%

Table IV-11B shows that households with children were most likely to say that they skipped paying their home energy bill. Sixty-seven percent of households with children said that they skipped paying their home energy bill at least once in the past year.

Table IV-11B
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill during Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Almost Every Month	4%	12%	19%	7%
Some Months	17%	21%	27%	20%
1 or 2 Months	16%	17%	21%	22%
Never / No	60%	48%	32%	47%
Don't Know / Refused	3%	2%	1%	4%

Table IV-11C shows that households with income below 50 percent of the poverty level were most likely to say that they skipped paying the home energy bill. Fifty-nine percent of these households said that they skipped paying or paid less than the entire amount on their energy bill sometime in the past year.

Table IV-11C
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Almost Every Month	17%	9%	11%	6%
Some Months	34%	17%	20%	15%
1 or 2 Months	8%	24%	12%	20%
Never / No	40%	47%	56%	57%
Don't Know / Refused	2%	3%	1%	2%

Respondents were asked whether they received a notice or threat to disconnect or discontinue their electricity or home heating fuel due to not having enough money for the energy bill during the past year. The table shows that 34 percent said that they received a notice or threat.

Table IV-12A
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill during the Past Year

	Percent of Respondents
Almost Every Month	4%
Some Months	13%
1 or 2 Months	17%
Never / No	64%
Don't Know / Refused	2%

Table IV-12B shows the percent who received a threat of service termination by vulnerable group. The table shows that households with children and the non-vulnerable were most likely to face this problem. Forty-eight percent of households with children and 44 percent of non-vulnerable households received a notice or threat to disconnect or discontinue their service in the past year.

Table IV-12B
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill during Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Almost Every Month	1%	5%	7%	6%
Some Months	8%	13%	19%	8%
1 or 2 Months	12%	15%	22%	30%
Never / No	76%	64%	50%	51%
Don't Know / Refused	2%	2%	1%	5%

Table IV-12C shows that households with income below 50 percent of poverty were most likely to report that they received a notice or threat to disconnect or discontinue their electricity or home heating fuel. The table shows that 47 percent of these households said that they faced this problem in the past year.

Table IV-12C
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel Due to Not Having Enough Money for the Energy Bill during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Almost Every Month	10%	3%	4%	0%
Some Months	17%	15%	9%	4%
1 or 2 Months	20%	18%	15%	12%
Never / No	50%	62%	70%	84%
Don't Know / Refused	4%	2%	1%	0%

Table IV-13A shows that 13 percent of respondents had their electricity shut off due to nonpayment, seven percent had their gas service shut off, and 15 percent had at least one of the two shut off during the past year.

Table IV-13A
Utility Service Was Shut Off Due to Nonpayment during the Past Year

	Percent of Respondents
Electricity	13%
Gas	7%
Electricity or Gas	15%

Table IV-13B displays the percent that had their utility service shut off by vulnerable group. The table shows that households with children were most likely to face these problems. Twenty-six percent of households with children had their electricity and/or gas shut off due to nonpayment in the past year.

Table IV-13B
Utility Service Was Shut Off Due to Nonpayment during the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Electricity	6%	12%	22%	16%
Gas	4%	7%	13%	10%
Electricity or Gas	9%	15%	26%	20%

Table IV-13C displays the percent of households who had utility service terminated by poverty group. The table shows that households with income below 50 percent of the poverty level were most likely to have had their service terminated. Twenty-six percent of

households with income below 50 percent of the poverty level had their gas and/or electric utility service terminated in the past year.

Table IV-13C
Utility Service Was Shut Off Due to Nonpayment During the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Electricity	24%	12%	9%	5%
Gas	12%	6%	8%	2%
Electricity or Gas	26%	14%	13%	7%

Table IV-14A shows the percent of households who were unable to use their main source of heat during the past year. The table shows that 20 percent were unable to use their main source of heat due to the system being broken, eight percent due to an inability to pay for a fuel delivery, and seven percent due to an electric or gas service termination. Thirty percent of households were unable to use their main source of heat during the past year for any of the three reasons.

Table IV-14A
Unable to Use Main Source of Heat during the Past Year

	Percent of Respondents
Heating System Broken	20%
Unable to Pay for Fuel Delivery	8%
Gas or Electric Service Discontinued	7%
Any of the Three Reasons	30%

Table IV-14B displays the percent of respondents who said that they were unable to use their main source of heat during the past year by vulnerable group. The table shows that households with children and households with disabled members were most likely to face this problem. Thirty-eight percent of households with children and thirty-two percent of households with disabled members could not use their main source of heat during the past year because their heating system was broken, they were unable to pay for a fuel delivery, or their gas or electric service was discontinued due to nonpayment.

Table IV-14B
Unable to Use Main Source of Heat during the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Heating System Broken	19%	23%	23%	21%
Unable to Pay for Fuel Delivery	5%	10%	8%	6%
Gas or Electric Service Discontinued	4%	6%	12%	8%
Any of the Three Reasons	24%	32%	38%	27%

Table IV-14C displays the percent of respondents who were unable to use their main source of heat during the past year by poverty group. The table shows that households with income below 50 percent of the poverty level were most likely to face this problem. Thirty-six percent of households with income below 50 percent of the poverty level were unable to use their main source of heat at some point during the past year.

Table IV-14C
Unable to Use Main Source of Heat during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Heating System Broken	26%	21%	16%	22%
Unable to Pay for Fuel Delivery	6%	7%	8%	16%
Gas or Electric Service Discontinued	13%	5%	8%	0%
Any of the Three Reasons	36%	29%	27%	30%

Table IV-15A displays the percent of respondents who were unable to use their air conditioner during the past year because it was broken or they had their electric service discontinued for nonpayment. The table shows that 25 percent could not use their air conditioner because it was broken and six percent could not use it because their electric service was discontinued. Twenty-seven percent could not use their air conditioner for at least one of those two reasons.

Table IV-15A
Unable to Use Air Conditioner during the Past Year

	Percent of Respondents
Air Conditioner Broken	25%
Electric Service Discontinued	6%
Either Reason	27%

Table IV-15B displays the percent of respondents who were unable to use their air conditioner in the past year by vulnerable group. The table shows that households with children and disabled members were most likely to face this problem.

Table IV-15B
Unable to Use Air Conditioner during the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Air Conditioner Broken	18%	29%	34%	19%
Electric Service Discontinued	3%	6%	10%	6%
Either Reason	19%	30%	38%	21%

Table IV-15C displays the percent of households that were unable to use their air conditioner during the past year by poverty group. The table shows that households below 50 of the poverty level were most likely to face this problem. Thirty-nine percent of households with income below 50 percent of poverty were unable to use their air conditioner at some point during the past year.

Table IV-15C
Unable to Use Air Conditioner during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Air Conditioner Broken	34%	24%	20%	26%
Electric Service Discontinued	13%	5%	3%	0%
Either Reason	39%	26%	22%	26%

Table IV-16A displays the percent of respondents who had to use candles or lanterns due to lack of lights. The table shows that 48 percent of respondents who had utilities shutoff in past 12 months had to go without lights at some point in the past year and seven percent of all respondents had this problem.

Table IV-16A
Had to Use Candles or Lanterns Due to Lack of Lights
During the Past Year

	Percent of Respondents With Utility Shutoff	Percent of All Respondents
Number of Respondents	83	624
Had to Use Candles or Lanterns Due to Lack of Lights	48%	7%

Table IV-18B displays the percent of respondents who had to go without lights during the past year by vulnerable group. Eleven percent of all recipients with children had to use candles or lanterns during the past year due to a lack of lights.

Table IV-16B
Had to Use Candles or Lanterns Due to Lack of Lights during the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	24	44	50	8
Had to Use Candles or Lanterns Due to Lack of Lights: Percent of those with Utility Shutoff	43%	56%	44%	43%
Percent of All Respondents	3%	8%	11%	7%

Table IV-16C displays the percent of households who had to go without lights during the past year by poverty group. Thirteen percent of all recipients with income below 50 percent of the poverty level had to use candles or lanterns during the past year due to a lack of lights.

Table IV-16C
Had to Use Candles or Lanterns Due to Lack of Lights during the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	26	34	30	3
Had to Use Candles or Lanterns Due to Lack of Lights: Percent of those with Utility Shutoff	49%	50%	46%	30%
Percent of All Respondents	13%	6%	5%	2%

Table IV-17A displays the percent of respondents who had their utility service shut off at the time of the survey. The table shows that three percent of respondents had their electricity or gas shut off at the time of the survey.

Table IV-17A
Utility Service Shut Off at Time of Survey

	Percent of Respondents
Electricity	1%
Gas	2%
Electricity or Gas	3%

Table IV-17B shows that four percent of households with children had their electricity or gas service shut off at the time of the survey.

Table IV-17B
Utility Service Shut Off at Time of Survey
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Electricity	<1%	1%	2%	0%
Gas	1%	2%	2%	3%
Electricity or Gas	1%	3%	4%	3%

Table IV-17C shows that households below 50 percent of the poverty level were more likely to have their utility service shut off at the time of the survey. Four percent of those below 50 percent of the poverty level had their electric and/or gas shut off at the time of the survey.

Table IV-17C
Utility Service Shut Off at Time of Survey
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Electricity	2%	2%	0%	0%
Gas	3%	2%	1%	0%
Electricity or Gas	4%	3%	1%	0%

Table IV-18 compares the responses about service disruptions across the surveys. The table shows that there was an increase in shutoffs and in the inability to use the heating and cooling systems because they were broken.

Table IV-18
Inability to Pay Energy Bills during Past Year
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Skipped Paying or Paid Less than Entire Home Energy Bill	52%	47%	50%	49%	49%
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel	38%	37%	36%	37%	34%
Electricity Shut off Due to Nonpayment	8%	9%	9%	9%	13%
Gas Shut off Due to Nonpayment	--	6%	7%	6%	7%
Electricity or Gas Shut off Due to Nonpayment	--	12%	12%	11%	15%
Heating System Broken and Unable to Pay for Repair or Replacement	10%	13%	13%	13%	20%
Unable to Use Main Heat Because Unable to Pay for a Fuel Delivery	10%	13%	11%	10%	8%
Unable to Use Main Source of Heat Because Utility Company Discontinued Gas or Electric Service Due to Nonpayment	11%	13%	11%	7%	7%
Unable to Use AC Because Broken and Unable to Pay Repair/Replace	12%	12%	12%	14%	25%
Unable to Use Air Conditioner Because Utility Company Discontinued Electric Service Due to Nonpayment	6%	7%	8%	5%	6%
Had to Use Candles or Lanterns Due to Lack of Lights	8%	7%	8%	5%	7%

E. Housing Problems

This section examines housing problems that respondents have faced due to unaffordable energy bills.

Table IV-19A shows that 17 percent moved in with friends or family and six percent moved into a shelter or were homeless in the past five years.

Table IV-19A
Housing Problems Due to Energy Bills in the Past Five Years

	Percent of Respondents
Moved in With Friends or Family	17%
Moved into Shelter or Was Homeless	6%

Table IV-19B displays the results by vulnerable group. The table shows that households with children and non-vulnerable households were most likely to face these problems.

Table IV-19B
Housing Problems Due to Energy Bills in the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Moved in With Friends or Family	13%	17%	24%	21%
Moved into Shelter or Was Homeless	3%	6%	8%	9%

Table IV-19C displays the results by poverty group. The table shows that the lowest poverty group was most likely to face these housing problems. Twenty-seven percent of households below 50 percent of the poverty level had to move in with friends or family at some point in the past five years and nine percent moved into a shelter or were homeless.

Table IV-19C
Housing Problems Due to Energy Bills in the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Moved in With Friends or Family	27%	18%	14%	8%
Moved into Shelter or Was Homeless	9%	4%	7%	3%

Table IV-19D displays the percent of respondents with housing problems by whether or not they own their home. The table shows that respondents who do not own their homes were more likely to face these problems.

Table IV-19D
Housing Problems Due to Energy Bills in the Past Five Years
By Home Ownership

	Own Home	Does Not Own Home
Number of Respondents	279	345
Moved in With Friends or Family	12%	22%
Moved into Shelter or Was Homeless	<1%	10%

Table IV-20 compares results with respect to housing problems from the surveys. The table shows that the prevalence of these issues have increased from the previous surveys.

Table IV-20
Housing Problems during Past Five Years
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Moved in with Friends or Family	9%	11%	12%	14%	17%
Moved into Shelter or Was Homeless	4%	3%	3%	4%	6%

Table IV-21A shows that one percent had a mortgage foreclosure in the past year.

Table IV-21A
Mortgage Foreclosure Due to Energy Bills in the Past Year

	Percent of Respondents
Had Mortgage Foreclosure	1%

Table IV-21B shows that three percent of households with children had a mortgage foreclosure in the past year.

Table IV-21B
Housing Problems Due to Energy Bills in the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Had Mortgage Foreclosure	1%	1%	3%	0%

Table IV-21C shows that percent of households that had a mortgage foreclosure in the past year by poverty level.

Table IV-21C
Housing Problems Due to Energy Bills in the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Had Mortgage Foreclosure	2%	1%	1%	2%

F. Financial Problems

This section examines one particular financial problem that respondents may have faced in the past year due to their energy bills. Table IV-22A shows that 13 percent reported that they took out a payday loan in the past year.

Table IV-22A
Financial Problems Due to Energy Bills
In the Past Year

	Percent of Respondents
Payday Loan	13%

Table IV-22B displays the percent of respondents who took out a payday loan in the past year due to unaffordable energy bills by vulnerable group. The table shows that 20 percent of households with children reported that they obtained a payday loan.

Table IV-22B
Financial Problems Due to Energy Bills
In the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Payday Loan	10%	13%	20%	12%

Table IV-22C displays the percent of respondents who took out a payday loan due to unaffordable energy bills by poverty level. The table shows that those below 150 percent of the poverty level were more likely to do so.

Table IV-22C
Financial Problems Due to Energy Bills
In the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Payday Loan	14%	15%	12%	2%

G. Food and Medical Insecurity

This section examines food and medical insecurity that respondents faced in the past year due to unaffordable energy bills.

Table IV-23A shows that 36 percent went without food for at least one day and 41 percent went without medical or dental care.

Table IV-23A
Food and Medical Insecurity Due to Energy Bills
In the Past Year

	Percent of Respondents
Went Without Food for at Least One Day	36%
Went Without Medical or Dental Care	41%

Table IV-23B examines food and medical insecurity by vulnerable group. The table shows that households with a disabled member, with children, and without vulnerable members were more likely than those with seniors to face these problems.

Table IV-23B
Food and Medical Insecurity Due to Energy Bills
In the Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Went Without Food for at Least One Day	30%	41%	40%	45%
Went Without Medical or Dental Care	39%	43%	46%	47%

Table IV-23C displays responses to questions about food and medical insecurity by poverty group. The table shows that households below 50 percent of the poverty level were most likely to go without food for one day.

Table IV-23C
Food and Medical Insecurity Due to Energy Bills
In the Past Year
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Went Without Food for at Least One Day	47%	36%	36%	12%
Went Without Medical or Dental Care	44%	39%	45%	35%

Table IV-24A compares the percent of respondents who had food and medical insecurity in the surveys. The table shows that there were higher reports of these problems since the 2011 survey.

Table IV-24A
Food and Medical Insecurity during the Past Year
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Went Without Food for At Least One Day	22%	32%	30%	24%	36%
Went Without Medical or Dental Care	38%	42%	41%	37%	41%

Table IV-24B compares the percent of respondents with seniors in the household who had food and medical insecurity. The table shows that these problems were higher for seniors in 2018 than in 2011 and 2009.

Table IV-24B
Food and Medical Insecurity during the Past Year
Comparison of Survey Results
Households with Seniors

	2003	2008	2009	2011	2018
Number of Respondents	888	542	757	705	294
Went Without Food for At Least One Day	11%	24%	20%	22%	30%
Went Without Medical or Dental Care	29%	32%	29%	36%	39%

Table IV-25A examines medical insecurity in the past five years. The table shows that 44 percent reported that they went without medical or dental care and 31 percent did not fill a prescription or took less than the full dose.

Table IV-25A
Medical Insecurity Due to Energy Bills
In the Past Five Years

	Percent of Respondents
Went Without Medical or Dental Care	44%
Didn't Fill Prescription or Took Less Than Full Dose	31%

Table IV-25B examines medical insecurity in the past five years by vulnerable group. The table shows that households with children and without vulnerable members were most likely to face these problems.

Table IV-25B
Medical Insecurity Due to Energy Bills
In the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Went Without Medical or Dental Care	38%	47%	50%	51%
Didn't Fill Prescription or Took Less Than Full Dose	24%	35%	39%	38%

Table IV-25C displays responses to questions about medical and health problems in the past five years by poverty group.

Table IV-25C
Medical Insecurity Due to Energy Bills
In the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Went Without Medical or Dental Care	48%	39%	50%	38%
Didn't Fill Prescription or Took Less Than Full Dose	36%	28%	33%	28%

Table IV-26 compares the percent of respondents who had medical and health problems in the past five years. The table shows an increase in the percent that went without medical or dental care.

Table IV-26
Medical Insecurity during the Past Five Years
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Went Without Medical or Dental Care	38%	42%	41%	37%	44%
Did Not Fill Prescription or Took Less Than Full Dose	30%	38%	33%	34%	31%

V. The Need for LIHEAP

This section examines the history of LIHEAP receipt, utility bill payment problems and payment arrangements, and the importance of LIHEAP in helping recipients meet their needs.

A. History of LIHEAP Receipt

Respondents were asked whether they had received LIHEAP benefits in the year prior to the survey. Since the survey sample was drawn from state LIHEAP databases, all respondents received LIHEAP in the past year. However, because LIHEAP is often paid directly on the household's utility bill, respondents are often not aware that they received these benefits. Table V-1A shows that 92 percent of the respondents reported that they had received LIHEAP in the past year.

Table V-1A
Received LIHEAP during Past Year¹⁰

	Percent of Respondents
Yes	92%
No	6%
Don't Know	2%

Table V-1B displays the percent of respondents who reported that they received LIHEAP during the past year by vulnerable group. Households with no vulnerable members were more likely than some of the other groups to report that they received LIHEAP, perhaps because they are less likely to have received these benefits automatically through participation in another program.

Table V-1B
Received LIHEAP during Past Year
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
Yes	90%	93%	91%	96%
No	7%	6%	8%	2%
Don't Know / Refused	2%	1%	2%	2%

¹⁰ Interviewers used the name for the LIHEAP program particular to the state of the recipient interviewed. If the respondent was initially confused or did not recall the program based on the state-designated name, interviewers were trained to assist their memory by describing energy assistance benefits, and using the term energy assistance throughout the survey instead of the state-designated LIHEAP name.

Table V-1C displays the percent of respondents who reported that they received LIHEAP in the past year by poverty level. The table shows that those above 150 percent of the poverty level were less likely to report that they received LIHEAP.

Table V-1C
Received LIHEAP during Past Year
By Poverty Level

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
Yes	95%	92%	93%	84%
No	4%	6%	6%	14%
Don't Know / Refused	2%	3%	1%	1%

Respondents were asked to report the number of times in the past five years that they received LIHEAP. Table V-2A shows that about one fifth said they only received benefits in one of the past five years, and about one quarter said that they received benefits in each of the past five years.

Table V-2A
Number of Years Received LIHEAP in the Past Five Years

Number of Years Received LIHEAP	Percent of Respondents
1	21%
2	21%
3	15%
4	7%
5	26%
None	4%
Don't Know / Refused	7%

Table V-2B displays the number of years that respondents reported LIHEAP receipt by vulnerable group. The table shows that households without vulnerable members were most likely to report that they only received benefits in one of the past five years and were least likely to report that they received LIHEAP in each of the past five years. These households appeared to be more likely to be facing temporary financial problems. Households with seniors and disabled members were most likely to report that they received LIHEAP in each of the past five years.

Table V-2B
Number of Years Received LIHEAP in the Past Five Years
By Vulnerable Group

	Senior	Disabled	Child Under 18	Non-Vulnerable
Number of Respondents	294	347	212	48
1	15%	20%	26%	30%
2	16%	18%	26%	29%
3	16%	15%	14%	18%
4	7%	8%	8%	1%
5	32%	31%	19%	17%
None	5%	3%	4%	2%
Don't Know / Refused	10%	6%	3%	3%

Table V-2C displays the number of years respondents reported they received LIHEAP by poverty group. The table shows that households with income above 150 percent of poverty were most likely to report that they received LIHEAP in only one of the past five years.

Table V-2C
Number of Years Received LIHEAP in the Past Five Years
By Poverty Group

	Poverty Level			
	0-50%	51-100%	101-150%	>150%
Number of Respondents	104	274	186	60
1	25%	18%	20%	30%
2	27%	17%	22%	22%
3	21%	14%	13%	9%
4	6%	6%	8%	5%
5	15%	34%	23%	20%
None	2%	3%	4%	7%
Don't Know / Refused	3%	7%	9%	7%

Table V-3 compares recall of LIHEAP benefits across the surveys. The table shows that a greater percentage of recipients were aware of the benefit in 2011 and 2018 than in previous years. This may relate to the timing of the survey, as it was conducted in Spring 2011 and Summer 2018, following the LIHEAP season, as opposed to prior to the season starting in previous years.

Table V-3
LIHEAP Receipt
Comparison of Survey Results

	2003	2008	2009	2011	2018
Number of Respondents	2,161	1,256	1,828	1,768	624
Recalled Receipt of LIHEAP	84%	86%	86%	93%	92%
Percent That Reported They Received LIHEAP in Each of the Past Five Years	21%	26%	25%	20%	26%

B. Utility Payment Arrangements

This section examines respondents' need for utility payment arrangements and resources available to assist with preventing service terminations. Table V-4 shows that 51 percent of respondents reported that they tried to work out a payment arrangement in the past year, and 81 percent of those who tried to work out a payment arrangement were able to do so. This is similar to the findings from the 2011 and 2009 surveys.

Table V-4
Payment Arrangement with Gas or Electric Company
In the Past Year

	2009 Survey		2011 Survey		2018 Survey	
	Tried to Work Out Payment Arrangement	Was Able to Work Out Payment Arrangement	Was Able to Work Out Payment Arrangement	Tried to Work Out Payment Arrangement	Tried to Work Out Payment Arrangement	Was Able to Work Out Payment Arrangement
Number of Respondents	1,828	976	1,768	966	624	313
Yes	51%	86%	52%	84%	51%	81%
No	48%	14%	47%	14%	48%	18%
Don't Know	1%	1%	1%	2%	1%	<1%

C. Problems that Would Have Been Faced in the Absence of LIHEAP

Respondents who said that they did not face some problems with their energy bills were asked whether they felt they would have faced such problems if LIHEAP assistance had not been available. Table V-5 shows that 54 percent said they would have had to keep their home at an unsafe or unhealthy temperature if LIHEAP assistance had not been available, and 59 percent said they would have had their electricity or home heating fuel discontinued if LIHEAP assistance had not been available.

Table V-5
If LIHEAP Had Not Been Available, Problems that May Have Been Faced

	Kept Home at Unsafe or Unhealthy Temperature	Had Electricity or Home Heating Fuel Discontinued
Number of Respondents	423	294
Yes	54%	59%
No	35%	36%
Don't Know / Refused	11%	5%

Table V-6 compares responses about problems that would have been faced in the absence of LIHEAP between the surveys. The table shows that respondents were somewhat less likely than in 2011 to report that they would have faced these problems in the absence of LIHEAP.

Table V-6
If LIHEAP Had Not Been Available, Problems that May Have Been Faced
Comparison of Survey Results

	2003	2008	2009	2011	2018
Kept Home at Unsafe or Unhealthy Temperature	54%	63%	64%	65%	54%
Had Electricity or Home Heating Fuel Discontinued	48%	59%	53%	63%	59%

D. LIHEAP Restored Heat

Respondents were asked whether LIHEAP helped to restore heat due to shutoff or broken equipment. The table shows that ten percent said that LIHEAP restored heat due to a shutoff and nine percent said that LIHEAP restored heat due to broken equipment.

Table V-7
LIHEAP Helped to Restore Heat Due to Shutoff or Broken Equipment

	Restored Heat Due to Shutoff			Restored Heat Due to Broken Equipment		
	2009	2011	2018	2009	2011	2018
Yes	12%	12%	10%	7%	7%	9%
No	6%	3%	10%	5%	5%	5%
Don't Know	<1%	<1%	<1%	<1%	1%	<1%
Did Not Experience Loss of Heat/or Did Not Receive LIHEAP	81%	84%	80%	87%	87%	86%

VI. Regional Analysis

This section provides a regional analysis of some of the information that was presented in this report.

A. *Demographic Characteristics*

Table VI-1 displays the percent of respondents with children and the percent in single family households. The table shows that households in the Midwest are most likely to include children, but households in the South are most likely to be single parent households.

Table VI-1
Presence of Children Under 18 and Single-Parent Households
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Percent with Children	34%	39%	36%	32%
Single Parent Household	11%	21%	24%	7%

Table VI-2 displays the poverty level of LIHEAP recipients by region. Households in the Midwest and South are most likely to have income below 50 percent of the poverty level.

Table VI-2
Poverty Level
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
0%-50%	14%	26%	22%	12%
51%-100%	36%	43%	48%	36%
101%-150%	35%	27%	26%	34%
>150%	15%	3%	5%	18%

Table VI-3 shows that recipients in the Northeast are most likely to have employment income, recipients in the West are most likely to have retirement income, recipients in the West are least likely to receive public assistance, and recipients in the Midwest and South are most likely to receive Medicaid or Disability.

Table VI-3
Types of Income and Benefits Received
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Wages or Self-Employment Income	34%	28%	21%	22%
Retirement Income	24%	40%	41%	47%
Public Assistance	67%	69%	65%	49%
Medicaid or Disability Insurance	55%	67%	69%	50%

Table VI-4 displays the percent of respondents who were unemployed during the year. The table shows that LIHEAP recipients in the Northeast and in the South were most likely to be unemployed.

Table VI-4
Unemployed during the Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Yes	29%	24%	29%	20%
No	71%	76%	71%	80%
Don't Know / Refused	0%	0%	0%	0%

B. Energy Burden and Energy Bill Payment Problems

Table VI-5 displays mean pre- and post-LIHEAP energy burden by region. The table shows that recipients in the Midwest have the highest energy burdens on average. California was the only state included in the West region and did not provide data on LIHEAP benefit amount.

Table VI-5
Mean Energy Burden
By Region

	Northeast	Midwest	South	West
Number of Respondents	148	169	159	66
Pre-LIHEAP	16%	27%	25%	14%
Post-LIHEAP	12%	24%	21%	--

Table VI-6 shows that the percentage of respondents who reported that they used their kitchen oven or stove to provide heat in the past year ranged from 21 percent in the Midwest to 39 percent in the South.

Table VI-6
Used Kitchen Stove or Oven to Provide Heat
Due to Not Having Enough Money for the Energy Bill during Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Almost Every Month	<1%	0%	3%	1%
Some Months	10%	10%	13%	9%
1 or 2 Months	21%	11%	23%	13%
Never / No	67%	79%	61%	76%
Don't Know / Refused	1%	0%	0%	0%

Table VI-7 shows the percent who reported that they skipped paying or paid less than their entire home energy bill during the past year by region.

Table VI-7
Skipped Paying or Paid Less than Entire Home Energy Bill
Due to Not Having Enough Money for the Energy Bill during Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Almost Every Month	10%	10%	13%	11%
Some Months	21%	24%	18%	21%
1 or 2 Months	16%	18%	15%	20%
Never / No	50%	47%	52%	46%
Don't Know / Refused	3%	1%	2%	3%

Table VI-8 shows that 24 to 39 percent of respondents reported that they received a notice or threat to disconnect their electricity or home heating fuel in the past year.

Table VI-8
Received Notice or Threat to Disconnect or Discontinue Electricity or Home Heating Fuel
Due to Not Having Enough Money for the Energy Bill during Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Almost Every Month	<1%	6%	8%	2%
Some Months	11%	14%	14%	11%
1 or 2 Months	24%	14%	17%	11%
Never / No	63%	65%	58%	76%
Don't Know / Refused	1%	2%	3%	0%

Table VI-9 displays the percent of respondents who had their electricity and gas utility service terminated during the past year. Service termination ranged from nine percent in the West and Midwest to 26 percent in the South.

Table VI-9
Utility Service Terminations
During Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Electricity	12%	8%	22%	6%
Gas	7%	5%	13%	4%
Electricity or Gas	15%	9%	26%	9%

C. Housing, Health, Food, and Medical Problems

Table VI-10 displays the percent of respondents who reported that they went without food for at least one day in the past five years. The table shows that respondents in the Midwest and South were most likely to report this problem.

Table VI-10
Went Without Food for at Least One Day Due to Energy Bills
In the Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Yes	32%	40%	41%	28%
No	68%	58%	59%	72%
Don't Know /Refused	<1%	1%	<1%	1%

Table VI-11 shows that respondents in the Midwest and in the South were most likely to report that they went without medical or dental care due to their energy bills in the past year.

Table VI-11
Went Without Medical or Dental Care Due to Energy Bills
In the Past Year
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Yes	35%	50%	45%	29%
No	65%	50%	54%	71%
Don't Know /Refused	0%	0%	1%	0%

Table VI-12 shows that respondents in the Midwest and South were most likely to report that they did not fill their prescription or took less than the full dose of a prescribed medication due to their energy bills in the past five years.

Table VI-12
Didn't Fill Prescription or Took Less Than the Full Dose of
Prescribed Medicine Due to Energy Bills
In the Past Five Years
By Region

	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
Yes	27%	35%	36%	23%
No	72%	64%	63%	76%
Don't Know /Refused	1%	1%	1%	1%

D. LIHEAP Receipt

Table VI-13 displays the number of years that respondents reported LIHEAP receipt out of the past five years. The table shows that respondents in the West were most likely to report that they received LIHEAP in only one of the past five years and respondents in the Northeast and Midwest were most likely to report that they received LIHEAP in each of the past five years.

**Table VI-13
Number of Years Received LIHEAP
In the Past Five Years
By Region**

	2018 Survey			
	Northeast	Midwest	South	West
Number of Respondents	170	189	182	83
1	20%	18%	23%	28%
2	24%	19%	20%	20%
3	12%	15%	22%	8%
4	8%	8%	7%	1%
5	28%	35%	16%	21%
None	1%	1%	5%	11%
Don't Know / Refused	7%	5%	7%	11%

VII. Conclusion

The 2018 NEADA study confirmed that LIHEAP recipient households are likely to be vulnerable to temperature extremes. They are likely to have seniors, disabled members, or children in the home. Over 92 percent of LIHEAP recipients had at least one of these vulnerable household members. The study also showed that these households face many challenges in addition to their energy bills, including unemployment, unhealthy home conditions, and medical issues.

Energy Costs

LIHEAP recipients reported that they faced high energy costs. Thirty-nine percent of the respondents reported energy costs over \$2,000 in the past year.

Responses to High Energy Costs

Households reported that they took several actions to make ends meet, including closing off part of the home. Some of the actions were unsafe and could lead to injury or illness, such as keeping the home at a temperature that was unsafe or unhealthy or using the kitchen stove or oven to provide heat.

Inability to Pay Energy Bills

Despite the assistance that they received, many LIHEAP recipients were unable to pay their energy bills. Almost half of the respondents reported that they had skipped paying or paid less than their entire home energy bill in the past year and more than one third said that they received a notice or threat to disconnect or discontinue their electricity or home heating fuel.

Households went without utility service and sacrificed heating and cooling their home. Fifteen percent had their electric or natural gas service shut off in the past year due to nonpayment. Thirty percent reported that they were unable to use their main source of heat in the past year because their fuel was shut off, they could not pay for fuel delivery, or their heating system was broken and they could not afford to fix it. More than one quarter reported that they were unable to use their air conditioner in the past year because their electricity was shut off or their air conditioner was broken and they could not afford to fix it.

Housing and Financial Problems

Many LIHEAP recipients had problems paying for housing in the past five years, due at least partly to their energy bills. Seventeen percent moved in with friends and family and 13 percent obtained a payday loan.

Medical and Health Problems

Many of the LIHEAP recipients faced significant medical and health problems in the past five years, partly as a result of high energy costs. Thirty-six percent reported that they went without food, 41 percent sacrificed medical/dental care, and 31 percent did not fill a prescription or took less than a full dose.

The Need for LIHEAP

Households reported enormous challenges despite the fact that they received LIHEAP. However, they reported that LIHEAP was extremely important. Many reported that they would have kept their home at unsafe or unhealthy temperatures and/or had their electricity or home heating fuel discontinued if it had not been for LIHEAP.

It is clear that many of these households will continue to need LIHEAP to meet their energy and other essential needs.

Appendix A: Survey Instrument

NEADA 2018 National Energy Assistance SURVEY FINAL INSTRUMENT

Screener

Hello. This is (INTERVIEWER) from APPRISE calling for (NAME) regarding the National Energy Assistance study.

{Interviewer Note: The goal is to conduct the survey with either (NAME) or that person's spouse/partner. If (NAME) is not home / unavailable, politely ask, "May I speak with the spouse or partner of (NAME)".}

You should have received a letter in the mail from the National Energy Assistance Directors' Association about this survey. I'm calling to ask you a few brief questions about your energy bills. In the survey, we will also talk about **(state specific LIHEAP name)**. By **(state specific LIHEAP name)**, we mean the home energy assistance benefits that your household received through your Community-Based Organization. Your responses will help us better understand the need for **(state specific LIHEAP name)** energy assistance, and the problems caused by high energy bills. All your responses will be kept confidential and will not affect your energy assistance benefits.

S1. {Interviewer: DO NOT READ, Whom are you speaking to?}

- 01 NAME
- 02 Spouse/Partner
- 03 Caretaker/Guardian
- 04 Other/Don't Know

[ASK if S1=04]

S2. When can I call back to speak with (NAME) or the spouse or partner of (NAME)? _____ WRITE DATE AND TIME FOR CALLBACK

{Interviewer: DO NOT READ, Enter your name}

A. Experience with Energy Assistance

A1. Did you receive (STATE SPECIFIC LIHEAP NAME) in the past 12 months?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

A2. In how many of the past 5 years have you received (STATE SPECIFIC LIHEAP NAME)?

- 01 ONE YEAR
- 02 TWO YEARS
- 03 THREE YEARS
- 04 FOUR YEARS
- 05 FIVE YEARS
- 06 NONE
- 07 DON'T KNOW
- 08 REFUSED

Appendix A: Survey Instrument

B. Actions taken to meet energy expenses

Energy bills can take up a large part of a family's budget, and households often find it necessary to make choices about what bills they will pay or what needs they will meet. In this section of the survey, we ask some questions about actions that your household may have taken when it was difficult to meet all of your expenses.

In the past year, have you or any member of your family taken any of the following actions or experienced any of the following due to your energy bills:

<u>Past Year</u>	01	02	07	08
B1. Had a foreclosure on your mortgage?	YES	NO	DON'T KNOW	REFUSED
B2. Got a payday loan to cover your expenses?	YES	NO	DON'T KNOW	REFUSED
B3. Went without food for at least one day?	YES	NO	DON'T KNOW	REFUSED
B4. Went without medical or dental care?	YES	NO	DON'T KNOW	REFUSED

In the past 5 years, have you or any member of your family taken any of the following actions or experienced any of the following due to your energy bills:

<u>Housing Problems</u>	01	02	07	08
B5. Moved in with friends or family?	YES	NO	DON'T KNOW	REFUSED
B6. Moved into a shelter or been homeless?	YES	NO	DON'T KNOW	REFUSED

<u>Other Expenses</u>	01	02	07	08
B7. Went without medical or dental care?	YES	NO	DON'T KNOW	REFUSED
B8. Didn't fill a prescription or took less than the full dose of a prescribed medicine?	YES	NO	DON'T KNOW	REFUSED

<u>Utility Payment</u>	01	02	07	08
B9. In the past year, have you tried to work out a payment arrangement with your gas or electric utility company?	YES	NO	DON'T KNOW	REFUSED
B10. (Ask if B9=1, YES) Were you able to work out a payment arrangement?	YES	NO	DON'T KNOW	REFUSED

Appendix A: Survey Instrument

C. Energy Insecurity Scale

In the past 12 months, did you almost every month, some months, only in 1 or 2 months, or never do the following because there wasn't enough money for your energy bill?
(INTERVIEWER NOTE: IF ASKED, ALMOST EVERY MONTH MEANS 10 OR MORE MONTHS, AND SOME MONTHS MEANS 3 TO 9 MONTHS.)

		01	02	03	04	07	08
C1.	Did you reduce your expenses for what you consider to be basic household necessities?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C2.	Did you skip paying your home energy bill or pay less than your whole home energy bill?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C3.	Did you have a supplier of your electric or home heating service threaten to disconnect your electricity or home heating fuel service, or discontinue making fuel deliveries?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C4.	Did you close off part of your home because you could not afford to heat or cool it?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C5.	Did you keep your home at a temperature that you felt was unsafe or unhealthy at any time of the year?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C6.	Did you use your kitchen stove or oven to provide heat?	ALMOST EVERY MONTH	SOME MONTHS	1 OR 2 MONTHS	NEVER/ NO	DON'T KNOW	REFUSED
C7.	In the past 12 months, was your electricity ever shut off because you were unable to pay your electric bill?		01 YES	02 NO	07 DON'T KNOW	08 REFUSED	
C8.	ASK C8 if C7=01, YES. Is your electricity service shut off now?		YES	NO	DON'T KNOW	REFUSED	
C9.	In the past 12 months, was your natural gas ever shut off because you were unable to pay your gas bill?		01 YES 02 NO 03 DOES NOT HAVE NATURAL GAS 07 DON'T KNOW 08 REFUSED				
C10.	ASK C10 if C9=01, YES. Is your gas service shut off now?		01 YES 02 NO 07 don't know 08 refused				

Appendix A: Survey Instrument

Was there ever a time during the past 12 months when you wanted to use your main source of heat, but could not for one or more of the following reasons?

	01	02	07	08
	YES	NO	DON'T KNOW	REFUSED
C11. Your heating system was broken and you were unable to pay for its repair or replacement?				
C12. You ran out of fuel oil, kerosene, LPG, propane, coal, or wood because you were unable to pay for a delivery?				
01 YES				
02 NO				
03 DOES NOT HAVE DELIVERED FUEL				
07 DON'T KNOW				
08 REFUSED				

C13. The utility company discontinued your gas or electric service because you were unable to pay your bill?	YES	NO	DON'T KNOW	REFUSED

(Ask C14 if C11=1, YES, OR C12=1, YES, OR C13=1, YES)

	01	02	07	08
	YES	NO	DON'T KNOW	REFUSED
C14. Did (STATE SPECIFIC LIHEAP NAME) help you to restore use of your main source of heat?				

Was there ever a time during the past 12 months when you wanted to use your air conditioner, but could not for one or more of the following reasons?

	01	02	07	08
	YES	NO	DON'T KNOW	REFUSED
C15. Your air conditioner was broken and you were unable to pay for its repair or replacement?				
C16. The utility company discontinued your electric service because you were unable to pay your bill?				

(ASK C17 IF C7=1, YES OR C13=1, YES OR C16=1, YES)

Was there ever a time during the past 12 months when you had to do the following because the utility company discontinued your electric service?

	01	02	07	08
	YES	NO	DON'T KNOW	REFUSED
C17. Did you have to use candles or lanterns because you didn't have lights?				

(READ IF A1=1 AND C5=4) OR (A1=1, YES AND C12=2, NO, AND C13=2, NO, AND C16=2, NO, AND C7=2, NO, AND C9=2, NO) ELSE SKIP TO NEXT SECTION

You stated that you did not face some of these problems that we asked about in the past year. In the next few questions we ask whether you think you may have had some of these problems if (STATE SPECIFIC LIHEAP NAME) assistance had not been available.

	01	02	07	08
	YES	NO	DON'T KNOW	REFUSED
C18. (ASK IF A1=1 AND C5=4) Would you have needed to keep your home at a temperature that you felt was unsafe or unhealthy at any time of the year if (STATE SPECIFIC LIHEAP NAME) assistance had not been available?				

Appendix A: Survey Instrument

C19.	ASK if (A1=1, YES AND C12=2, NO, AND C13=2, NO, AND C16=2, NO, AND C7=2, NO, AND C9=2, NO) Would you have had your electricity or home heating fuel shut off or discontinued during a time when you needed it to heat or cool your home if (STATE SPECIFIC LIHEAP NAME) assistance had not been available?	YES	NO	DON'T KNOW	REFUSED

D. Demographics

D1. Do you own or rent your home?

- 01 OWN
- 02 RENT
- 03 OTHER _____
- 07 DON'T KNOW
- 08 REFUSED

D2. Including yourself, how many people normally live in this household? (Interviewer instruction: if someone asks if a child who is away at college should be included, instruct them that the child should only be included if he/she is listed as a dependent on the household's tax form.) (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ OCCUPANTS

D3. How many are 60 or older? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ OCCUPANTS OVER AGE 60

INTERVIEWER NOTE: DO NOT ASK D4 AND RECORD 0 FOR D4 IF D2=D3

D4. How many are 18 or under? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ CHILDREN 18 OR UNDER

(ASK D5 IF D4 ≠ 0)

D5. How many are 5 or under? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ CHILDREN 5 OR UNDER

D6. How many are disabled? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ DISABLED OCCUPANTS

D7. How many are veterans? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ VETERAN OCCUPANTS

ASK D8 IF D7>0

D8. How many served overseas? (USE CODES 97 FOR 'DON'T KNOW' AND 98 FOR 'REFUSED')

_____ OCCUPANTS SERVED OVERSEAS

ASK D9 IF D8>0

D9. Where did they serve? (MARK ALL THAT APPLY)

- 01 IRAQ
- 02 AFGHANISTAN
- 03 OTHER _____
- 07 DON'T KNOW
- 08 REFUSED

ASK D10 IF D7>0

D10. Was the veteran disabled as a result of an injury suffered during service?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

D11. Which fuel is used most for heating your home? (DO NOT READ LIST EXCEPT TO PROMPT)

- 01 GAS; FROM UNDERGROUND PIPES SERVING THE NEIGHBORHOOD
- 02 GAS: BOTTLED, TANK OR LPG, OR PROPANE
- 03 ELECTRICITY
- 04 FUEL OIL, KEROSENE, ETC.
- 05 COAL OR COKE
- 06 WOOD
- 07 SOLAR ENERGY
- 08 OTHER FUEL
- 09 NO FUEL USED
- 97 DON'T KNOW
- 98 REFUSED

[ASK IF D1 ≠ 01]

D12. Is heat included in your rent?

- 01 YES
- 02 NO
- 03 DO NOT PAY RENT
- 07 DON'T KNOW
- 08 REFUSED

D13. In the past 12 months, what was the cost of electricity, gas, and other fuels (oil, coal, kerosene, wood, etc.) for your home? (IF NECESSARY: Please provide your best guess. IF RESPONDENT STILL STRUGGLES: give option to provide average monthly cost) (DO NOT READ LIST EXCEPT TO PROMPT.)

- 01 ≤\$500 (MONTHLY: ≤41.67)
- 02 \$501 - \$1,000 (MONTHLY: 41.68 – 83.33)
- 03 \$1,001 - \$1,500 (MONTHLY: 83.34 – 125.00)
- 04 \$1,501 - \$2,000 (MONTHLY: 125.01 – 166.67)
- 05 \$2001 OR MORE (MONTHLY: 166.68 OR MORE)
- 07 DON'T KNOW
- 08 REFUSED

D14. In the past 12 months, did any member of your household have any necessary medical equipment that uses electricity?

(OPTIONAL INTERVIEWER NOTE: I WOULD LIKE YOU TO THINK ABOUT ANY NECESSARY MEDICAL EQUIPMENT SUCH AS AN OXYGEN MACHINE, NEBULIZER, RESPIRATOR, DIALYSIS MACHINE, WHEELCHAIR OR OTHER MEDICAL DEVICE THAT NEEDS TO BE CHARGED, INSULIN OR OTHER MEDICATION THAT REQUIRES REFRIGERATION, ETC.)

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

D15. In the past 12 months, did you or any member of your household receive employment income from wages and salaries or self-employment income from a business or farm?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

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D16. In the past 12 months, was any member of your household unemployed and looking for work?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

D17. In the past 12 months, did you or any member of your household receive retirement income from Social Security or pensions and other retirement funds?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

D18. In the past 12 months, did you or any member of your household receive benefits from Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), Food Stamps, or general assistance or public assistance?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

D19. In the past 12 months, did you or any member of your household receive Medicaid or disability assistance?

- 01 YES
- 02 NO
- 07 DON'T KNOW
- 08 REFUSED

Appendix A: Survey Instrument

D20. What is your household's annual income? (give option to provide monthly income) (DO NOT READ LIST EXCEPT TO PROMPT.)

- 01 ≤\$5,000 (MONTHLY: ≤416.67)
- 02 \$5,001 - \$10,000 (MONTHLY: 416.68 – 833.33)
- 03 \$10,001 - \$15,000 (MONTHLY: 833.34 - 1,250.00)
- 04 \$15,001 - \$20,000 (MONTHLY: 1,250.01 – 1,666.67)
- 05 \$20,001 - \$25,000 (MONTHLY: 1,666.68 – 2,083.33)
- 06 \$25,001 - \$30,000 (MONTHLY: 2,083.34 – 2,500.00)
- 07 \$30,001 - \$35,000 (MONTHLY: 2,500.01 – 2,916.67)
- 08 \$35,001 - \$40,000 (MONTHLY: 2,916.68 – 3,333.33)
- 09 >\$40,000 (MONTHLY: >3,333.33)
- 97 DON'T KNOW
- 98 REFUSED

{Interviewer: DO NOT READ, Was this interview conducted in Spanish?}

- 01 YES
- 02 NO

That was my last question. Thank you very much for your time and cooperation. Have a pleasant day/evening.

Costs Associated With First-Time Homelessness for Families and Individuals



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Costs Associated With First-Time Homelessness for Families and Individuals

Prepared for:

U.S. Department of Housing and Urban Development
Office of Policy Development and Research
Office of Special Needs Assistance Programs

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Preface

This study examines costs associated with the use of homeless and mainstream service delivery systems by families and individuals experiencing homelessness for the first time in six study communities. Assigning costs to public programs is a first step toward developing measures of the value of public interventions compared to the public costs incurred by ignoring or avoiding the problems those interventions are intended to address. The study finds that the experience of homelessness is diverse and the associated costs vary tremendously depending on the pattern of homelessness and family or individual status. It is not, however, a study of either cost-effectiveness or quality of care, but rather a calculation of costs associated with homelessness.

Homeless Program Costs

The study examines average costs per month across sites for emergency shelter, transitional housing, and permanent supportive housing. It finds that:

- For individuals, overnight emergency shelter has the lowest cost per day (and provides the fewest services and often limited hours).
- For individuals, transitional housing proves more expensive than permanent supportive housing, since services for transitional housing were usually offered directly by the homeless system rather than by mainstream service providers.
- For families, emergency shelters are usually equally or more expensive than transitional housing and permanent supportive housing, because families are often given private rooms or apartments. Emergency shelters for families are also likely to be open 24-hours, provide supportive services, and have fewer units, yielding higher fixed costs.
- In almost all cases, the costs associated with providing housing for individuals and families who are homeless within a program exceeds the Fair Market Rent cost of providing rental assistance *without supportive services*.
- Homeless system and mainstream service costs were difficult to calculate, largely due to challenges in accessing local administrative data.

Costs Associated with First-Time Homelessness

Average homeless system costs for individuals (\$1,634 to \$2,308) are much lower than those for families (\$3,184 to \$20,031), who usually have higher daily costs and stay much longer. The 50 percent of individuals with the lowest homeless system costs incurred only 2 to 3 percent of the total system costs; whereas the 10 percent of individuals with the highest daily costs incurred up to 83 percent of total costs. The distribution of costs for families is also quite skewed, though less so than for individuals.

The emergency shelter system may be an “adequate” response to an immediate housing crisis for most individuals, but is an expensive solution to family homelessness. More than half of individuals studied used only emergency shelters, yet the costs of this facility type represent less than one-third of total costs for individuals.

Individuals and families who remain in homeless programs for extended periods incur the highest percentage of costs, presenting the greatest opportunity for homeless system cost savings. Cost savings may be realized if permanent supportive housing were more readily available to these households. Permanent supportive housing tends to be less expensive to the homeless system than transitional housing because most service costs are borne by mainstream systems.

Individuals and families who use homeless programs multiple times with long gaps between stays represent less than one-fifth of those studied. Although costs for this group are proportionately smaller than for those with extended uses of homeless programs, the episodic homelessness of these households indicates that resources currently may not be used effectively. These individuals and families tend to have high levels of interaction with the criminal justice system (though gaps were not explained exclusively by incarceration), and a majority of families with long gaps also experience changes in household composition between stays.

Demographics

Nearly three-quarters of first-time homeless individuals in the communities studied were male. Per-person costs for first-time homeless women are 97 percent higher than for men, due largely to greater privacy arrangements in female emergency shelters and a higher proportion of women in transitional or permanent supportive housing. Women also stay in homeless programs 74 percent longer than men (this is controlled for in the cost differential above). In all sites but one, African-Americans are over-represented among first-time homeless individuals in comparison to the general population of people in poverty.

The first time homeless family in the study most frequently has one adult member (usually female) and an average of 3 to 3.5 members. Homeless families headed by younger persons tend to use less expensive program types, stay for shorter periods, and, consequently, incur lower costs than those headed by older persons.

Patterns of First-Time Homelessness

The majority of households studied, 50 to 65 percent of individuals and 58 to 72 percent of families, stayed in a homeless program only one time during the 18-month period the study covered. Families cycled less in and out of homeless facilities, but remained in programs longer. Extended stays were associated with escalating costs; each additional month in a program is associated with 35 percent higher costs for individuals and 22 percent higher costs for families.

Mainstream System Costs

The question of whether mainstream service costs can be offset by appropriate housing interventions is left open by this study. However, consistent with past research, significant mainstream system cost savings may be achieved by targeting individuals or families with high levels of involvement in mainstream systems prior to homelessness. Most first-time homeless individuals in the study do not have high involvement in mainstream systems, and less than 10 percent received care in these systems during the period of homelessness. At two sites, criminal justice and mental health involvement increased substantially immediately before first-time individual homelessness. This finding suggests a need for discharge planning to ensure that individuals leave mainstream programs, such as inpatient treatment or jails, with adequate housing. In contrast, first-time homeless families had very high enrollment in Medicaid and low to moderate use of other mainstream systems.

Conclusions

The study concludes that communities should explore strategies to:

- Avoid extensive use of high-cost homeless programs (i.e., transitional housing) for individuals or families who primarily need permanent housing without supports or those whose service needs can be met by mainstream systems.
- Alter the way that homeless assistance systems respond to households that are unable to remain stably housed and face repeated instances of homelessness. Communities could consider models such as Homeless Prevention and Rapid Re-Housing.

- Work with mainstream systems (especially criminal justice, mental health, and substance abuse systems) to design appropriate discharge planning strategies and ways to identify clients at-risk of homelessness to prevent homelessness.

Acknowledgments

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We are especially grateful to the individuals who assisted us in the six study sites: Des Moines, Iowa; Houston, Texas; Jacksonville, Florida; Kalamazoo, Michigan; Upstate South Carolina; and Washington, DC. These individuals—leaders and members of the Continuum of Care (CoC); Homeless Management Information System administrators; program and administrative staff of homeless service providers; mainstream agency staff; and other local champions—contributed their time, data and ideas to make this study possible. In particular, we would like to highlight the contributions of Julie Eberbach, Eileen Mitchell, and David Eberbach, Des Moines, Iowa; Tuan Nguyen, Clarissa Stephens, Anthony Love, Cathy Crouch, Julia Thompson, Buddy Grantham, Brandon LeBlanc, Horace Robinson, Houston, Texas; Molly Petersen, Melissa Pociask, Thomas Shull, and David Anderson, Kalamazoo, Michigan and Barbara Ritter, Michigan Coalition for the Homeless; Wanda Lanier, Bob Arnold, Stephen Caravella and Diane Gilbert, Jacksonville, Florida and Dr. Annette Christy and Kristen Turner, University of South Florida; Michael Chessner and Kay Perry, Upstate South Carolina CoC and Diana Tester and Charles Bradberry, State of South Carolina; and Darlene Mathews, Sue Marshall, Steve Cleghorn and Laura Zeilenger, Washington, DC.

We also appreciate the guidance of the leading researchers who participated in a research design expert panel meeting: Martha Burt, Dennis Culhane, Joe Harkness, David Long, Lori Megdal, and Sandra Newman. Denise DiPasquale advised the study team on development of appropriate methods to calculate nightly unit costs associated with capital investments for homeless programs.

At Abt Associates, a number of staff members played important roles in designing the study and in collecting, assembling, analyzing, and interpreting the data and writing the report. The authors of this study are Brooke Spellman, Jill Khadduri, Brian Sokol, and Josh Leopold. Dr. Jill Khadduri was the Principal Investigator, and Brooke Spellman was the Project Director for the study; both were involved in all aspects of the study. Dr. Larry Buron, Project Quality Advisor, provided thoughtful and constructive input throughout all phases of the research. Brian Sokol led the HMIS and mainstream data analysis, with analytical support from Josh Leopold and Evan Volgas. Ken Lam conducted the multivariate cluster analysis of the study cohort and regression analysis of cost and cohort data. Megan Tiano and Nichole Fiore assisted with document review and cross-checking the data. Eileen Fahey and Katheleen Linton provided production support. Jill Khadduri, Josh Leopold, Pedram Mahdavi, Louise Rothschild, Matt White, and Erin Wilson were responsible for collecting the programmatic and cost data on the homeless systems for each of the sites and writing portions of the case studies, with support from subcontractors and consultants, Martha Burt, Kat Freeman, Ann Oliva and Daria Zvetina. Consultants Eric Jahn and Heidi Burbage played significant roles in researching and coordinating access to mainstream data.

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Executive Summary

This study measures costs associated with first-time homeless families and individuals incurred by homeless and mainstream service delivery systems in six study communities. Unaccompanied individuals were studied in Des Moines, Iowa; Houston, Texas; and Jacksonville, Florida. Families were studied in Houston, Texas; Kalamazoo, Michigan; Upstate South Carolina; and Washington, DC.

Past research has primarily documented costs associated with homelessness for individuals with chronic patterns of homelessness or severe mental illness. Newer work has been published on the costs incurred within the homeless system for families experiencing first-time homelessness. This study provides additional findings that help to improve our understanding of homelessness and its associated costs. It presents ideas about opportunities for cost savings, and it advances an approach for measuring costs that, coupled with other evaluation methods, can help communities understand the cost-effectiveness of different homelessness interventions.

The study demonstrates that the experience of homelessness is diverse and the associated costs vary tremendously depending on the pattern of homelessness. Across the six sites, the study identifies three primary patterns of first-time homelessness. Most first-time individuals and families experience homelessness only once or twice and use emergency shelter for a limited period of time at fairly low cost. Some experience much longer stays, usually in transitional housing, and some have very high associated costs. A third group uses the system sporadically, moving in and out of homeless programs multiple times during long periods. We recommend that communities consider specific responses to homelessness that target the needs of those who use the system in different ways.

We also identified certain demographic characteristics and limited patterns of first-time homelessness that were associated with greater mainstream system involvement, but the analysis did not identify clear opportunities for cost savings in the mainstream systems through the implementation of alternative responses to homelessness. However, the results also do not eliminate the possibility of mainstream system cost savings. Analysis of more comprehensive client-level data may yield more conclusive findings in this area.

The study does not attempt to isolate which of the mainstream costs are attributable to homelessness, and it does not compare the benefits of different programs with the costs of their use. Thus, the study is not a cost-effectiveness study and is most accurately characterized as a study to measure homeless and mainstream costs *associated* with homelessness.

The findings from these communities are not intended to be nationally representative. In fact, findings presented in this report show that the community in which individuals and families received services frequently had a strong effect on both their length of stay and costs. Thus, local factors and particular Continuum and program-level decisions can have a large effect on patterns of homelessness and associated homeless system costs. Despite these local differences, the study finds trends that cut across communities. We hope that policymakers will review these findings and consider whether similar conclusions can be drawn about their own communities. Policymakers can also use similar methods to help assess: how people who are homeless use homeless and mainstream systems in their communities; whether these patterns of use are appropriate; whether their homelessness systems are

efficient in achieving positive outcomes for people who become homeless; and whether there are opportunities for cost savings through alternative program models.

After a brief summary of the methodology used for the study, the remainder of the executive summary highlights the key results and policy implications of this research. All of these findings are discussed in detail in the main body of the report.

Methodology

This study breaks new ground methodologically in homelessness research in the following areas:

- rigorously calculating the costs of providing a family or individual with a day of shelter in specific residential programs for homeless people;
- incorporating distinctions among program types and their housing models (e.g., facility-based transitional housing) into our analysis of both patterns and costs of first-time homelessness; and
- analyzing both individuals and families, as well as vastly different types of communities or geographic areas, using the same research design, facilitating direct comparisons.

For purposes of this study, persons were considered homeless if they used a street outreach or residential homeless program that is represented in the site's homeless management information system (HMIS) data. People were considered first-time homeless if they did not have a recorded encounter with an outreach program or stay in a residential homeless program in the HMIS at any point prior to the study enrollment period. Periods in which persons were precariously housed, doubled up, or staying in a non-participating program are not represented as "during homelessness," with one exception. If study subjects had more than one stay in residential homeless programs during the study period, then the time between stays, referred to in the study as a "gap," is also considered "during homelessness." Homeless system costs are based on the actual days stayed in programs, but mainstream costs incurred during "gaps" are counted in the "during homeless" period.

Homeless systems are limited to programs within a community that are designed and dedicated to providing housing and services to people who are homeless. The homeless programs accounted for in this study are: outreach programs, emergency shelters, transitional housing, and permanent supportive housing. Programs that only provide supportive services to homeless people are not included.

Mainstream service systems are those that are not dedicated exclusively to serving people who are homeless, yet provide services that are needed and often used by them. Mainstream system cost data examined for this study include: Medicaid primary healthcare, mental healthcare and substance abuse treatment; state-funded mental healthcare and substance abuse treatment; law enforcement and criminal justice; and income supports.

Using telephone outreach and in-person site visits, we collected information about the homeless system within each community. From this information we developed a homeless program typology, which sometimes differed from local definitions of homeless program types, as a framework for the study. We also derived daily costs for a sample of homeless programs of each type. The homeless program costs account for operational and agency overhead costs associated with each program, in addition to services that are provided as part of the program. Capital costs of facilities owned by programs or donated to them also are included in daily costs per unit for programs in Jacksonville,

Des Moines, and Upstate South Carolina. To account for programs from which we did not collect costs directly, we calculated weighted averages for each type of homeless program within each site.

For each community, we analyzed Homeless Management Information System (HMIS) data to identify the individuals and families who accessed homeless programs for the first-time during the 12-month period between July 1, 2004 and June 30, 2005.¹ We also used HMIS data to examine homeless program use for each household in the 18 months (30 months in DC) following the day each household (or a member of the household) first accessed a homeless program. Using multivariate cluster analysis, we analyzed four aspects of each household's pattern of homeless system use to derive "path groups," that is groups of households with similar homeless system use, for each community. The variables used to define path groups are: total number of days each household stayed in homeless programs during the 18-month period in which we analyzed homelessness (across all program stays); number of distinct homeless program stays within the 18-month period; types and sequences of homeless programs used; and total number of days between all homeless program stays, also referred to as total number of "gap" days.

Combining homeless program usage and daily cost data, we calculated estimated homeless system costs for each individual or family household in the study. When possible, we also acquired and analyzed utilization data for mainstream systems in order to measure how mainstream systems interact with people who are homeless and to estimate the costs associated with the use of mainstream systems by first-time homeless people. Finally, we analyzed homeless and mainstream costs, using regression analysis to understand the demographic characteristics, homelessness patterns, and path groups associated with lower and higher costs.

Homeless Program Costs

Among homeless programs serving individuals, overnight emergency shelter for individuals has the lowest costs per day, typically offers the fewest services in the least private settings, and is often open only during evening hours. Transitional housing is the most expensive model for individuals and frequently offers private settings and a range of supportive services. Permanent supportive housing also generally offers private living space and supportive services. Permanent supportive housing providers indicate that residents are offered services equivalent in intensity to or even greater than services offered in transitional housing; however, the types of services provided may differ. In most cases, we found that permanent supportive housing programs arrange for residents to receive the "support" piece of the supportive housing directly from mainstream systems, and in fact many residents of the permanent supportive housing projects we examined are believed to be clients of mainstream programs prior to being placed in the housing.² Services paid directly by permanent supportive housing programs appear to be limited to housing-focused services and basic case management. As a result of this structure, permanent supportive housing programs do not have to secure resources to fund these services directly, and the costs are on average comparable to the less expensive 24-hour emergency shelter programs from the perspective of the homeless system.

¹ In Kalamazoo, we studied families who became homeless for the first-time in calendar year 2005.

² Because these clients receive services that they would otherwise be eligible for and could continue to receive these services if they moved to alternative housing, we did not include this cost as part of the housing program. Services paid for with the program budget and those dedicated to the project are accounted for in the program daily costs, when possible.

In contrast, emergency shelters for families are as expensive, if not more expensive, than transitional housing and permanent supportive housing offered in the four communities in which we studied homeless families. This is because families often get private rooms or apartments in emergency shelter; the programs are small and have few units over which to prorate fixed costs; and emergency shelters for families are likely to be open 24-hours and provide supportive services. Permanent supportive housing for families is generally less expensive than emergency shelter from the perspective of the homeless system.

More expensive programs typically have higher costs across all major budget categories: housing operations, services, agency overhead, and the daily cost equivalent of capital investments. Higher overall costs may reflect more supervision, more services, increased private space, or lower program capacity (e.g., decreased economies of scale).

Exhibit 1 shows the average cost per month incurred by the homeless system for each program type in each community in relation to HUD's Fair Market Rents (FMRs) for a private market unit in the same community. The FMR is a way to quantify the value of a rental subsidy for a month and therefore to compare the costs associated with providing housing for persons who are homeless within a homeless program with the cost of providing rental assistance without supportive services in the private market. Except for overnight emergency shelters in Jacksonville and permanent supportive housing in Des Moines, the FMR is lower than the average monthly cost of all types of homeless residential programs in all six of the communities in which we studied homelessness.

Exhibit 1: Average Cost Per Household Per Month for Homeless Program Types^a				
Individual Sites	Emergency Shelter	Transitional Housing	Permanent Supportive Housing	2006 Fair Market Rent for One-bedroom Unit^b
Des Moines	\$581	\$1,018 – \$1,492	\$537	\$549
Houston	\$853 - \$1,817	\$1,654	\$664 – \$1,757	\$612
Jacksonville	\$408 - \$962	\$870	\$882	\$643
Family Sites	Emergency Shelter	Transitional Housing	Permanent Supportive Housing	2006 Fair Market Rent for Two-bedroom Unit^b
District of Columbia	\$2,496 - \$3,698	\$2,146 - \$2,188	\$1,251	\$1,225
Houston	\$1,391	\$1,940 – \$4,482	\$799	\$743
Kalamazoo	\$1,614	\$813	\$881	\$612
Upstate South Carolina	\$2,269	\$1,209	\$661	\$599 (Greenville MSA)

Note: All costs reported in 2006 dollars.

^a Costs shown reflect weighted averages by program type. Ranges represent the averages of different housing models within a program type. Costs only represent homeless system costs and do not include the value of mainstream system costs that may be incurred while individuals or families reside in these programs.

^b Source: (HUD, 2005)

Chapter 3 of this report describes each program type, the costs associated with providing each type, and the extent to which programs are providing both shelter and supportive services to clients—in contrast to the Fair Market Rents, which represent only the cost of housing. Since rental subsidies are often permanent or long-term, it may not be realistic to assume that a community would provide a single month of rental assistance; whereas, it is very common for a household to use emergency shelter for only one month. It also would be important to assess whether people using rental subsidies use mainstream systems to a greater or lesser extent and cost than people who use residential programs for homeless people either during or after their period of homelessness. Such an examination is outside the scope of this study..

Characteristics of First-time Homeless Individuals and Families in this Study and Costs to the Homeless Services System

Among the three sites in which we studied single adult homelessness, we identified 7,502 individuals as first-time homeless, with the majority in Houston, Texas. The total number of unduplicated families who experienced first-time homelessness across the four family sites was 1,374 households. Exhibit 2 includes descriptive information about the individuals and families we studied, focusing in particular on demographic characteristics associated with costs.

Exhibit 2: Study Cohort Characteristics ^a							
	Individual Sites			Family Sites			
	Des Moines	Jacksonville	Houston	Houston	Kalamazoo	Upstate SC	Washington, DC
Total Households	1,124	1,972	4,406	477	342	145	410
Male Adults	73%	81%	74%	13%	15%	10%	18%
African American	21%	48%	57%	65%	60%	49%	97%
Average Age of Adults at First Entry	39 yrs	41 yrs	41 yrs	32 yrs	30 yrs	31 yrs	32 yrs
Adults over 40	47%	54%	53%	16%	12%	12%	20%
Household Size				3.2 people	3.2 people	3.0 people	3.5 people
One Adult Household				88%	89%	88%	80%
Household Change ^b				25%	13%	17%	34%

^a Null demographic values are excluded from percentage calculations.

^b Household change reflects a change in household membership from one program entry to another. Household change usually occurs across multiple program stays. However, household change can also occur when a new member joins a family already staying in a program.

The first-time homeless individuals in the communities we studied were predominantly male (73 to 81 percent) and had an average age of 39 to 41 years at program entry. With the exception of Jacksonville, African-Americans are over-represented among first-time homeless individuals in comparison to the general population of individuals in poverty. Multivariate analysis showed that among individuals, single women had fewer stays but used homeless programs 74 percent longer than single men. And women dominate groups with certain patterns of homelessness, such as those who use more expensive types of programs.³ Even when controlling for length of stay, program type, and

³ Data from victim service providers, such as domestic violence shelters, were not available for this study, so these findings are for other type of homeless residential services.

other demographic characteristics, multivariate analysis shows that single women have 97 percent higher costs than men. Relatively older adults have longer lengths of stay than younger adults, and when controlling for other factors, costs for individuals older than 40 are 10 percent higher than for those between 31 and 40 years. African-American individuals are more likely to spend longer cumulative periods of time homeless, have a greater number of stays, and to incur 19 percent higher homeless system costs than white individuals.

The first-time homeless families in the study primarily had only one adult member (80 to 89 percent), were comprised of female adults accompanied by children (82 to 90 percent), and had on average 3 to 3.5 members. On average, adults were 30 to 32 years old when they first used a homeless program, and 41 to 50 percent of the children were 6 years old or younger. While the majority of families in the study cohort at each site had constant membership, a very high percentage of those who used more than one program experienced a change in their household membership from one program stay to another.

Homeless families headed by people between 18 and 24 use less expensive program types, stay for shorter periods, and, consequently, incur costs that are approximately one-third less than those headed by 31 to 40 year olds. Unlike results for individuals, African-American families are likely to spend shorter periods of time in homeless programs and to be associated with lower costs than white families. Families with household change are associated with 35 percent greater homeless system costs than those with stable membership, even when controlling for other factors.

These findings show that different types of first-time homeless individuals and families use homeless system resources differently, which suggests opportunities for communities to develop specific strategies to meet the needs of each of these types of individuals and families. For example, communities may want to reevaluate their systems for serving single women rather than serving them primarily in programs alongside families with children. Communities should also explore prioritizing African-American families for prevention and rapid rehousing interventions that address housing and income issues with less focus on services for non-economic issues, since our analysis suggests that a large portion of African-American families may be homeless primarily due to extreme poverty rather than issues related to mental illness or substance abuse. Finally, we recommend strategies to identify and refer households with greater needs to lower-cost interventions, such as permanent supportive housing for individuals, transitional housing for families, or even alternative program types that have not yet been developed.

Patterns of First-time Homelessness for Individuals and Families in this Study

The majority of households we studied, 50 to 65 percent of the first-time homeless single adults and 58 to 72 percent of families, stayed in a homeless program only one time during the 18-month period in which we studied homelessness (30 months in DC). However, individuals who used homeless programs more than once used them frequently; individuals in the study had an average of three distinct program stays. The average for individuals was more than double the average number of stays for families. Although families had fewer stays, they stayed in programs for longer than individuals. Individuals averaged 5 to 10 weeks in a homeless program, whereas families averaged 3 to 10 months. For both, the median number of days spent in homeless programs was well below the average number of days. This means that half of the individuals and families stayed for much shorter

periods than the average, and that a small number of individuals and families had very long stays that substantially increased the average for each group as a whole. Households in the study also had gaps averaging 25 to 75 days between all homeless programs stays. Since the majority of households had only one stay, this statistic really means that those with multiple program stays had quite lengthy gaps between all homeless program stays. Exhibit 3 provides some basic information about the patterns of homelessness for the individuals and families within each community.

Exhibit 3: Homelessness System Utilization							
	Individual Sites			Family Sites			
	Des Moines	Jacksonville	Houston	Houston	Kalamazoo	Upstate SC	Washington, DC ^a
Households with only one stay	53%	50%	65%	72%	68%	65%	58%
Average Number of Stays	3.0 stays	3.3 stays	3.0 stays	1.4 stays	1.5 stays	1.4 stays	1.2 stays
Average Days In Homeless Programs	73 days	57 days	39 days	113 days	94 days	186 days	309 days
Median Days In Homeless Programs	24 days	10 days	22 days	49 days	31 days	103 days	258 days
Average "Gap" Days Between Stays	63 days	75 days	44 days	31 days	61 days	25 days	73 days

^a Homeless system utilization was analyzed over a 30-month period for the DC case study.

Greater length of time in homeless programs and (to a lesser extent) longer periods between stays in homeless programs are associated with greater homeless costs for first-time homeless individuals and families. Controlling for other household characteristics and for the type of program used, each additional month in a homeless program is associated with 35 percent higher costs for individuals and 22 percent higher costs for families. The type of program used has an even greater impact on homeless system costs, as will be discussed later in this summary.

Costs Associated with First-time Homelessness

The average homeless system costs incurred for individuals and families in the communities are provided in Exhibit 4. The average costs for individuals (\$1,634 to \$2,308) are much lower than those for families (\$3,184 to \$20,031). The difference in costs between individuals and families is not surprising, since the average daily costs for programs serving individuals are generally much lower than for those serving families (Exhibit 1), and the average length of stay for first-time homeless individuals is much shorter than for first-time homeless families (Exhibit 3).

Exhibit 4: Average Homeless System Cost per Household							
	Individual Sites			Family Sites			
	Jacksonville	Houston	Des Moines	Kalamazoo	Upstate South Carolina	Houston	Washington, DC ^a
Average Cost per Household	\$1,634	\$2,257	\$2,308	\$3,184	\$9,663	\$11,627	\$20,031

Note: All costs reported in 2006 dollars.

^a The DC cost per family does not include families who used only the Community Care Grants program. Including such families would drop the average cost per family in DC to \$17,962.

Average costs offer a general picture of the costs associated with homelessness, but they obscure important information about the wide variation in costs associated with first-time homelessness. Only a small group of households incurred high costs at each site, while the majority had minimal or more moderate costs. For individuals, the 50 percent of individuals with the lowest homeless system costs incurred only 2 to 3 percent of the total homeless system costs; whereas the highest-cost 10 percent of the cohort incurred 62 percent of the homeless system costs in Jacksonville, 70 percent in Des Moines, and 83 percent in Houston. Transitional housing for individuals is more expensive per day on average than other program types, and programmatic factors also encourage longer lengths of stay, which also drive up costs. Thus, it is not surprising that the cost to the homeless services system of the most expensive 10 percent of individuals in the study cohort at each site generally reflects continuous use of expensive transitional housing programs for much or all of the 18-month observation period.

The distribution of costs for families is also quite skewed, but not to the same extent as for individuals. In the four sites in which we studied first-time homeless families, the lowest-cost half of families accounts for less than one-seventh of the total cost incurred by the community for first-time homeless families. The proportion ranges from 13 percent in Upstate South Carolina to 5 percent in Houston. In Upstate South Carolina, the highest-cost 10 percent of the study cohort accounts for 32 percent of the total cost to the system, while in Houston the 10 percent highest-cost group accounts for 57 percent of the total homeless system costs for first-time homeless families.

Costs for Groups of Households with Common Patterns of System Utilization

The study defined “path groups” as a way to group people who use the homeless system in similar ways, that is, those who follow similar “paths” through the homeless system. Although path groups were derived separately for each community in the study, several broad patterns of use were present across all six communities: households that use only emergency shelter for brief periods, households that used homeless programs for extended periods, and households that use homeless programs multiple times with long gaps between stays.

Households that Use Only Emergency Shelters for Brief Periods

Households that use only emergency shelter for brief periods represent the majority of all first-time homeless households in the study, although their costs represent less than one-third of total costs

incurred by first-time homeless households, as shown in Exhibit 5. On average, “short-stayer” individuals used emergency shelter programs for only 1 to 3 weeks at an average cost per household of \$321 to \$686. The stays for families were on average longer than those of the individuals we studied. One group of short-stayer families in South Carolina remained in shelters for only 9 days on average, but other short-stayer families in all four communities stayed an average of one to three months. The average costs per short-stayer family ranged from less than \$1,000 to almost \$9,000, depending on the average number of days spent in programs and the relative cost of the programs used.

Exhibit 5: Households that Use Only Emergency Shelter for Brief Periods				
Population	Utilization description	% of Each Study Cohort ^a	Average Homeless System Costs Per Household ^b	% of Homeless Costs Represented by Path Group Within Each Site
Individuals	Emergency shelter only, for 1 or 2 brief stays totaling 1 to 3 weeks.	57% - 69%	\$321 - \$686	8% - 28%
Families	Emergency shelter only, for 1 or 2 brief stays totaling 10 days to 3 months.	33% – 66%	\$784 - \$8,890	9% - 30%

Note: All costs reported in 2006 dollars.

^a In this table, the universe of individuals excludes individuals in Houston who were only contacted by street outreach. And the universe of families in DC excludes families who participated only in the Community Care Grant program.

^b Ranges in this column represent distinct path groups within each site.

These short-stayers all had much lower costs than other groups of first-time homeless individuals and families. We suggest that the emergency shelter system may be an “adequate” response to an immediate housing crisis for most individuals and a place in which individuals who are not able to quickly resolve their housing crisis can be referred to more intensive interventions. It would be very difficult to fund a prevention response at such low cost, and it would be difficult to identify up front which of the individuals’ homelessness could be prevented with minimal assistance.

In contrast, we found that emergency shelter is an expensive solution to family homelessness, in comparison to transitional housing, permanent supportive housing, and traditional rental subsidies. As an alternative, we suggest that communities consider three approaches: 1) offering shelter diversion or rapid-rehousing interventions that optimize the use of resources to get families back into housing, rather than shelter; 2) examining the cost structure of current emergency shelter programs to determine if the environment and services offered can be scaled back and still meet the needs of those who are using them; and 3) referring more quickly those who need intensive assistance to transitional housing (facility-based or scattered site), permanent supportive housing, or other new interventions.

Households Who Remain in Homeless Programs for Extended Periods

Up to one-quarter of first-time homeless individuals and a larger portion of first-time homeless families used homeless programs for extended periods at substantial cost per household (Exhibit 6). Cumulatively, individuals with extended stays incurred 40 to 73 percent of homeless system costs associated with first-time homelessness for individuals. Families with extended use of homeless programs incurred 47 to 82 percent of costs associated with first-time family homelessness.

Therefore, the greatest opportunities for homeless system cost savings lie with the individuals and families who remain in homeless programs for extended periods. Most often, this long-term, high-cost use of the homeless system reflects extended use of transitional housing either alone or in combination with other programs, which is consistent with the fact that transitional housing is typically designed for long lengths of stay.

For individuals, extended use of homeless programs costs an average of \$9,000 to \$14,000 per person, with the exception of a group with average costs of \$3,103 for use of a low-cost form of shared transitional housing in Des Moines. For families, heavy use of transitional housing costs an average of \$15,500 to \$38,800 per family, with the exception of costs for families in Kalamazoo, which were \$6,574 on average.

Exhibit 6: Households that Use Homeless Programs for Extended Periods				
Population	Utilization description	% of Each Study Cohort ^a	Average Homeless System Costs Per Household ^b	% of Homeless Costs Represented by Path Group Within Each Site
Individuals	Used emergency shelter, transitional housing, or permanent supportive housing exclusively or in combination for average of 4 to 12 months.	7% - 25%	\$3,103 – \$14,418	40% - 73%
Families	Used transitional housing exclusively or in combination with emergency shelter or permanent supportive housing for average of 8 to 18 months.	24% – 42%	\$6,574 - \$38,742	47% - 82%

Note: All costs reported in 2006 dollars.

^a The universe of individuals in this table excludes individuals in Houston who were only contacted by street outreach, and the universe of families in DC excludes families who participated only in the Community Care Grant program.

^b Ranges in this column represent distinct path groups within each site.

In all cases, the costs to house individuals and families in homeless programs for extended periods are significantly higher than rental subsidies based on Fair Market Rents for an equivalent period. Strategies for identifying cost-savings, include examining: 1) whether patterns of extended use or transitional housing or other program types are cost-effective and whether there are opportunities to reduce costs without diminishing client outcomes; 2) whether some households are using transitional housing as a form of subsidized permanent housing, in which case actual rent subsidies without extensive services would be a more cost-effective approach; 3) whether some households should be referred more aggressively to permanent supportive housing to address long-term needs at lower costs; and 4) whether the permanent supportive housing model of leveraging services from mainstream systems could be used to deliver transitional housing at lower cost to the homeless system.

Households Who Use Homeless Programs Multiple Times with Long Gaps Between Stays

Our analysis also identified a small group of first-time homeless individuals and families who return multiple times for homeless assistance but have long gaps between stays. Their patterns suggest that the assistance they receive from the homeless system the first and even second or third time is not

sufficient to help them regain stable housing. These households sometimes only use emergency shelter and sometimes use a combination of program types. As shown in Exhibit 7, costs for individuals who repeatedly used homeless programs with long gaps between stays averaged approximately \$1,000 for groups that only used emergency shelter to as high as \$10,705 for a group of individuals in Houston who used a range of program types. Costs for families averaged from \$3,295 in Kalamazoo for a group that used only emergency shelter for an average of 38 days across all stays to \$17,314 for a group in DC that spent an average of 9 months in a range of program types.

Exhibit 7: Households that Use Homeless Programs Multiple Times with Long Gaps Between Stays				
Population	Utilization description	% of Each Study Cohort ^a	Average Homeless System Costs Per Household ^b	% of Homeless Costs Represented by Path Group Within Each Site
Individuals	Used emergency shelter only or used a range of programs, returning to emergency shelter after using transitional or permanent supportive housing. Average gaps between all stays total 6 months to a year.	12% - 18%	\$910 - \$10,705	14% - 24%
Families	Repeated use of homeless programs with long gaps between stays totaling 4 to 17 months.	5% - 16%	\$3,293 - \$12,475	2% - 20%

Note: All costs reported in 2006 dollars.

^a The universe of individuals in this table excludes individuals in Houston who were only contacted by street outreach, and the universe of families in DC excludes families who participated only in the Community Care Grant program.

^b Ranges in this column represent distinct path groups within each site.

Although costs are proportionately not as large for these households as for those with extended use of homeless programs, the current system does not appear to be working well and therefore, resources currently used to serve these households may not be used effectively. In addition, our analysis of mainstream costs shows that these individuals and families had high levels of interaction with criminal justice systems. In Jacksonville, Kalamazoo, and Upstate South Carolina, rates of arrest or incarceration were above 60 percent for individuals and families with long gaps between homeless stays. The criminal justice involvement occurred across all time periods relative to homelessness - before the first homeless stay, between stays, and in the period following the last homeless stay. By comparing the number of days between homeless stays and the number of days spent in jail during those same times, we know these households are not exclusively staying in jail between homeless stays. We surmise that they spent time in many different types of places, including living on their own, living doubled up with others, staying on the streets, or in other residential facilities. The high rates of arrest and incarceration coupled with high levels of housing instability suggest that the individuals and families in this group would benefit from targeted assistance to secure and maintain housing and reduce criminal justice recidivism.

A significant percentage (53 to 92 percent) of families with long gaps also had changes in household composition from one program stay to the next. These high rates of household change are evidence of household instability and may also suggest high involvement in child welfare systems. This theory is supported by statistics from DC, the only site in which we obtained rates of child welfare involvement, that show that 55 percent of the group with long gaps had child welfare involvement at

some point during the study period. The significant housing and family instability experienced by this group suggests that neither homeless nor mainstream systems are addressing sufficiently the needs of these families and that targeted interventions may be needed to achieve positive housing and family-related outcomes. Communities should explore whether funds currently used to serve these households over repeated stays, in addition to resources from the criminal justice and possibly the child welfare system, could be used to fund alternative interventions to meet the specific needs of these households.

Costs Associated with Mainstream System Use By First-time Homeless Individuals and Families

The question of whether mainstream system costs can be offset by appropriate housing interventions is left open by this study. Our analysis suggests that there are few opportunities for mainstream cost reductions when targeting groups based on their patterns of homelessness. However, consistent with past research, significant mainstream system cost reductions may be achievable when targeting individuals or families with high levels of involvement in mainstream systems prior to homelessness.

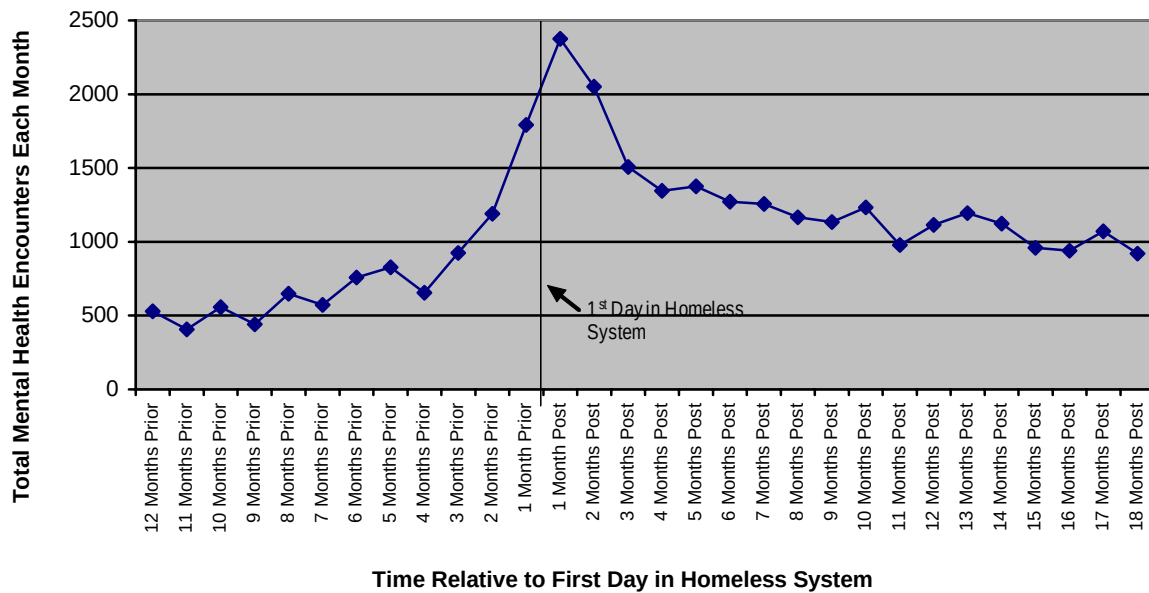
Most first-time homeless individuals do not have high involvement in mainstream systems. This means that there is only a small group of individuals with the possibility of cost offsets. For instance, only a quarter of individuals in Jacksonville received publicly funded mental healthcare, only 22 percent received substance abuse treatment, and only 20 percent had Medicaid physical healthcare claims at any point in the approximately three-year period for which we collected cost data. And less than 10 percent received healthcare in any of these domains *during* the period of homelessness. Exhibit 8 shows that the total per person costs of mainstream involvement in each domain during homelessness for first-time homeless individuals, totaling approximately \$1,000 in Jacksonville and approximately \$500 in Houston. However, when looking only at the costs per person for those who were involved in each mainstream domain, costs increase substantially per person as do opportunities for cost savings. The difference in average costs for mainstream users and the cohort average illustrates why narrowly targeted interventions to reduce or shift use by those who are involved with each system have the greatest potential to yield cost savings, whereas broadly targeted interventions are not likely to realize substantial savings.

Exhibit 8: Average Mainstream System Costs per Person Incurred “During” Homelessness						
	Jacksonville			Houston		
	% of Cohort involved in this Domain	Average Costs During Homelessness Per Person Involved in this Domain	Average Costs During Homelessness Per Person in Cohort	% of Cohort involved in this Domain	Average Costs During Homelessness Per Person Involved in this Domain	Average Costs During Homelessness Per Person in Cohort
Medicaid Primary Health	9%	\$2,436	\$219			
Mental Health	8%	\$1,318	\$106	9%	\$4,157	\$391
Substance Abuse	7%	\$2,265	\$158			
Criminal Justice	13%	\$3,057	\$397	2%	\$6,520	\$157
Income Supports	22%	\$627	\$138			

We also found that criminal justice and mental health involvement in Jacksonville and Houston increased substantially immediately before first-time homelessness, peaking in the period just after the individual entered the residential homeless system.⁴ Nine percent of the individuals we studied in Houston received services from the mental health system at some time in the 12 months prior to homelessness or the 18 months following the first day the individual entered a homeless program. The total encounters are graphed in Exhibit 9, with the total number of encounters for all of those who received services during each month shown in the y axis and the month relative to the start of homelessness shown on the x-axis. The exhibit shows that the highest number of encounters occurred in the month following the day these individuals became homeless for the first time, followed by the second month after that day. These individuals also had a high number of encounters in the month immediately prior to homelessness. This finding suggests a need for discharge planning to ensure that individuals leave mainstream programs, such as inpatient treatment or jails, with adequate housing. It also suggests that that mainstream systems may be able to help identify risk of homelessness for their clients and that targeted alternative interventions could avoid costly homeless system use. We also conclude that homeless systems should use emergency shelter to proactively identify individuals with severe mental illness who would benefit from permanent supportive housing before they experience long-term homelessness.

⁴ Other research analyzing rates of homelessness among ex-offenders found that individuals released from state prisons or jails have a greater risk of homelessness than individuals with similar characteristics who have not been recently incarcerated. In the communities studied, risk of homelessness among ex-offenders was higher for individuals with certain demographic characteristics. The same research also found that longer periods of incarceration were associated with greater risks of homelessness after release. (Graham, D., Locke, G., Bass Rubenstein, D. & Carlson, K., unpublished) This finding supports the conclusion above that discharge planning strategies targeting the ex-offenders most at risk of homelessness, based on gender, race, age, and length of incarceration, may be effective in preventing homelessness for this group.

Exhibit 9: Total Mental Health Encounters Each Month by First-time Homeless Individuals in Houston Shown Relative to First Day of Homelessness



In contrast, first-time homeless families in the communities for which we obtained mainstream data had very high enrollment in Medicaid (over 90 percent) and low to moderate use of other mainstream systems across the entire period for which we collected costs. Medicaid costs across the entire study period totaled \$21,770 per family in Kalamazoo and \$15,615 per family in Upstate South Carolina, as compared with mental health costs in Houston of \$722 per family and criminal justice costs of \$175 to \$597 per family. Average monthly mainstream costs per family were highest during periods of homelessness, as shown in Exhibit 10.

Exhibit 10: Rate of Mainstream System Involvement and Costs Per Family Per Month					
	Mental Health	Medicaid	Criminal Justice	Financial Assistance	Food Stamps
Kalamazoo					
Rate of Involvement ^a		94%	42%	> 39% ^b	
Pre-Homelessness		\$657.58	\$13.33	\$5.18	
During Homelessness		\$929.59	\$12.99	\$22.05	
Post-Homelessness		\$471.90	\$19.36	\$21.55	
South Carolina					
Rate of Involvement ^a		> 90% ^b	34%		92%
Pre-Homelessness		\$319.66	\$4.65		\$187.30
During Homelessness		\$433.70	\$4.70		\$229.34
Post-Homelessness		\$493.28	\$4.86		\$190.78
Houston					
Rate of Involvement ^a	16%		8%		
Pre-Homelessness	\$13.01		\$6.55		
During Homelessness	\$32.87		\$1.57		
Post-Homelessness	\$20.67		\$16.36		

^a Percentage of the families studied who were involved in the mainstream domain at any point from 12-months prior to the first day of homelessness through December 31, 2006 (June 30, 2007).

^b De-duplicated data across types of involvement with this domain were not available.

As with individuals, we surmise that families interact with mainstream systems on an ongoing basis, but that use rises immediately preceding homelessness and peaks immediately following homelessness. Some of the increased Medicaid costs may reflect health crises related to homelessness or use of expensive acute care systems for routine medical needs during homelessness. Increased coordination between homeless and mainstream systems, and potentially some interventions targeted to specific high-users of mainstream services, could result in more appropriate use of mainstream services and potential cost savings.

Aside from the observations about criminal justice and potential child welfare involvement for households with long gaps between homeless stays, we did not find sufficient relationships between patterns of homelessness for families and mainstream costs to warrant recommendations related to targeting households based on their homeless system use in order to achieve mainstream cost savings. It is possible that more complete data would identify additional cost saving opportunities.

Conclusion

This study does not show which homelessness interventions are cost-effective or indicate whether mainstream systems are appropriately used during periods of homelessness. However, it does illuminate the diverse patterns and costs of homeless and mainstream system use that are essential to answer two critical policy questions. Are high-cost interventions an appropriate response to homelessness for specific subgroups? Are there more efficient and effective ways of meeting people's needs?

In brief, we conclude that communities should explore strategies to 1) prevent homelessness for the majority of families facing first-time homelessness, 2) avoid extensive use of high-cost homeless

programs for individuals or families who primarily need permanent housing without supports or those whose service needs can be met by mainstream systems, 3) alter the way their homeless assistance systems respond to households that are unable to remain stably housed and face repeated instances of homelessness, 4) work with mainstream systems to design appropriate discharge planning strategies and ways to identify clients at-risk of homelessness so their homelessness can be prevented.

This research also raises a number of additional questions that should be the focus of new research. These questions center around understanding the cost-effectiveness of different types of homeless programs, identifying program features that drive costs and therefore present opportunities for reducing costs, and identifying client-level indicators associated with high costs that can be used to predict and avoid unnecessary or ineffective high cost system use.

1. Introduction

This study measures costs associated with first-time homeless families and individuals incurred by homeless and mainstream service delivery systems in six study communities. Unaccompanied homeless individuals were studied in Des Moines, Iowa; Houston, Texas, and Jacksonville, Florida. Homeless families were studied in Houston, Texas, Kalamazoo, Michigan; Upstate South Carolina; and Washington, DC.

Past research has primarily documented costs associated with homelessness for individuals with chronic patterns of homelessness or severe mental illness. Newer work has been published on the costs incurred within the homeless system for families experiencing first-time homelessness. The emerging body of research on homelessness piqued the interest of many. It also raised additional questions about the comparability of these findings to individuals and families with different characteristics or patterns of homelessness and about opportunities for savings through alternative responses to homelessness.

This study was designed to allow policy makers at the national and community levels to have a better understanding of:

- the comparative costs of different types of homeless programs;
- the wide-ranging experience of homelessness among individuals and families and the costs associated distinct patterns of homelessness;
- some of the mainstream costs that can be associated with homeless individuals or families during the periods before, during, and after their period of homelessness
- characteristics of first-time homeless individuals and families that are related to higher or lower homeless or mainstream system costs; and
- the implications of these findings for homeless policy and planning.

Homeless systems include programs within a community that are designed and dedicated to providing housing and services to people who are homeless. The homeless programs accounted for in this study are outreach programs, emergency shelters, transitional housing, and permanent supportive housing for homeless people with disabilities. Programs that only provide supportive services to homeless people are not included in this study.

Mainstream service systems are those that are not dedicated exclusively to serving people who are homeless, yet provide services that are needed and often used by them. Mainstream system cost data examined for this study include: Medicaid primary healthcare, mental healthcare and substance abuse treatment; other state-funded behavioral health care; law enforcement and criminal justice; and income supports.

In each site, we examined the system of homeless service provision, patterns of homelessness for a cohort of homeless families or individuals based on analysis of Homeless Management Information System (HMIS) data, and the costs associated with the use of homeless programs by the study cohort based on cost data collected directly from homeless programs. We also acquired and analyzed utilization data for mainstream systems in order to measure how mainstream systems interact with

people who are homeless and to estimate the costs associated with the use of mainstream systems by homeless people. Finally, we analyzed homeless and mainstream costs together.

We follow a growing body of literature in identifying groups of people who experience similar patterns of homelessness and analyzing homeless and mainstream service utilization and costs based on these patterns. However, this study breaks new ground methodologically in homelessness research in the following areas:

- rigorously calculating the costs of providing a family or individual with a day of shelter in specific residential programs for homeless people;
- incorporating distinctions among program types and their housing models (e.g., facility-based transitional housing) into our analysis of both patterns and costs of first-time homelessness; and
- analyzing both individuals and families, as well as vastly different types of communities or geographic areas using the same research design, facilitating direct comparisons.

The study does not attempt to isolate which of the mainstream costs are attributable to homelessness, and it does not compare the benefits of different programs with the costs of their use. Thus, the study is not a cost-effectiveness study and is most accurately characterized as a study to measure the costs associated with homelessness, rather than the costs of homelessness.

The study does not attempt to measure the broader costs of homelessness to individuals who become homeless or to society as a whole. For example, we do not attempt to measure the costs of increased morbidity or mortality for individuals who become homeless, nor do we measure the costs to businesses and property owners that may result from concentrations of sheltered or unsheltered homeless individuals in cities or neighborhoods. And to the extent that the data we used are not comprehensive of all homeless program utilization or all relevant mainstream systems, the findings somewhat underrepresent the costs for some first-time individuals and families.

Yet even with its limitations, we anticipate that this information will prompt future research and policy discussions on whether resources are being used efficiently to provide services to people who are homeless and whether better outcomes might be achieved by triaging clients to specific paths or by examining current strategies and designing targeted interventions to serve specific subpopulations.

Chapter 2 of this report continues with an overview of the research questions and methodology used to conduct the study. Chapter 3 discusses the range of unit costs (that is, costs per day for each individual or family) associated with various types of residential homeless programs within each site. Chapter 4 analyzes costs associated with first-time homeless individuals across the three individual study sites, and Chapter 5 analyzes costs associated with first time homeless families across the four family study sites. Chapters 4 and 5 begin with a discussion of previous research and a discussion of the characteristics of the cohort at each site. The chapters continue with an analysis of the patterns and costs of homeless system utilization, followed by a discussion of mainstream system costs. Each of these chapters concludes with a discussion of policy implications and areas for future research. Chapter 6 provides summary conclusions that encompass both families and individuals.

Appendix A is a standalone case study for Jacksonville, which is the site where we obtained and analyzed data covering the most comprehensive set of mainstream programs. Appendix B contains data tables for the Jacksonville case study. Appendix C contains detailed data for the individual study sites. Appendix D contains detailed data for the family study sites. Appendix C and Appendix D both include summary data for each study site and the results of cross-site multivariate regression analyses.

Aside from Jacksonville, complete case studies for each site are not included in this document. However, stand-alone case studies for the six sites are available, along with comprehensive data tables, on www.huduser.org.

2. Methodological Framework for Analysis of Costs Associated with Homelessness

This chapter covers the methodological framework for the Costs of Homelessness study. It presents the research questions for the study, our approach to answering these questions, the key domains of costs that were measured in each community, and some of the methodological challenges that we encountered.¹

2.1. Research Questions

The primary research questions for the study are: **What are the combined homeless and mainstream system costs for people who become homeless for the first-time? How do these costs vary across patterns of homeless system use?**

We pursued the following six specific research questions to help us understand the primary research questions.

1. How do people who become homeless use homeless and mainstream systems?
2. Are there common patterns of homelessness system utilization (homeless paths) that can be used to group people who access homeless services?
3. Do people who use homeless system resources in similar ways share characteristics that can be used to describe each group?
4. What is the cost of the homeless and mainstream system service use associated with first-time homelessness and the periods immediately before and after it? How do these costs vary by path group?
5. What is the total cost associated with the period of homelessness for the study population?
6. How do mainstream system costs change when a person becomes homeless and in the period after homelessness?

Exhibit 2.1 shows the data that we generated to answer each question.

¹ This methodology applies to this report as well as to each of the six individual case studies.

Exhibit 2.1: Research Questions and Outputs for the Study

Research Questions	What this study reports.
How do people who become homeless use homeless and mainstream systems?	Number, type, and sequence of homeless and mainstream service encounters and lengths of stay (or number of service units) during the study period. Use of systems is reported separately for types of programs that comprise the residential homeless services system, and for each mainstream system studied.
Are there common patterns of homelessness system utilization (homeless paths) that can be used to group people who access homeless services?	- Description of groups of homeless families or individuals following different paths is based on cluster analysis of the number of homeless program enrollments, the types of programs used, the sequence of program types, the durations of program stays, and the overall length of the period of homelessness. - Percent of clients that fall into each path group. - Similar path groups generated at the site level are grouped together for overall analysis.
Do people who use homeless system resources in similar ways share characteristics that can be used to define each group?	Analysis of demographic characteristics and special needs (defined by service use) of persons in each path.
What is the cost of the homeless and mainstream system service use associated with first-time homelessness and the periods immediately before and after it? How do these costs vary by path group?	- Costs incurred by the homeless system for outreach, emergency shelters, transitional programs, and permanent supportive housing - Costs incurred by selected mainstream service systems reported separately for time periods before, during, and after homelessness. - Analysis of each of these costs for different path groups.
What is the total cost associated with the period of homelessness for the study population?	- Total estimated homeless and mainstream system costs for the study population. - Analysis of costs by demographic characteristics and path groups.
How do mainstream system costs change in relation to homelessness?	Comparison of mainstream system costs for the periods before, during and after homelessness.

2.2. Research Domains

At the start of the study, we convened an expert panel of homelessness researchers and economists to advise us on the design of the study. In preparation for the panel meeting, we conducted a literature review on previous attempts to analyze costs associated with homelessness and methods that have been used to measure costs of homeless and mainstream service systems. We also explored methods to measure indirect costs of homelessness, such as costs associated with premature morbidity and mortality and indirect costs to businesses that are located near spots inhabited by persons living “on the streets.” After discussing extensively the priorities among cost domains, available methods for analyzing different domains, and the feasibility of implementing the methods, we decided to focus this study on the direct costs associated with the homeless system and the following mainstream systems: mental health, substance abuse, and primary health care treatment; criminal justice; child welfare; and Food Stamps and Temporary Assistance to Needy Families (TANF).

2.3. Study Sites, Period, and Population

2.3.1 Site Selection

We based our data collection strategy on administrative records whenever possible. For the homeless services system, this meant using local homeless management information system (HMIS) data to understand the utilization of homeless assistance programs. However, these administrative data sources did not include information on the costs incurred by these programs, so we collected cost data directly from a sample of homeless programs to develop unit costs for various types of homeless programs. For mainstream systems, we used local or state administrative data systems to analyze service utilization and to measure actual tracked costs. When actual tracked costs were not available, we consulted with local officials to derive an average unit cost for each service type within each system. These research design decisions influenced our site selection, as we had to select sites where these sources of data were available.

The criteria used to select sites were: HMIS data coverage of at least 75 percent of homeless system beds serving homeless families or 75 percent of beds serving individuals; high quality HMIS data for client identifiers, basic demographic characteristics, and program utilization or services received; a strong likelihood we could obtain mainstream client data, based on local relationships between the homeless services system and mainstream systems or on the existence of a data repository; and the site's willingness to participate in the study. In addition to these criteria, efforts were also made to select an equal number of sites where we would study families and sites where we would study individuals and to achieve a mix of different community types and geographic locations. Site selection was based on analysis of HUD's Housing Inventory Charts for homeless programs, data on HMIS participation rates and data quality, and telephone interviews with CoC staff and homeless providers in potential study sites.

Through this process, we selected six communities to participate in this study: Des Moines, Iowa; Houston, Texas; Jacksonville, Florida; Kalamazoo, Michigan; Upstate South Carolina; and Washington, DC. We also attempted to include Sacramento, California in the study, but were unable to secure access to the required client-level HMIS data due to local interpretation of California State privacy laws. Based on the availability and quality of HMIS data, we chose to study either homeless individuals or homeless families in each community. In Houston we studied both individuals and families, because the HMIS data met our criteria for both populations. The study population for each site is shown in Exhibit 2.2.

Exhibit 2.2: Case Study Sites and Study Population

#	Case Study Site	Case Study Population
1	Des Moines, Iowa	Single Individuals
2	Jacksonville, Florida	Single Individuals
3	Houston, Texas	Single Individuals Families
4	Kalamazoo, Michigan	Families
5	Upstate South Carolina	Families
6	Washington, D.C.	Families

We first analyzed each site independently and drafted six distinct case studies. We then analyzed overarching patterns as well as distinctions that emerged across each of the six sites. This report provides the overall findings across all six sites. In addition, each of the six distinct case studies produced as a result of this research is available as a stand-alone report.²

2.3.2 Study Period and Study Population

This study examined the costs associated with a cohort of individuals or families (depending on the case study) who became homeless for the first time between July 1, 2004 and June 30, 2005.³ For purposes of this study, an individual or family was considered homeless if the household stayed in a residential homeless program or was served by a street outreach program. The length of time the household was homeless was also defined based on use of these programs, as documented in local HMIS databases. Individuals and families were considered to be homeless for the first-time if they did not appear in the community's HMIS at any point prior to the study enrollment period.

Periods in which members of the study cohort were precariously housed, doubled up, or staying in a program that did not report to the HMIS are not included in the homeless system costs estimated by this study. However, if the studied family or individual had more than one stay in a residential homeless program during the study period, then the time between stays is also considered “during homelessness” when we analyze patterns of homelessness or analyze time-adjusted costs to the homeless services system. The period of homelessness is considered to begin on the first day of a program entry and to end on the date of the last program exit.

As will be discussed in more detail in Section 2.4, we followed each individual or family's homeless service utilization for eighteen months from the household's point of entry into the homeless system. In Washington, D.C, we followed families for thirty months. To the extent that data were available, we measured the individual or family's mainstream service utilization for twelve months prior to and for at least eighteen months after the household's point of entry into the homeless system.

To identify the study population, a single individual was defined as a homeless adult who was served within our study timeframe and was unaccompanied by any other persons at any point during the study period. A homeless family was defined as at least one adult and at least one child (under 18 years at first program entry) who used residential services together at some point during our study period. If a member of a family also used homeless programs as a single individual, we included those stays as part of the family's homeless utilization patterns and costs.

Because of federal law related to HMIS data, the study was not able to analyze services provided to people who are homeless by providers of services for victims of domestic violence. Since the study aimed to capture the complete costs associated with individuals or families who become homeless, households that included a person who was served by a victim services provider at any point preceding or during the study period, as determined by HMIS records, were excluded from the study population. In addition, unaccompanied youth under age 18 were excluded from the study.

² A “Bibliography of Cost of Homelessness Case Studies” appears at the end of this report.

³ Kalamazoo is the only site for which we used a different study enrollment period. We identified people for the Kalamazoo study cohort based on first entry into the homeless system between January 1, 2005 and December 31, 2005, because homeless system utilization data for 2004 were incomplete.

2.4. Data Sources

The study relies primarily on three types of data:

1. HMIS data maintained by the local Continuum of Care (CoC);
2. Homeless program cost data collected directly by the study team; and
3. Mainstream system administrative data maintained by a data warehouse or by local or state agency administrators.

Each data source and the process for obtaining the data are described in the subsections that follow.

2.4.1 Homeless Management Information Systems Data

HMIS data are longitudinal, client-level data that record demographic details and program utilization for all persons served by agencies participating in the HMIS at each study site. We used HMIS data to identify the study population, to identify each individual or family household's period of homelessness, and to follow each household's homeless system utilization for eighteen months from the date the household's homelessness first began.⁴

HMIS data are maintained by a local HMIS Lead Agency, which acts on behalf of the CoC to manage community data on homelessness. In 2004, HUD published HMIS Data and Technical Standards that outline data collection, privacy and security requirements for HMIS (Housing and Urban Development [HUD], 2004). As a result of the 2004 Standards, HMIS databases across the country store client-level data uniformly, so that we knew the types of data on homeless clients that we would be able to obtain and were able to use a common data analysis strategy across all of our study sites. We purposely selected communities with high levels of residential homeless provider participation in HMIS to ensure that we could get a comprehensive picture of who became homeless within each study site during the study's enrollment period and could understand the types of programs people used and their patterns of use.⁵

As part of site selection, we examined the level of HMIS participation (which is an indicator of how well HMIS data represent the homeless service system) for each community, indicators of data quality, and whether the community had authorized the use and disclosure of client data for research purposes in its privacy policies. We chose only sites with high residential program coverage rates, good quality data, and authority to release their data for research purposes. Thus, we were confident that we could obtain access to the client-level HMIS data for each of our selected study sites. Once sites were selected, we began negotiating with the HMIS Lead Agency to obtain access to the data. We developed data use agreements that were executed between Abt Associates Inc., and each HMIS Lead Agency and that specified the terms of our access, protection, use, and further disclosure of the data. The process and timeline for negotiating access to HMIS data varied by site, depending primarily on the extent to which the process of granting access to data for research purposes already

⁴ The period was thirty months in Washington, D.C.

⁵ We also attempted to include sites with strong participation from homeless programs that provide supportive services only. As we analyzed the HMIS data, we determined that most such programs did not enter service utilization data sufficient to support a cost analysis; therefore, we did not include costs associated with use of supportive service programs.

had been defined by local policies and procedures. In most cases, time delays were associated with administrative reviews or approval processes rather than with substantive local concerns. We were able to secure direct access to HMIS data for all six study sites.

2.4.2 Homeless Program Cost Data

This study includes homeless system costs associated with the use of residential homeless programs for all programs that report client utilization data to the HMIS. While HMIS provides information on client use of homeless programs, HMIS does not record costs associated with each program. Within the industry of providers of homeless services, there are no standardized unit costs based on funding reimbursements or other estimates. Therefore, we collected program costs directly from a sample of programs within each community and used these data to derive estimates of daily costs of residential programs (and in some cases costs per outreach encounter) for each program type at each site. The daily costs represent all aspects of each residential program's costs: operating, leasing, services provided as part of the residential program, administration, and, in some cases, the capital costs of the program's facility. This process is described in detail in Section 2.5.2. Chapter 3 contains a detailed discussion of our findings related to homeless program costs

2.4.3 Mainstream System Administrative Data

The third primary data source used for this study was administrative data from mainstream service systems. Mainstream systems are those that do not exclusively target people who are homeless. The primary mainstream systems that we attempted to include in the study were:

- primary health care;
- mental health care;
- substance abuse treatment;
- law enforcement and criminal justice;
- child welfare (including financial support, foster care, and protective services); and
- Food Stamps and TANF entitlements.

We were able to obtain mainstream cost data from at least one site for each of these systems, except child welfare. However, in Washington, D.C., we obtained and used data on whether each family in the study cohort had at least one encounter with the child welfare system over a five-year period.

We used the mainstream administrative data to track mainstream utilization and estimate the costs associated with that utilization for the twelve months prior to each household's homelessness, for each household's period of homelessness, and for the period following homelessness through December 31, 2006 (or June 30, 2007 for Kalamazoo).

In contrast to homeless services, mainstream system administrative data can be used to estimate both utilization and costs. Mainstream services, such as those funded by Medicaid or state health resources, are frequently funded based on standard state reimbursement rates. Mainstream income support systems such as Food Stamps or TANF provide assistance that is quantified at the household level. Other systems, such as local jails, track actual utilization, and their administrators have estimated nightly costs or arrest costs for budgetary or reimbursement purposes, so that the estimated costs of these mainstream systems can be estimated. We also determined through discussions with the expert panel that obtaining data on mainstream utilization from client case files or self-reports

would not be as accurate or comprehensive as administrative data and that using administrative data would be much less expensive than primary data collection.

We found that the largest challenge inherent in using mainstream administrative data systems was negotiating access to them. First, we had to identify all of the appropriate local or state administering agencies that maintained data on primary healthcare, mental healthcare, substance abuse treatment, police and/or sheriff arrests, police and/or sheriff jail incarcerations, Food Stamps benefits, TANF benefits, and other relevant mainstream assistance provided to the individuals or families studied at each site.

Once we identified the agencies and began discussions with appropriate staff, we had to convince the agencies to provide data for the study. We offered numerous analytical methods to ease the burden of participation, ranging from the agency sending us their complete identifiable client-level dataset for the study period to the agency conducting all of the analysis and sending only aggregate, tabulated data in table shells defined by the study team. While a formal commitment to participate in the study was an important benchmark, we experienced many delays after that point—for example, in securing formal legal approval to exchange client-level data. Therefore, agreement to obtain the necessary data was not considered complete until we had a signed, data use agreement in hand. Once we had such an agreement, we worked with the information technology staff at the mainstream agency to link records and analyze the utilization data according to our study specifications. This phase of the process was the least complicated, but still yielded many opportunities for project delays.

These steps had to occur for each separate mainstream administering agency within each community. We tried to achieve economies of scale by approaching state agencies that consolidated data across multiple service providers within a community, but in many cases we were not able to penetrate the appropriate bureaucracy at the state level. To support this process, we prepared a Mainstream Data Analysis Guide that we shared with mainstream administrators in advance to explain the process, options, and final table shells. At all sites, the success of accessing mainstream data depended on the motivation of our CoC and mainstream agency contacts. In communities where the mainstream contact was motivated and invested in the study, we had much greater responsiveness.

For each mainstream domain, Exhibit 2.3 lists the case study sites in which we were able to successfully access and incorporate cost data.

Exhibit 2.3: Mainstream Domains included in the Study						
Mainstream Domains	Jacksonville	South Carolina	Kalamazoo	Houston (Individuals and Families)	Washington DC	Des Moines
Primary health care	✓	✓	✓		**	
Mental health care	✓	*	*	✓	**	
Substance abuse treatment	✓	*	*		**	
Law enforcement and criminal justice	✓	✓	✓	✓		
Child welfare					**	
Food Stamps and TANF	✓	✓ (FS)				
Other mainstream data			✓		**	

*Included if funded by Medicaid.
**Data on whether there was any system utilization, but not types of services, extent of utilization, or costs.

2.5. Data Analysis Approach for Case Studies

The data analysis repeated for each distinct case study had five major components:

1. analyzing HMIS data to identify the study population and measure the use of homeless services;
2. developing homeless program typologies, calculating homeless unit costs for each program type, and deriving homeless system costs for each person;
3. identifying common groups of homeless system users, i.e. those with common “paths”;
4. extracting mainstream service data to measure mainstream costs associated with the study population; and
5. analyzing homeless and mainstream costs by path groups and other variables.

Each of these components is described below. Each section provides a discussion of the data sources, filtering and analysis that occurred, and the output that was used as a basis for the case study findings.

Analyzing HMIS Data to Identify the Study Population and Measure Homeless Service Use (HMIS Analysis)

Measurement of homeless service utilization was based on analysis of HMIS data to determine each homeless individual or family’s length of stay within each program. In some cases, we were able to obtain data on program utilization maintained outside of the HMIS by specific agencies and to merge it with the HMIS data. We also attempted to measure costs associated with supportive services that were provided outside a residential program. However, these unit costs were difficult to quantify, and we determined that most service programs reported only partial information on service utilization to

the HMIS. Therefore, the estimates of total homeless program costs do not reflect stand-alone homeless supportive service program utilization unless otherwise noted.

The three steps in the process of analyzing HMIS data to identify the study population and measure homeless service use were:

1. de-duplicate client records and create a Master Household ID;
2. identify the study population; and
3. calculate the length of each program stay.

Each step is detailed below.

Step One: De-duplicate client records and create master household ID

First, we compiled personal identifiers and basic demographic characteristics, such as HMIS Client ID, first, middle, and last names, social security number, date of birth, gender, ethnicity, race, and household IDs. We used The-Link-King software⁶ to de-duplicate client records within the HMIS and merged client records if the same individual was associated with multiple HMIS Client IDs. We did not rely on the de-duplication procedures of the HMIS itself.

Most HMIS databases allow persons to be associated with multiple household IDs. This reflects the reality that people sometimes enter a program for homeless people alone and sometimes enter a program with various combinations of other adults and children. This phenomenon made it very challenging to count the number of distinct households served within the study sites during the study period and to follow particular households over time. We defined our study population according to household composition: for example, a single adult must never be accompanied by other persons; a person in a family is sometimes if not always accompanied by at least one other person and must at some point be accompanied by a child. Therefore, we had to be able to determine each household's composition throughout the study period and, once categorized as a single member household or a family household, to measure its total utilization of homeless services and patterns of use over time. For family households that changed composition during the period of homelessness, this meant that we had to identify utilization of homeless programs (and associated costs) by each member of the household at any time during the study period.

To accomplish this goal, we created master household IDs—one Master Household ID for each household—that are shared by all persons who were ever in the same household or had a household member in common in any program within our study period.⁷ For example, if a mother and two children entered a program together, in the HMIS they may have been referred to as HMIS Household ID 1. For purposes of this study, we assigned them Master Household 1. If they later went to another program and were joined by a third child, they may have been assigned HMIS Household ID 2. By contrast, for this study, all four persons (the mother and all three children) were then considered part of Master Household 1. If two of the children left and joined their father in a different program, the children and their father were then also considered part of Master Household 1. The master household approach may in some sense undercount the number of households or merge costs of

⁶ The Link King tool is designed for de-duplication and matching of client data for research purposes using both probabilistic and deterministic record linkage algorithms.

⁷ For single individuals, the Master Household ID is the same as the Client ID.

households that purposely separated. However, other options would have over-counted households and suggested lower costs per household. Also, our approach allowed us to track change in household composition over time, which turned out to be an important variable in the study.

Step Two: Identify the study population

The selection criteria for the study population required the member of the study cohort (individual or family) to be served by a residential homeless program for the first time during the study “enrollment” period. After examining household associations to group persons by Master Household IDs and select only individuals or groups of people that met our definition of family, we analyzed program entry dates to determine whether the individual or any family member had been in the homeless services system before the enrollment period. Households were excluded if any member of the household was ever homeless prior to the enrollment period.

For family sites, once a Master Household was determined to be part of the study cohort, then all members of the family who were housed in a residential homeless program at any time during the complete study period, including after the one year-enrollment period, were included as part of the family cohort for analyzing use of homeless programs and measuring costs.

Step Three: Calculate Length of each Program Stay

A key building block of homeless system costs is homeless program utilization, which can be described in terms of the number of days stayed in a residential program.

We calculated the length of each program stay, chronologically sequenced and tallied program stays for each household, cleaned the program stay data to merge concurrent stays and truncate overlapping stays, and assigned Program Stay IDs. We defined all program stays associated with a master household and the gaps in time between these stays as that household’s homeless “path.” The first program entry date for each household’s first program stay was designated as that household’s “Household Start Date,” and the program exit date of the household’s last program stay was designated as that household’s “Household Exit Date.” For program stays that did not have valid exit dates, we assumed that the household exited a residential program on the day it started another residential program. In cases where there was no exit date for the final stay, we imputed exit dates using a “hot deck” imputation approach based on the length of stay for other client records within the same program type. Finally, if a household was still enrolled in a program as of the end of the eighteen-month follow-up period, the length of stay was truncated to the maximum client end date based on 548 days (18 months)⁸ from the household start date. These lengths of stay were used to calculate homeless program costs for each household and to group individuals or families into similar patterns of homeless system use.

Developing Homeless Program Typologies and Deriving Homeless Unit Costs for Each Program Type

To determine the unit cost for each program used by a member of the study cohort (usually a cost per day), we inventoried all homeless programs within the system at each site (HUD-funded and not HUD-funded), interviewed CoC and program staff to learn more about each program, and developed homeless program typologies for each site. The typology’s primary purpose was to identify like programs for which unit costs derived from a sample of the group would reasonably represent the

⁸ The period was thirty months (913 days) in Washington, D.C.

costs of the full group. Thus, the typology was based on key cost drivers, including: whether a residential program was operated in a facility or scattered-site environment, the extent of privacy afforded, the level of supervision, and the nature and intensity of services provided as part of the program. In addition to these cost drivers, we also considered the role of the program within the homeless assistance system and time limits for participants. The resulting typologies were tailored to each site. This means that some program types appear in more than one case study, and some appear in only one.

To derive homeless unit costs by program type within each site, we:

1. selected a sample of programs within each type from which to collect unit costs directly;
2. used on-site interviews, review of financial documentation, and extensive follow-up to document total costs for each program, calculated separately for housing operations (including rent, where applicable), supportive services provided as part of the program, administration, and the capital costs associated with facilities owned by the program or donated to the program rather than rented;
3. calculated unit costs (household nightly costs for family programs and bed night costs for single programs) for each program, with and without capital costs included;
4. calculated average unit costs for each program type, weighted by the number of occupied units or beds, and assigned a cost code to each program designating whether its unit costs should be represented by its own actual costs, the costs of another program within the same type that was substantially similar, or the weighted average unit costs of the program type.

Cost Data Collection Strategy

During visits to each of the study sites, we attempted to collect all costs for each sampled homeless program and, sometimes, all homeless programs of a particular type. Costs were collected using a standard data collection instrument that guided probes for information in various cost categories to ensure that all aspects of program operations, services provided as part of the residential program, and program administration were included. We collected information on sources of funding and made sure that the sources and costs balanced, as a check on the total costs. As described in more detail in the section that follows, we also spent extensive effort collecting costs on capital expenditures for program facilities that were paid for or donated to the agency and, therefore, do not appear in the program's operating budget. All homeless costs are based on 2006 program budgets or actual expenses; therefore all homeless program costs are expressed in 2006 dollars.

We collected comprehensive data on costs of programs providing supportive services only while we were on site. We intended to divide the total program figures by appropriate units to derive average unit costs that could be multiplied by each person's actual program utilization. This effort was confounded by two issues—our ability to accurately define units that represented the various types of services offered by each program, and our ability to accurately track individual client-level utilization of service units.

- We found that programs that offered a uniform type of service, such as outreach services, could generally be valued in terms of a contact or hour of client-staff interaction. But multi-service programs, such as drop-in centers, might provide a \$2 bus token, utility assistance, case management, healthcare, medication, employment support, or a shower.

Therefore, it was virtually impossible to estimate the value of administering each service type without conducting a thorough time-study of the program.

- Even when we could define units of service and measure their costs, we found that most programs providing only social services did not accurately record service utilization in the community HMIS.

Ultimately, we included only the costs of outreach contacts and only for two case studies, Jacksonville and Houston. Thus, the homeless system costs reported in the case studies should be interpreted as residential homeless program costs. Fortunately, the work we did to inventory programs and collect their costs at each site suggests that there are very few non-residential service programs targeted to homeless people at our study sites and that many of the programs provide modest levels of service. In each case study, we provide information about the extent of missing costs to the homeless services system that may result from not including stand-alone homeless supportive services programs.

Capital Costs

We consider it important to include capital costs for the buildings in which the homeless programs operate as part of the total cost of providing residential services to homeless individuals and families. When facilities are leased in the private market, we can assume that the costs associated with prior or future capital investments are included as part of the lease rate. If the agencies own or are donated the use of the facility, operating costs do not include rent and, therefore, we would capture only part of the facility cost if we did not find another sources of capital cost information.

We collected two types of information on capital costs:

- Costs incurred to construct and rehabilitate buildings, based on administrative records and interviews. We found it very difficult to find complete information, as many of the facilities did not have the records associated with a mortgage loan (e.g., a pro forma). Some were built several decades ago, some were government property, and some were gifts from individuals. In addition to the difficulty of determining original development costs, we found that records of property rehabilitation not reflected in annual operating budgets were difficult for many providers to assemble.
- 2006 property values from tax assessment data. We decided that this was a more consistent and comprehensive way of determining capital costs than historical data on capital expenditures. However, not all communities systematically record the values of tax-exempt properties. We converted all costs to 2006 dollars using the Consumer Price Index less Shelter for the MSA or appropriate region and amortized the total investment over a 30-year period with a three percent inflation rate.

We prorated the resulting capital values to calculate a daily per unit capital cost. However, we found some property values and resulting estimates of daily costs that were not easily explained by the property's size, location, and other characteristics. The scope of the study did not accommodate further econometric analysis to explain and validate the reasonableness of the capital cost component of estimates of daily unit costs.

In this report, we have included capital costs in the daily unit costs for the three sites for which we are most confident about the validity of the cost estimates, either because many of the programs pay

market rents for the facilities they use or because of the quality of the tax assessment data. For Jacksonville, Upstate South Carolina, and Des Moines, our cost analysis incorporates estimates of all capital costs in the costs reported for the homeless services system.

Homeless System Costs for Each Household in the Study

Homeless system costs were calculated for each household in the study sample based on the following formula, where LOS represents that household’s length of stay in the specified program:

$$\begin{array}{l} \text{Homeless System Costs for} \\ \text{each Household} = \end{array} \begin{array}{l} \text{Program Stay 1 LOS} \times \text{Program 1 Unit Cost} \\ + \\ \text{Program Stay 2 LOS} \times \text{Program 2 Unit Cost} \\ + \\ \text{Program Stay n LOS} \times \text{Program n Unit Cost} \end{array}$$

We calculated utilization statistics and total, mean, and percentile values of homeless system costs for the study cohort and for selected subgroups within the cohort. Thus, these costs reflect the actual costs associated with participation of the study cohort in residential homeless programs. The costs are represented in the case studies as homeless system costs “during homelessness,” although it is important to note that the costs may be spread across an extended period in which there are days or months during which the individual or family was not being served by residential homeless programs, which we refer to as “gaps.” Some of these gaps may result from incomplete HMIS data, but, since we deliberately targeted communities with high rates of HMIS participation, they most probably represent the intermittent use of homeless residential services by many individuals and families. More extensive discussion on the time periods used to present the findings is provided in Section 2.5.4.

Identifying Common Groups of Homeless System Users (Path Groups) and Calculating their Costs and Characteristics

Analysis of “path” groups, or groups of users who share similar patterns of homelessness, is an area in which this study breaks new ground. For each of the case studies, we analyzed the pattern of program stays for individual households and used cluster analysis to group households with similar patterns of homeless system utilization. We refer to this process as the path group analysis.

We based the path group analysis on four types of information about the person’s homeless system use:

- types and sequence of homeless programs used (sequence categories);
- number of program stays;
- duration of Program Stays (cumulative days across all stays); and
- gaps between programs stays (cumulative days across all gaps).

To develop the sequence categories we created a sequence analysis file, which reports the program type sequences used by each client and aggregates like sequences. Three or four members of the study team independently grouped the sequences into similar “sequence categories” and then worked together to develop consensus sequence categories. The sequence categories became one variable used in the multivariate cluster analysis. We then applied multivariate cluster analysis to derive the

path groups based on the four variables listed above.⁹ We did not determine in advance the number of path groups desired. For each site, we reviewed various analytical outputs, and chose the model that resulted in the most coherent clusters with sufficiently sized path groups. Thus, the number of clusters varied across sites. Finally, we assigned a Path Group ID to each of the client records in our research database to make possible the analysis of costs and demographics by path group.

Extracting Mainstream Service Utilization Data for the Study Population

We used the mainstream data to estimate the mainstream system costs associated with our study population that were incurred anytime from 12 months prior to each household's homelessness (Household Start Date) through December 31, 2006. In Kalamazoo, the study period began and ended six months later, so mainstream data collection ended on June 30, 2007. We analyzed mainstream costs for three time periods:

- *Prior to Homelessness*: 12 months prior to Household Start Date through Household End Date
- *During Homelessness*: Household Start Date through Household End Date
- *Following Homelessness*: Household End Date through December 31, 2006 (June 30, 2007, in Kalamazoo).

For example, if someone experienced homelessness from July 15, 2004 through November 30, 2004, the time periods for the mainstream service utilization were:

- Prior to homelessness: July 15, 2003 – July 14, 2004
- During homelessness: July 15, 2004 – November 30, 2004
- Following homelessness: December 1, 2004 – December 31, 2006
- Full period: July 15, 2003 – December 31, 2006

Costs following homelessness represent mainstream costs incurred after the household's last exit from the homeless system during the 18-month period in which we tracked homelessness and any costs incurred after the 18-month period. Mainstream costs were calculated for each timeframe for each individual and summed into master household totals.¹⁰

The steps used to match HMIS data with mainstream service data and calculate mainstream costs were:

1. **Finder File.** We produced a finder file for each study site that we provided to each agency to use to identify people in our study who used the mainstream system.
2. **Agency Services Information.** We worked with the mainstream system administrator or mainstream agency contacts to document general agency information, types of agency services provided, and the unit or costs of client services and allocated client benefits.

⁹ The study team used a cluster analysis algorithm that can handle both continuous and categorical variables (Chiu, Fang, Chen, Wang & Jeris, 2001; Zhang, Ramakrishnon & Livny, 1996).

¹⁰ In Washington, D.C. we only received information on whether households received any services in specified domains at any time. The time period for these results was from July 2003 through July 2008.

3. **Matching Client Records.** Either Abt or the mainstream system administrator matched client records in the mainstream database(s) to clients in the finder file. Once shared records were identified, mainstream records associated with these individuals were extracted for the full study period.
4. **Client Service Utilization.** Depending on whether client-level data could be released to Abt, either Abt or the mainstream system administrator analyzed mainstream service utilization data and generated standard mainstream table shells for pre-, during, and post-homelessness and the full study period by path group and by specified demographics and household variables. These were used as the basis for the case study reports.

Analyzing Homeless and Mainstream Costs

To calculate total costs associated with homelessness in each site, we started by summing homeless and mainstream costs for each individual or family for each period and then aggregated the costs across time periods and households to convey the costs associated with a particular group of homeless individuals or families in the study cohort.

*Costs associated with
Homelessness =*

*Total Costs incurred by the Homeless System
+
Total Costs incurred by Mainstream Systems*

Most of the analysis reported in the case studies shows household medians and averages and total costs for specific domains during the periods before, during, and following homelessness. However, members of the study cohorts spent varying amounts of time homeless and, therefore, had shorter or longer periods following homelessness, as well as varying amounts of time homeless, and this can make the cost estimates misleading. For example, if Medicaid costs are lower for the study population during homelessness than after homelessness, one might assume that people become disconnected with mainstream medical care during homelessness. However, if the period of homelessness averages three months and the period after homelessness averages fifteen months, the difference in costs may just reflect that the households had longer time period in which to incur costs following homelessness. We addressed this issue by calculating time-adjusted average monthly household costs for each period and group to allow for meaningful comparison of costs associated with different time periods and across groups that may have varying lengths of homelessness.

Multivariate Analysis of Determinants of Costs

To examine how demographic characteristics and patterns of homelessness are related to costs, the study team used a multivariate analysis technique called multiple regressions. Multivariate analysis is useful because it allows us to identify the *independent* impact or effect of each variable of interest on costs, while holding all other variables constant. This analysis helps us to answer questions, such as:

- Which demographic factors are associated with higher costs, after controlling for the duration of homelessness and path groups?
- Everything else being equal, what is the relationship between the duration of homelessness and total costs incurred? What is the relationship between the duration of homelessness and total mainstream costs?

- Which path group tends to incur the highest costs, holding the demographic variables constant? Which path group tends to incur the lowest costs?
- Is there a correlation between mainstream system costs and homeless costs?

To conduct the multivariate analysis, we developed regression models to explain homeless system costs. The explanatory variables used in the models included:

- homeless path group or path group constituent variables (length of stay, number of stays, and length of gaps);
- gender (individuals sites only);
- race (individuals sites only);
- age (individuals sites only);
- number of adults (family sites only);
- number of children (family sites only); and
- changes in household composition (family sites only).

A central research question for this study is the relationship between homeless paths (e.g. groups of people who use the system in similar ways) and costs. Thus, homeless path group was used as an explanatory variable. However, we were also interested in gaining a more nuanced understanding of the impact of cumulative length of homeless stays, number of homeless stays, length of gaps between stays, and types of programs used. These two analyses could not be done in the same model, since the path group variable was derived from the variables on homeless patterns. Thus we ran two families of models related to homeless costs, one set using the path group variable itself, and another using the three independent variables related to patterns of homelessness.¹¹ Within each family of models, we layered different combinations of the independent variables to understand their relative influence.

For Houston and Jacksonville, the sites in which we had access to client-level mainstream data, regression models were also developed to explain the variations in total homeless system and mainstream costs per household. Separate models were estimated for the following categories of costs:¹²

- total costs (total homeless costs + total mainstream costs);
- total homeless costs;
- total mainstream costs;
- specific mainstream costs

¹¹ A fourth variable used in the cluster analysis, program sequences, was not included.

¹² The study team used the logarithm (log) scale of the costs as the dependent variable. The log specification is commonly used in the cost modeling literature. It has a number of appealing characteristics. First, the estimated model coefficients can be interpreted as percentage changes in the dependent variable for a 1-unit change in the explanatory variable. Second, it implies non-linearity and joint determination of the cost level by all the explanatory variables in the model. Third, the specification mitigates a common form of heteroskedasticity in the model's error term (Wooldridge, 2001). One exception is that, for regression models developed for the mainstream domain costs in Jacksonville, we used the cost amounts in their original metric.

To measure the relationship between these categories of costs and homelessness, three families of models were developed to separately test independent variables for 1) homeless path group, 2) the four variables related to patterns of homelessness, and 3) homeless system costs as an independent variable and excluding path group variable and the four variables related to patterns of homelessness. The models also included versions with and without covariates for involvement in mainstream domains. For instance, the model for criminal justice measured whether people who had received mental health treatment (as well as the other mainstream systems) were associated with higher criminal justice costs, when controlling for the other independent variables.

2.6. Cross-Site Analysis

The cross-site findings presented in this report are the result of two analytical approaches. First, we synthesized the findings from the separate case studies and identified common themes as well as salient differences that emerged among the various sites. Second, we integrated data across sites into a combined cross-site cohort dataset and analyzed the records using multivariate regression analysis, adding a dummy site variable to model the influence of site differences. In some cases, we also had to standardize the variables that diverged across sites prior to creating the cross-site dataset. The latter analytical approach was only possible for analysis of the homeless system patterns and costs, which were gathered consistently across all sites. It was not possible to conduct a similar analysis of mainstream costs, since we were unable to collect client-level mainstream costs in most sites and since the mainstream domains obtained differed from one site to another.

The steps for the cross-site multivariate analysis are described in more detail below.

Standardization of Variables

While an important part of the case studies was to generate both program and path typologies that were tailored to the site and household type, for the cross-site analysis, we re-categorized these typologies using the generic groupings of emergency shelter, transitional housing, permanent supportive housing, and non-residential program types. For example, in Houston, we originally categorized individual emergency shelters as either short-term shelter or extended stay shelters. In Jacksonville, the distinction between overnight shelters and 24-hour shelters was a more important typological distinction. For the cross-site analysis, these programs were all re-categorized as “Emergency Shelter.” The “non-residential type included outreach programs as well as programs that were involved in direct placement of clients into mainstream housing with a short rental subsidy and case management.

For each individual or family, we then created a program type use variable, based solely on which of these general program types the household used. The basic groupings created were as follows:

- cohort members using emergency shelter only;
- cohort members using transitional housing only;
- cohort members using emergency shelter and transitional housing only; and
- cohort members using any other combination of program types.

The last combination included households that were served by non-residential programs as well as those served by permanent supportive housing. Unlike the path groups used in the case studies, these

groupings were not based on cluster analysis and did not account for length of stay, number of stays, or gaps, or the sequence in which households used the particular programs. However, these other factors (except sequence) were re-introduced as variables in the cross-site multivariate regressions.

Finally, we ensured that the data were comparable across sites. This was particularly necessary for Washington D.C., which used a 30-month study period instead of an 18-month study period. In order to compare Washington, D.C. data directly to the other sites, we re-analyzed the patterns of the Washington, D.C. cohort, and incorporated only the data on costs, length of stay, number of stays, and gaps that were incurred during each family's first 18-months.¹³ In addition, the Washington D.C. cohort included 87 families that only used a program that placed families into mainstream housing. These families were excluded from the cross-site analysis, since they were never literally homeless, and this program did not have equivalents in other sites.

Cross-site Multivariate Analysis

We conducted two sets of additional regressions to support the cross-site analysis. One set of analyses was conducted for the four family sites, and another set of analyses was conducted for the three individual sites. Models were developed to explain two outcome variables: length of homelessness and homeless system costs.

These regressions used the same variables that were used to understand site-specific correlations (see section 2.5.5), with the exception of homeless path group, which was not comparable across sites. Instead, the models included the new program type use variable, as well as the length of stay, number of stays, and gap days. Each model in the cross-site regressions also included a variable for the site to control for differences in program costs across communities. Also, the family sites incorporated demographic data that were not used on the case study level, including gender of adults in households, race of head of household, age of head of household, and age of youngest child. Follow-up analyses were also conducted to address additional questions that arose:

- For families, we modeled the relative risks of households falling into one or other of our program type use categories, based on the explanatory variables.
- For individuals, we modeled the impact of the explanatory variables on number of stays, and another model to explain the cumulative length of gaps between homeless stays.

2.7. Limitations of the Study

Although this study of the costs associated with homelessness paves new ground and provides important findings in many areas, the results of this study also have several limitations.

Perhaps most importantly, the study does not attempt to isolate which of the mainstream costs are caused by homelessness, and it does not compare the benefits of different programs with the costs of their use. Thus, the study is not a cost-effectiveness study and is most accurately characterized as a study to measure the costs associated with homelessness, rather than the costs of homelessness.

¹³ We did not re-generate information on changes in household composition, which might have occurred after the first 18 months.

Specific limitations of our methodology include the following:

1. The study does not include homeless or mainstream system costs associated with individuals or families who may have experienced homelessness but who were not entered into the HMIS.
2. The study explicitly excludes households that were served by residential domestic violence providers at any point during their homelessness.
3. The estimates of costs to the homeless system do not reflect costs associated with the programs that do not report data to the HMIS.
4. Some capital costs are missing, as noted in Section 2.5.2.
5. Mainstream costs are limited to the domains for each case study listed in Section 2.4.3.

For all of these reasons, the estimates in this study may underrepresent costs associated with homelessness in our study sites.

Further, real world data is “messy.” The reliance on administrative data rather than direct data collection requires both trusting in the validity of the data entered by local system users and confronting inevitable gaps in data completeness. The actual data includes numerous data fields that were left blank and others that were inaccurate. Missing or inaccurate information in identifying fields, such as name, social security number and date of birth, inhibited our ability to match records within the HMIS itself in order to construct a complete homeless path or even to determine whether a client met the basic criteria for inclusion in the cohort. It also hampered our ability to match data with mainstream domains. Missing program exit dates was a frequent occurrence and affected our ability to precisely calculate length of stay, which is a critical part of determining homeless system costs as well as establishing the period of homelessness itself.

While we used state-of-the-art tools and statistical techniques to compensate for data entry shortcomings, such as using probabilistic record matching to link client records and hot-deck imputation to fill in missing exit dates, these techniques are only as accurate as the original input and decline in validity as the proportion of available data declines in relation to the missing data. Finally, not all of the data administrators of mainstream systems were able to use Link-King, which supports advance record-matching algorithm. In these cases, a more direct, deterministic record matching approach was used, which may have led to an undercount in the number of matches found.

3. Homeless Program Costs

This chapter reports on the costs of residential programs for homeless people across the six study communities. Little has been documented nationally about the program budgets or daily costs of providing different types of homeless programs. Estimates for homeless programs used in other studies of the costs of homelessness have been based primarily on levels of reimbursement available from public agencies. For this study, homeless program costs are based on actual budgets collected from examples of different types of residential programs in each of the case study sites.¹ Using actual program costs provides a more detailed understanding of the variation in costs across homeless programs. It also provides insight on the main cost components of homeless residential programs: operations, services, administration, and in some cases capital investments in facilities owned by programs.²

This chapter discusses daily program costs by program type within our study sites, starting with program costs for individuals and followed by a discussion of program costs for families. Within each section, the costs per person per day are discussed in two different ways:

1. *Community costs*: average daily costs for all programs types in the community for which we collected cost data, **weighted by program size**; and
2. *Cohort costs*: average daily costs for the program types **as they were used by the study cohort**.

The distinction is subtle but important. The average costs per day weighted by program size represent the costs of the sample of programs for which we collected costs at each site weighted by the typical number of individuals or families using the program each day.³ These average costs fulfill the interest in the field in understanding the cost per day of different types of homeless programs. They also allow us to compare the variability of costs from one community to another. However, community weighted averages do not reflect the way the study cohort used the various programs. Averages weighted by program size assume that households use each program in proportion to its size.⁴ In contrast, the average cost per day for members of the study cohort reflects the actual levels of use of each program by the cohort. For example, if the study cohort used more expensive

¹ Daily unit costs were calculated by taking a program's 2006 annual budget, divided by 365 days to get the average daily cost of the program and then divided by the average number of occupied units per day to arrive at the average daily cost per unit. See Section 2.5.2 for a detailed discussion of the methodology. Homeless program costs are expressed in 2006 dollars.

² To explore the relative value and influence of capital costs for programs that owned their own properties (and therefore invested real or in-kind resources to build, acquire and/or rehabilitate them), capital daily cost estimates were developed for the Des Moines, Jacksonville, and Upstate South Carolina case studies.

³ The sample was selected to achieve an understanding of the costs of each homeless program type operated in each community; however, the average costs are not statistically representative of all homeless programs within each the community.

⁴ For example, assume that a community has one 10-unit and one 90-unit emergency shelter. The weighted average assumes that if the cohort spends ten days in emergency shelter, one day will be spent in the 10-unit program and nine days will be spent in the 90-unit program. In practice, members of the study cohorts did not use programs according to these proportions.

emergency shelter programs extensively, then the cohort’s average costs per day are higher than the weighted averages for all programs for which we collected data, and vice-versa.⁵

As we discuss throughout this report, the cost findings illustrate the powerful influence of variation in costs among particular programs, as well as variations in costs among types of programs.

3.1. Homeless Program Costs for Individuals

We identified three primary types of homeless residential programs for individuals in Des Moines, Houston, and Jacksonville: emergency shelter, transitional housing, and permanent supportive housing. Sometimes we went beyond this three-part classification and created further categorizations based on the “housing model”—the type of residential space provided or amount of time an individual was expected to spend in the program.

The average cost per day is shown for each program type within each site in Exhibit 3.1. Overnight emergency shelter has the lowest cost per day, typically offers the fewest services in the least private settings, and is often open only during evening and nighttime hours. Transitional housing is generally an expensive model and frequently offers individual room or apartment settings and a range of supportive services. In Houston, Extended Stay Emergency Shelter, in many respects very similar to transitional housing but with shorter intended lengths of stay, has slightly higher costs than transitional housing. Permanent supportive housing also generally offers private living space and supportive services. Providers who operate it indicate that residents are offered services equivalent in intensity to or even greater than services offered in transitional housing; however, in most cases, we found that permanent housing programs arrange for residents to receive services directly from mainstream systems.⁶ Services paid for by permanent supportive housing programs directly appear to be limited to housing-focused services and basic case management. As a result of this structure, permanent supportive housing programs do not have to secure resources to fund these services directly, and the costs are on average comparable to the less expensive 24-hour emergency shelter programs *from the perspective of the homeless system*. Scattered Site Permanent Supportive Housing has higher costs than transitional housing in Houston primarily due to the costs of leasing private apartments.⁷

⁵ If we did not directly collect costs from a program, we used the costs of another program within the same type that was substantially similar. If there was no substantially similar program, we used the weighted average costs of the program type.

⁶ Because these clients receive services that they would otherwise be eligible for and could continue to receive these services if they moved to alternative housing, we did not include this cost as part of the housing program. Although the resident may be enrolled in this service as a direct result of being accepted into the housing, anecdotally we heard that clients moving into PSH are already enrolled in mainstream care and may even be referred to the permanent supportive housing by their mainstream providers. Our analysis of PSH client enrollment in mainstream services, reported in Chapter 4, is consistent with this assertion. Services paid for with the program budget and those dedicated to the project are accounted for in the program daily costs, when possible.

⁷ The Houston site does not include the daily equivalent value of capital investments. Therefore, the daily costs of facility-based programs may under-represent the housing operations costs in comparison to programs that lease space in the private market.

Exhibit 3.1 also presents the proportion of costs spent for housing operations, services, agency overhead, and the daily cost equivalent of capital investments for programs that are operated in a facility owned by the agency. When facilities or individual housing units are leased, the capital costs are reflected in the housing operations budget.

Exhibit 3.1: Average Cost Per Person Per Day of Homeless Residential Programs Serving Individuals by Program Type and Site ^a						
Site – Program Type	Housing Model	Average Cost Per Person Per Day ^b	Housing Operations	Supportive Services	Agency Overhead	Capital Costs ^c
Des Moines						
Emergency Shelter	Congregate	\$19	\$8 (42%)	\$9 (44%)	\$2 (9%)	\$1 (5%)
Transitional Housing	Shared Rooms	\$34	\$11 (33%)	\$14 (43%)	\$7 (20%)	\$1 (4%)
Transitional Housing	Individual Rooms	\$50	\$17 (34%)	\$11 (21%)	\$7 (13%)	\$16 (31%)
Permanent Supportive Housing	Shelter Plus Care	\$18	\$17 (94%)	< \$1 (2%)	< \$1 (4%)	\$0 (0%)
Houston						
Emergency Shelter	Short Stay	\$28	\$7 (25%)	\$17 (60%)	\$4 (15%)	
Emergency Shelter	Extended Stay	\$61	\$14 (23%)	\$27 (44%)	\$20 (33%)	
Transitional Housing	Facility-based	\$55	\$16 (29%)	\$30 (55%)	\$9 (16%)	
Permanent Supportive Housing	Facility-based	\$22	\$14 (64%)	\$5 (25%)	\$3 (12%)	
Permanent Supportive Housing	Scattered Site	\$59	\$31 (52%)	\$18 (31%)	\$10 (17%)	
Jacksonville						
Emergency Shelter	Overnight	\$14	\$7 (54%)	\$3 (25%)	\$1 (8%)	\$2 (13%)
Emergency Shelter	24-hour Shelter	\$32	\$22 (70%)	\$5 (16%)	\$5 (14%)	\$0 (0%)
Transitional Housing	Facility-based and Scattered Site	\$29	\$13 (46%)	\$11 (37%)	\$4 (15%)	< \$1 (2%)
Permanent Supportive Housing	SRO, Facility-based and Scattered Site	\$29	\$14 (48%)	\$9 (30%)	\$2 (7%)	\$4 (14%)

^a Costs represent the average across programs within each type, weighted by the typical number of individuals served in each program each day. Costs only represent homeless system costs and do not include the value of mainstream system costs that may be incurred while individuals or families reside in these programs.

^b Total weighted daily unit cost may not equal the sum of the budget component estimates due to rounding

^c Capital costs were available for Jacksonville and Des Moines, but not for Houston.

More expensive programs generally have higher costs across all budget categories. Higher costs of housing operations may reflect more supervision when comparing an overnight program to a 24-hour program, or increased private space and smaller program capacity (i.e., decreased economies of scale) when comparing transitional and permanent supportive housing programs to emergency shelters. Often more expensive programs provide more services to clients, in the form of either lower case loads or a broader range of services. Agency overhead costs frequently are higher in more expensive programs, again in part due to smaller program capacity and associated decreases in economies of scale. It also appears that many of the more costly programs have higher management and overhead expenses and may be operated by agencies that have a professional management structure. As the

break-down of costs in Exhibit 3.1 shows, the higher cost of transitional housing is generally driven by higher costs across all areas: housing operations, services, overhead, and capital costs.

Often cost differences reflect idiosyncratic features of particular programs. Nonetheless, there are trends in costs by program type that appear to be tied to the programmatic and physical requirements of the different program types. As we discuss in Chapter 4, transitional housing that is used by the study cohort of homeless individuals is consistently more expensive than emergency shelter used by the cohort. Multivariate analysis that controls for other cost drivers shows that individuals who use transitional housing, or transitional housing in combination with emergency shelter, have costs more than double costs of individuals who only use emergency shelters.

3.1.1 Monthly Program Costs and Local Costs of Housing

Exhibit 3.2 shows the average costs per month for each program type in each community compared to HUD's Fair Market Rents (FMRs) for a one-bedroom unit in the same community. The FMR is one way to quantify the value of a rental subsidy for a month.

Exhibit 3.2: Average Cost Per Person Per Month for each Homeless Program Type for Individuals and FY2006 One-Bedroom Fair Market Rents^a				
	Emergency Shelter	Transitional Housing	Permanent Supportive Housing	2006 Fair Market Rent for One-bedroom Unit^b
Des Moines	\$581	\$1,018 – \$1,492	\$537	\$549
Houston	\$853 - \$1,817	\$1,654	\$664 – \$1,757	\$612
Jacksonville	\$408 - \$962	\$870	\$882	\$643

^a Costs shown reflect weighted averages by program type. Ranges represent the averages of different housing models within a program type, also shown as daily costs in Exhibit 3.1.

^b FMR Source: HUD, 2005. The FMR does not include the monthly fee paid to a public housing agency for administering the voucher program, which was approximately \$58 per unit per month in these three communities. (HUD, 2007)

In Chapter 4 we discuss average and median lengths of homeless program stays and report that the majority of individuals who become homeless in each of the three study sites use homeless programs for considerably less than one month. However, for individuals who do use homeless programs for longer than one month, the monthly figures provide a way to compare the cost of the assistance that is being provided by these programs to a rent subsidy. The FMRs are much more similar across the three sites than the average homeless program costs per month, reflecting in part the great variability from site to site in what is provided within each homeless program type and how it is provided. Except for overnight emergency shelters in Jacksonville and permanent supportive housing in Des Moines, the FMR is lower than the monthly costs of all types of homeless residential programs in these communities. The sections below describe each program type, the costs associated with providing it, and the extent to which programs are providing both shelter and supportive services to clients—in contrast to the Fair Market Rents, which represent only the cost of housing.

3.1.2 Emergency Shelters for Individuals

All three sites provide emergency shelter for individuals, primarily in large facilities with congregate sleeping arrangements, communal meals, and short expected lengths of stay. Jacksonville has two

models of shelter: overnight shelter and 24-hour shelter. The overnight facilities offer minimal assistance (a hot meal, a cot, and chapel services) and often limit the number of consecutive nights clients can stay. For example, one overnight shelter allows three free nights per month and then charges \$5 per night. Although overnight shelters are not very large, they serve more people than other program types because they have the highest turnover rates. Jacksonville's 24-hour emergency shelter has continual supervision, on-site supportive services, and no explicit limits on length of stay. Des Moines' emergency shelter beds are similar to Jacksonville's 24-hour shelter model. Houston also has two models of shelter, referred to in this study as Short-Stay Emergency Shelter and Extended Stay Emergency Shelter. The short-stay programs serve either single men only or single women alongside women with children. Short-stay shelters offer beds, food, and assistance in moving clients back into housing as quickly as possible. The shelters for men are overnight shelters. One of them allows clients to stay for free for up to 8 nights a month and then begins charging a nightly fee. The women's short-stay shelters have 24-hour staffing and allow stays of up to 90 days.

The category that we refer to as Extended Stay Emergency Shelters offers a rich variety of supportive services and accommodates stays of 3 to 6 months. Extended stay shelters provide clients a greater level of privacy and have a wider array of services than the shorter-stay model, in many ways paralleling the environment and programming provided at a transitional housing program but with the expectation of shorter stays. Programs in this category are primarily targeted to women with a history of substance abuse.

Exhibit 3.3 reports the average cost per person per day, the range of costs per day across programs within each program type at each site, and the average cost per day of each program type as it was actually used by the study cohort.

Exhibit 3.3: Average Cost Per Day of Emergency Shelter for Homeless Individuals				
Site	Housing Model	Average Cost Per Person Per Day	Range of Costs Per Person Per Day ^a	Average Cost Per Day As Used By The Cohort
Des Moines	Congregate	\$19	\$19	\$19
Houston	Short Stay	\$28	\$19 - \$73	\$36
Houston	Extended Stay	\$61	\$31 - \$85	\$67
Jacksonville	Overnight	\$14	\$14	\$14
Jacksonville	24-hour	\$32	\$32	\$32

^a If only one number is provided, costs were only collected from one program.

While emergency shelter costs are generally low, they are quite varied. Overnight and short-term emergency shelters have relatively low daily costs. In Jacksonville, the overnight emergency shelter has a cost of only \$14 per day. Des Moines' congregate shelter program is provided for \$19 per day. Jacksonville's 24-hour shelter serves both singles and families and has a daily cost more than double the cost of the overnight emergency shelter, \$32. Houston's short-stay programs have a similar average daily cost, \$28, although costs ranged from \$19 per day to \$73 per day depending on the program. Houston's extended stay shelter model has a cost almost triple the daily cost of the short-stay shelters, \$82. The lower cost emergency shelter programs all have high capacity (more than 100

beds) and are able to achieve significant economies of scale that are not achievable with programs that have only 20 to 40 beds.

Single women are frequently served in shelter programs that also serve families and that also have much higher daily costs.⁸ A single agency in Houston operates a short-stay program for single men and another program for families and single women. The shelter for men, a large facility with more than 300 beds, operates at a daily cost per person of only \$19, compared with \$73 for the program for families and single women. Half (51 percent) of the \$54 difference in cost can be attributed to services, for which the agency spends \$40 per single woman compared with \$13 per single man. But the program also spends \$26 more per night for single women on housing operations and agency overhead, since the women and families program provides more privacy and individual space and there are fewer units in the facility over which to prorate fixed housing operations and agency overhead costs.

Exhibit 3.3 also shows that the average daily cost of emergency shelter in Houston as it was actually used by members of the study cohort is higher than the cost per person per day weighted by program capacity. This means that individuals in the study cohort of first-time homeless individuals used the expensive programs slightly more than the less expensive programs within each category.

3.1.3 Transitional Housing Programs for Individuals

Transitional housing programs serving single adults in our study sites are offered in both facility-based and scattered site settings. Of the programs we examined, those designed exclusively for single adults use a facility-based model, whereas programs that serve families with children or both families and single women use both models. In the facility-based model, clients are housed in a single building or a campus of buildings owned or leased by the program. In the scattered site model, households are placed in independent apartments located in larger complexes where most of the buildings' tenants are not homeless. The difference in privacy and independence associated with scattered site transitional housing (which was offered for single women but not for single men in our study sites) may contribute to longer lengths of stay for single women. And since single women were often served in more expensive programs that were designed to accommodate families, their associated costs were also higher when compared with single men in the study cohort, as we discuss in Chapter 4.

Most transitional housing programs offer supportive services, including case management, assistance in securing benefits, and job training. In Jacksonville, many of the transitional programs screen out persons who are actively using drugs or alcohol and cite employment, sobriety, and obtaining permanent housing as their primary program goals. By contrast, most programs in Houston target persons with substance abuse histories. One large program targets tuberculosis patients who are in recovery, and another serves persons with HIV/AIDS. Several transitional programs in Houston serve only women.

Des Moines has two models of transitional housing: one with individual rooms or apartments and another with shared rooms. The facilities used by the programs with individual rooms are large

⁸ This is an important point that is discussed in more depth in Chapter 4, since we find that, even when patterns of homelessness such as lengths of stay are controlled for, single women are associated with substantially higher costs than single men, implying that women use more expensive programs.

buildings in downtown Des Moines, some of which are valuable properties. This has implications for the programs' daily costs per person, since we included a daily cost equivalent of capital infrastructure in the estimates for Des Moines. Programs providing transitional housing with shared rooms generally are group homes and have a completely different housing and capital cost structure. They target homeless people with particular types of need. Three of the five programs in this category serve people who are homeless and have a history of incarceration and, therefore, a need for specialized services that help to address barriers imposed by a criminal history and to mitigate behavior that may lead to reincarceration. Another is a program for veterans operating within an emergency shelter building but with more privacy, longer lengths of stay, and extensive client services funded by the Veterans Administration. The final program is targeted to homeless men recovering from substance abuse.

Exhibit 3.4 shows the range of daily program costs for transitional housing within each site and compares average program costs per day overall with the costs of the programs as they were used by the study cohort.

Transitional housing has the highest program cost per person per day across the three residential program types in Des Moines (\$46) and Houston (\$55). In Jacksonville, the cost of transitional housing (\$29 per person per day) is comparable to the cost of the 24-hour model of emergency shelter. As shown earlier in Exhibit 3.1, approximately half of the costs of transitional housing are expended for housing operations and agency overhead, ranging from 45 percent in Houston, to 57 percent in Des Moines, to 61 percent in Jacksonville. In Houston, where we are unable to include the daily cost equivalent of capital investments, services account for 55 percent of costs, whereas services represent only 26 percent in Des Moines and 37 percent in Jacksonville. The remaining 2 percent in Jacksonville and 25 percent in Des Moines represent the daily equivalent capital costs of transitional housing facilities owned by the agencies. Since many of the transitional housing programs identified in Houston were facility-based, the proportion of costs for both housing and services would be lower if capital costs were included.

In Des Moines, the two types of transitional housing have quite different cost structures due to their different models and locations. The combined housing and capital daily equivalent cost of the private room model (\$32.62) is more than 2.5 times that of the shared model (\$12.58), primarily due to the high value of the properties in which the private room model operates. The supportive services cost for the shared room model, which targets special populations, is 37 percent higher (\$14.46 versus \$10.55), offsetting some of the differences in facility-related costs. The cost of administration (~\$7) is approximately the same for both models. The net cost of the private room model is 47 percent higher than the shared room model, a result that affects the average cost of transitional housing as used by the study cohort in Des Moines, since the private room transitional housing model was used for 35 percent more total days than the shared room model. (The number of days used is not shown in the exhibit.)

Within each type of transitional housing program in Des Moines, the study cohort used lower cost programs somewhat more extensively than higher-cost programs. Since many programs in Des Moines were targeted to special needs populations, the actual program use and resulting costs may reflect the extent to which the study cohort met various eligibility requirements. In Houston and Jacksonville, the study cohort used the more expensive transitional housing programs more often than the less expensive ones. This could reflect the fact that higher cost units often offer more privacy and are more attractive to residents, thereby resulting in longer lengths of stay and higher utilization.

Exhibit 3.4: Average Cost Per Day of Transitional Housing for Homeless Individuals

Site	Housing Model	Average Cost Per Person Per Day	Range of Costs Per Person Per Day	Average Cost Per Day As Used By The Cohort
Des Moines	Shared Room Transitional Housing	\$34	\$10 - \$80	\$28
Des Moines	Individual Room Transitional Housing	\$50	\$22 - \$204	\$43
Houston	Transitional Housing	\$55	\$19 - \$144	\$65
Jacksonville	Transitional Housing	\$29	\$13 - \$46	\$31

3.1.4 Permanent Supportive Housing for Individuals

Permanent supportive housing provides indefinite housing assistance and supportive services to residents, directly or guaranteed based on formal relationships with mainstream providers. Permanent supportive housing in the three study sites is commonly offered in both facility-based and scattered site models. Houston has made a considerable investment in permanent supportive housing. These units are almost evenly split between facility-based and scattered-site programs. The biggest provider of supportive housing units targets persons with HIV/AIDS. Houston also has large permanent supportive housing programs for disabled veterans and individuals with severe mental illness. The only permanent supportive housing program serving individuals in Des Moines is a Shelter Plus Care (S+C) program providing subsidies for homeless people with disabilities who rent private market units. Under agreements with several providers of mental health and substance abuse services, a local non-profit sponsor of affordable housing make slots in the S+C program available to clients referred by those agencies.

While permanent supportive housing is generally limited to persons with a chronic disability that inhibits independent living, the majority of permanent housing units considered part of the residential system for homeless individuals in Jacksonville are Section 8 Moderate Rehabilitation Single Room Occupancies (SROs). Unlike permanent supportive housing, these programs do not exclusively serve persons with disabilities, although local providers said that most residents do have disabilities. Aside from meals, these permanent housing SROs do not include on-site supportive services. Services are provided through formal relationships with mainstream service providers and by referral. Jacksonville also has some permanent supportive housing programs that offer more intensive on-site supportive services.

In all three of the study sites for individuals, the cost per person per day of permanent supportive housing is less than or equal to the cost of transitional housing, with the exception of the scattered site permanent supportive housing model in Houston, which has slightly higher average costs per day (Exhibit 3.1). The cost of permanent supportive housing averages \$18 per day in Des Moines and \$29 per day in Jacksonville. In Houston, the cost is \$22 per day for facility-based housing and \$59 per day for scattered site housing. Because most services are delivered by mainstream agencies that residents are otherwise eligible for (and would be eligible to continue to receive if they moved to alternative housing), we did not include the costs of mainstream services as part of the permanent supportive housing program cost estimates. Although the resident may be enrolled in this service as a

direct result of being accepted into the housing, anecdotally we heard that clients moving into permanent supportive housing already are enrolled in mainstream care and may even be referred to the housing by their mainstream providers. Our analysis of enrollment of users of permanent supportive housing in mainstream services (reported in Chapter 4) is consistent with this premise. Services paid for within the program budget or otherwise dedicated to the project are accounted for in the program daily costs to the extent possible.

Martha Burt conducted two self-report surveys (2004 and 2007) of more than 90 permanent supportive housing providers that enable us to place these costs in context. The surveys were part of a multi-year study of the Taking Health Care Home evaluation for the Corporation of Supportive Housing (Corporation for Supportive Housing [CSH], 2005; CSH, 2008).⁹ These programs housed primarily individuals with chronic patterns of homelessness and used mainly facility-based models. From the 2007 survey, Burt reports costs averaging \$46 per unit per day, with housing costs of \$27 and services costs from all sources of \$19. These costs are higher than the estimates of the average cost per person per day presented in Exhibit 3.5 for permanent supportive housing in Des Moines and Jacksonville, and for facility-based permanent supportive housing in Houston. These lower overall costs in the study sites reflect lower services costs, but also lower housing operations costs, as shown in Exhibit 3.1. Perhaps the programs surveyed in the Burt study are more comparable to properties in this study with costs at the higher end of the ranges shown in Exhibit 3.5.

Exhibit 3.5: Average Cost Per Day of Permanent Supportive Housing Programs for Homeless Individuals

Site	Housing Model	Average Cost Per Person Per Day	Range of Costs Per Person Per Day ^a	Average Cost Per Day As Used By The Cohort
Des Moines	Scattered Site	\$18	\$18	\$18
Houston	Facility-based	\$22	\$13 - \$69	\$54
Houston	Scattered Site	\$59	\$35 - \$80	\$47
Jacksonville	Scattered Site and Facility-based	\$29	\$21 - \$41	\$24

^a If only one number is provided, costs were only collected from one program.

Another analysis, conducted by Abt Associates Inc. (2005) for HUD, reviewed the costs of permanent supportive housing projects serving individuals with a history of chronic homelessness. That cost review also found lower costs than the Burt survey. The Abt Associates analysis was based on program budget data collected on-site and included costs of services unless we concluded that they were mainstream costs readily available to all people with qualifying conditions regardless of their homelessness. That study found average daily costs per person of \$21 for older facility-based models (62 percent for housing, 38 percent for services), \$22 for newly developed properties (46 percent for

⁹ This information was self-reported in response to a survey and not based on direct examination of program budget documents. Some survey respondents reported that they were unable to include costs reimbursed by certain mainstream systems, such as Medicaid.

housing, 54 percent for services), and \$40 for scattered site models (57 percent for housing, 43 percent for services).¹⁰

The comparison of average costs per day with the costs per day actually incurred by the study cohort within each site (Exhibit 3.5) again illustrates how client-specific or systemic decisions that determine who uses which particular program can make a significant difference in costs incurred by the homeless services system. This is most clear for Houston. On average, the scattered-site permanent supportive housing model in Houston costs almost three times as much as the facility-based model. However, the individuals we studied who used facility-based models generally used the more expensive programs, whereas those who used scattered site housing used less expensive programs than the community average. As a result, the average cost per day for members of the Houston cohort using facility-based housing was greater than the average cost per day for those who used scattered site housing, exactly opposite what we would have surmised from the overall averages for the program types.

Des Moines has only one permanent supportive housing program, so there is no difference between the two average costs. In Jacksonville, the difference between the average cohort cost and the community-wide average cost shows that members of the Jacksonville study cohort used less expensive programs more heavily than more expensive models.

Very few individuals in our study cohort used permanent supportive housing at any time during the study's 18-month tracking period. For example in Des Moines, we found only four individuals in the Shelter Plus Care program from among the 1,124 who became homeless for the first time between July 1, 2004 and June 30, 2005. Across all three sites, this phenomenon may be a result of two patterns. First, most people using permanent supportive housing programs were not included in this study because they had been housed in a homeless residential program before July 1, 2004. Second, some individuals in our study cohorts who used permanent supportive housing were not placed there until well into the 18-month observation period, so some permanent supportive housing stays may have been truncated. Regardless, costs associated with permanent supportive housing are not a major part of the costs associated with homelessness for our study cohort.

3.2. Homeless Program Costs for Families

As we did for individuals, we identified three primary types of homeless residential programs for families in our four family study sites—emergency shelter, transitional housing, and permanent supportive housing—and also made further distinctions among “housing models” for some program types in some communities. The average cost per family per day is shown for each program type in Exhibit 3.6 for DC, Houston, Kalamazoo, and Upstate South Carolina. The exhibit also shows the proportion of costs spent for housing operations, services, agency overhead, and—only for Upstate South Carolina--the daily cost equivalent of capital investments for programs that are operated in a facility owned by the agency. (Rental or leasing costs for facilities not owned by the agency are factored into housing operations.) These are the average costs per day for the programs for which we collected cost data, weighted by program capacity. Costs for the programs as used by the study cohorts of first-time homeless families are presented later.

¹⁰ These figures do not include daily equivalent costs for capital investments.

Exhibit 3.6: Average Cost Per Family Per Day of Homeless Residential Programs Serving Families by Program Type and Site^a

Site – Program Type	Housing Model	Average Cost Per Family Per Day ^b	Housing Operations	Supportive Services	Agency Overhead	Capital Costs ^c
District of Columbia						
Emergency Shelter	Congregate	\$123	\$67 (54%)	\$41 (33%)	\$16 (13%)	
Emergency Shelter	Apartment-style	\$83	\$45 (55%)	\$30 (36%)	\$8 (10%)	
Transitional Housing	Facility-based	\$73	\$19 (26%)	\$32 (45%)	\$21 (29%)	
Transitional Housing	Scattered Site	\$72	\$33 (47%)	\$27 (38%)	\$11 (16%)	
Permanent Supportive Housing	Shelter Plus Care ^d	\$42	\$39 (94%)	\$0 (0%)	\$3 (6%)	
Houston						
Emergency Shelter	Congregate and Apartment-Style	\$46	\$9 (19%)	\$31 (66%)	\$7 (15%)	
Transitional Housing	Facility-based	\$149	\$37 (25%)	\$82 (55%)	\$30 (20%)	
Transitional Housing	Scattered Site	\$65	\$22 (34%)	\$30 (46%)	\$13 (20%)	
Permanent Supportive Housing	Shelter Plus Care and Facility-based	\$27	\$13 (48%)	\$7 (27%)	\$7 (25%)	
Kalamazoo						
Emergency Shelter	Congregate	\$54	\$27 (50%)	\$25 (46%)	\$2 (4%)	
Transitional Housing	Facility-based and Scattered Site	\$27	\$16 (58%)	\$8 (31%)	\$3 (11%)	
Permanent Supportive Housing	Shelter Plus Care	\$29	\$19 (65%)	\$0 (0%)	\$10 (35%)	
Upstate South Carolina						
Emergency Shelter	Congregate and Single Family	\$76	\$26 (34%)	\$32 (43%)	\$13 (17%)	\$5 (6%)
Emergency Shelter	Church Hospitality	\$297	\$68 (23%)	\$194 (65%)	\$35 (12%)	\$0 (0%)
Transitional Housing	Scattered Site	\$40	\$20 (50%)	\$15 (37%)	\$5 (12%)	< \$1 (<1%)
Permanent Supportive Housing	Shelter Plus Care	\$22	\$21 (96%)	\$0 (0%)	\$1 (4%)	\$0 (0%)

^a Costs represent the average across programs within each type, weighted by the typical number of families served in each program each day.

^b Total weighted daily unit cost may not equal the sum of the budget component estimates due to rounding.

^c Capital costs are included for Upstate South Carolina only. Capital costs are only applicable to programs that own their own facilities.

^d The District has both scattered site and facility-based programs, but costs were only collected from the City-funded scattered site program.

As we found for programs for individuals, the more expensive family program types tend to have higher costs across all budget categories. That is, cost differences among programs are not explained by only one budget category. For example, in Houston, facility-based transitional housing costs more than 3 times as much as emergency shelter (\$149.39 vs. \$46.37). The housing operations cost is 4.2 times higher (\$37.35 vs. \$8.87 per family per day), and the services cost is 2.7 times higher (\$82.11 vs. \$30.62 per family per day). The higher cost of housing operations probably reflects both increased private space and lower program capacity, which decreases economies of scale. The higher

cost of services probably reflects more intensive services, as would be expected for transitional housing.

In DC, apartment-style emergency shelter is more expensive than scattered site transitional housing (\$83 vs. \$72). The housing operations cost is one-third higher (\$45 vs. \$33), and the services cost is one-tenth higher (\$30 vs. \$27). The apartment-style emergency shelter is facility-based, with 24-hour staffing, and the higher cost of housing operations may reflect this additional on-site supervision.

Often more expensive programs provide more services to clients, in the form of either lower case loads or a broader range of services. Agency overhead costs frequently are higher in more expensive programs, again in part due to smaller program capacity and decreased economies of scale. Cost differences also reflect idiosyncratic features of particular programs, such as program, size, amount of private space per family, level of volunteer or in-kind services, or the value of the physical location.

Unlike transitional housing for individuals, transitional housing for families is not consistently more expensive than emergency shelter. Emergency shelters are more expensive on average than transitional housing programs in DC, Kalamazoo, and Upstate South Carolina. One reason is that families often get private rooms or apartments in emergency shelter, in contrast to emergency shelter programs for individuals. Emergency shelters that serve families also are small and therefore have few units over which to prorate fixed costs, such as on-site supervision. Emergency shelter programs for families are likely to be open 24 hours a day and often provide fairly intensive supportive services. In Upstate South Carolina, the church-based shelter programs have particularly high in-kind costs associated with volunteer labor and donated materials. We counted the value of these contributions as costs since the program could not be operated without them. Thus, the physical and programmatic differences between family shelters and family transitional programs are not as great as they are between these program types for individuals. At the same time, there usually are very different philosophies, program goals, and intended lengths of stay between family emergency shelters and family transitional housing programs.

The characteristics of specific programs have more influence on costs for each program type within the family sites compared with the individual sites, because most communities had only a few family programs. Thus, the average program costs reflect heavily the costs of specific programs, such as a high-cost publicly-operated congregate shelter in the District of Columbia,¹¹ the small church-based shelters in South Carolina, a large and service-rich facility-based transitional housing program in Houston, and a particularly low-cost transitional housing program in Kalamazoo.

Despite the lower average cost per day for family transitional housing compared with family emergency shelter, we found that families in our study cohort who use transitional housing programs have higher costs than families who only use emergency shelter, as will be discussed in Chapter 5. Families in the study cohort who used only emergency shelter used less expensive shelter programs more heavily, while those who used transitional housing only or in combination with shelter used transitional housing programs higher-cost shelter programs more heavily.

¹¹ This program has subsequently been closed and the DC system has shifted entirely to an apartment-based emergency system.

As we found for individuals, permanent supportive housing was the least expensive program type *from the perspective of the homeless system*. In most cases, we found that permanent housing programs arranged for residents to receive services directly from mainstream systems rather than from the permanent supportive housing programs directly, so permanent housing programs did not have to secure resources to fund these services directly and the services costs are not accounted for in these estimates. However, even setting aside the issue of services, permanent supportive housing for families usually has equivalent or lower housing operations costs than the emergency shelter or transitional housing programs in the same site. Having said that, the cost of permanent supportive housing plays only a small role in the cost of homelessness for the study cohort of first-time homeless families. Very few families in the study cohort used it, because of a combination of capacity constraints and lack of families qualifying for permanent supportive housing on the basis of a disability.

3.2.1 Monthly Program Costs and Local Costs of Housing

Exhibit 3.7 shows the average costs per month for each program type in each community along with the average 2006 HUD Fair Market Rents for a two-bedroom unit in the same community.

Exhibit 3.7: Average Cost Per Family Per Month for Each Homeless Program Type for Families and FY2006 Two Bedroom Fair Market Rents ^a				
	Emergency Shelter	Transitional Housing	Permanent Supportive Housing	2006 Fair Market Rent for Two-bedroom Unit ^b
District of Columbia	\$2,496 - \$3,698	\$2,146 - \$2,188	\$1,251	\$1,225
Houston	\$1,391	\$1,940 – \$4,482	\$799	\$743
Kalamazoo	\$1,614	\$813	\$881	\$612
Upstate South Carolina	\$2,269	\$1,209	\$661	\$599 (Greenville MSA)

^a Costs shown reflect weighted averages by program type. Ranges represent the averages for different programs within a program type.

^b FMR Source: HUD, 2005. The FMR does not include the monthly fee paid to a public housing agency for administering the voucher program, which ranged from \$50 to \$90 per unit per month in these four communities. (HUD, 2007)

In Chapter 5 we discuss the total homeless system costs incurred for each first-time homeless family over an 18-month tracking period. Many families remain in homeless programs for a month or more. In most cases, a month of assistance provided within the homeless system exceeds the local Fair Market Rent—that is, the maximum subsidy cost of providing a housing voucher to the family. The sections below describe each program type, the costs associated with providing it, and the extent to which programs are providing both housing assistance and supportive services—in contrast to the Fair Market Rents, which only represent housing assistance.

3.2.2 Emergency Shelters for Families

All four study sites provide emergency shelter for families, but shelter for homeless families looks quite different from shelter for homeless single adults.¹² Two types of shelter are offered in the District of Columbia: congregate emergency shelter and apartment-style emergency shelter. Congregate Emergency Shelters have communal eating and bathing facilities and little privacy. Families may share rooms, depending on the size of the family and the space available at the facility. During our study period, the largest of the congregate programs, DC Village, was the main point of entry into the emergency shelter system for families in DC. DC Village closed in October 2007, just before the end of the period during which we tracked families. Policy-makers were aware of the high daily cost of DC Village, and advocates for homeless people objected to its remote location and its lack of privacy. The factor that precipitated the facility's closing was the DC government's need to use the property for another purpose.¹³

The District of Columbia also houses families in Apartment-Style Emergency Shelters in which each family has a private apartment. However, there is 24-hour supervision, and access by visitors is restricted. During the study period, entry into these facilities usually was by referral from DC Village. The programs are funded by the DC government, and they must take any family referred to fill a vacancy.¹⁴ Emergency shelters for families have fairly high per family costs (Exhibit 3.6). In DC congregate shelter is the most expensive homeless program type, averaging \$123 per family per day. Apartment-style shelter costs two-thirds as much (\$83) per day in comparison, with the savings relatively evenly distributed across housing, services, and administration.

In Houston, emergency shelter programs for families provide both dormitory-style shelter units with shared kitchen and bath facilities and individual apartments that provide families more privacy and autonomy over their daily routines. Services include basic emergency support services such as food, immediate crisis intervention and de-escalation, and referral to more intensive services at other programs. The length of stay in congregate dormitory programs is intended to be shorter than in individual apartment emergency shelters, with an emphasis on referring families into more intensive service programs such as apartment-based shelters or transitional housing. Apartment-Style Emergency Shelter programs are structured as 90-day shelters with a level of service and linkage that is intended to be more intensive than congregate dorm emergency shelters. These programs focus on placing families directly into permanent housing. Exhibit 3.8 presents the costs of these two program types together. The average cost of emergency shelter for families in Houston is \$46 per family per day, with the services budget 66 percent of that total.

In Kalamazoo, families are served primarily by two shelter programs. One is a large house that is shared by up to six families. The other is operated for both families and single women in a large facility with shared common areas and private sleeping rooms. This facility also has a transitional housing program for families on another floor. Across the two programs, the average cost is \$54 per

¹² Except when single women are served alongside families in a women and families program.

¹³ After the closing of DC Village, another congregate program, DC Hypothermia, remained open but with plans to close. The number of apartment-style shelters was expanded to offset the loss of beds at DC Village.

¹⁴ The only exception is that the program can refuse to accept a family that would threaten the safety of other residents.

family per day, but the program operated in the single-family home is significantly more expensive due to lower economies of scale for housing and overhead and substantially more supportive services.

South Carolina provides three types of emergency shelters: congregate shelters, single family homes, and church hospitality networks. Congregate Facilities have open bed space or small sleeping rooms with shared living space and bathrooms. Occupancy is often fluid between families and single women based on need that day. Length of stay typically is less than six weeks. Single Family Houses are shared by multiple families, but offer private space for each family and have somewhat longer lengths of stay. Church Hospitality Networks provide housing sponsored by various congregations around the 13-county area covered by the Upstate South Carolina Continuum of Care. The actual shelter space rotates weekly in church rooms, and the programs are heavily staffed by volunteers. Lengths of stay typically are short but can last several months. The cost per family per day for the church-based program type is very high (\$297), in part reflecting actual paid costs and in part reflecting the estimated value of volunteer hours and donated space and supplies.¹⁵ Together the congregate and single family shelters cost an average of \$76 per family per day, of which 43 percent funds services.

Exhibit 3.8 reports the average cost per family per day, the range of costs per day across programs within each program type at each site, and the average cost per day of each program type as it was actually used by the study cohort.

Exhibit 3.8: Average Cost Per Day of Emergency Shelter for Homeless Families				
Site	Housing Model	Average Cost Per Family Per Day	Range of Costs Per Family Per Day ^a	Average Cost Per Day As Used By the Cohort
District of Columbia	Congregate	\$123	\$123 ^b	\$123
District of Columbia	Apartment-style	\$83	\$67 - \$102	\$80
Houston	Congregate and Apartment-style	\$46	\$23 - \$175	\$61
Kalamazoo	Congregate	\$54	\$32 - \$179	\$75
Upstate South Carolina	Congregate and Single Family	\$76	\$37 - \$135	\$82
Upstate South Carolina	Church Hospitality	\$297	\$229 - \$348	\$229

^a If only one number is provided, costs were only collected from one program.

^b Costs were also collected for DC Hypothermia overflow shelter, which has daily costs of \$28 per family; however, these costs were not included in the program type average, since the Hypothermia shelter serves only a limited purpose. Members of the study cohort also used shelters for single individuals at times, whose costs are included in the DC case study and analysis reported in Chapter 5. They are not reported here, since this section discusses costs associated with family programs.

¹⁵ Many emergency shelter programs rely on substantial volunteer support to operate. Our cost calculation methodology shows the costs that would be required to replicate the level of effort provided by these programs.

Emergency shelter programs for families have huge variations in costs, ranging from \$23 per day on the low end to \$348 on the high end, as shown on Exhibit 3.8. The range of costs reflects differences in both the housing model and the type and level of services provided. Exhibit 3.8 also illustrates the influence of the specific programs used by the study cohort on the costs of homelessness reported in this study. The average costs per family per day for members of the cohort are slightly higher than the overall average daily costs of emergency shelter in Houston and for congregate and single-family shelters in Upstate South Carolina, meaning that the cohort spend a greater number of nights in more expensive programs than the lower cost ones. No one in the study cohort in Upstate South Carolina used the more expensive of the two church hospitality programs, so the cohort's costs represent only the relatively lower cost church program. The Kalamazoo cohort's daily costs for emergency shelter are almost 40 percent higher than the overall program average, since one-third of the cohort's shelter nights were spent at the more expensive shelter program. In DC the cohort used less expensive programs slightly more than higher cost programs within the Apartment-Style Emergency Shelter program type.

3.2.3 Transitional Housing Programs for Families

The four family study sites have transitional housing programs that aim to help the head of household become stably employed, maintain sobriety, and move to market-rate housing with or without the assistance of a Housing Choice Voucher. Facility-based programs are operated in a building owned by or rented exclusively for the program, while scattered site programs are provided in individual apartments that are rented on behalf of the program's clients. In some programs, families must find and move into different permanent housing units at the end of the transitional period. Other scattered-site programs allow families to remain in the same housing unit after graduating from the transitional program, assuming the families can assume the lease payments. Some housing units in a scattered-site program may be in the same larger rental development or may be located in particular neighborhood and serve families with ties to that neighborhood.

The District of Columbia, Houston, and Kalamazoo all offer both facility-based and scattered site transitional housing models. In Kalamazoo, one of the transitional programs is operated within the same facility as an emergency shelter, and almost all participants have graduated from the shelter program. One transitional housing program that was heavily used by the study cohort in Kalamazoo is facility-based and has very low housing operations costs. All transitional housing programs for families in Upstate South Carolina use a scattered-site housing approach.

The cost to operate transitional housing programs varies widely from one program to another, within and across sites, ranging from a weighted average cost per day of \$27 for the transitional housing programs in Kalamazoo to a weighted average of \$107 per day in Houston (Exhibit 3.9). The structure of the housing (e.g., facility-based vs. scattered site) does not seem to drive costs up or down consistently. On average, housing operations consumes a greater proportion of the program cost and services a lower proportion of the cost in scattered site models than it does in facility-based models. However, for the three sites that have both types of transitional housing, we were not able to include an estimate of capital costs for transitional housing programs that owned their facilities. Had we done this, it would reduce the percentage of total cost represented by services for these programs. The absolute dollar value of the average cost per day used to fund services is higher for facility-based programs than for scattered site programs in DC and much higher in Houston (Exhibit 3.6). It is possible that facility-based programs provide more living-support services, such as child care or informal resident mediation, while the case management and self-sufficiency related services on

average are comparable in intensity for facility-based and scattered-site transitional housing. It is also possible that scattered site programs provide more of their services through referral to mainstream employment or treatment programs, and that these services costs do not show up in their direct budgets.¹⁶ In interviews conducted for the study, program staff described similar levels of services across the two housing models.

Exhibit 3.9 reports the average cost per family per day, the range of costs per day across programs within each housing model at each site, and the average cost per day of each program type as it was actually used by the study cohort.¹⁷

Exhibit 3.9: Average Cost Per Day of Transitional Housing for Homeless Families				
Site	Housing Model	Average Cost Per Family Per Day	Range of Costs Per Family Per Day	Average Cost Per Day As Used By the Cohort
District of Columbia	Facility-based	\$73	\$30 - \$109	\$77
District of Columbia	Scattered Site	\$72	\$40 - \$112	\$68
Houston	Facility-based and Scattered Site	\$107	\$52 - \$177	\$134
Kalamazoo	Facility-based and Scattered Site	\$27	\$14 - \$66	\$22
Upstate South Carolina	Scattered Site	\$40	\$26 - \$44	\$40

In addition to the considerable range of program costs per day within each site, there is huge variation among sites, with the most expensive transitional housing program in Kalamazoo comparable in cost to some of the least expensive programs in Houston. These site differences have a substantial impact on the overall costs associated with first-time homeless families from one community to another. (See further discussion in Chapter 5.) The exhibit also shows that families in the study cohort who use transitional housing in Houston and families who use facility-based transitional housing in the District of Columbia make relatively heavy use of the more expensive transitional housing programs. The difference is most notable in Houston, where the study cohort used a high-cost, service-rich transitional program more heavily than other programs. This Houston program provides very high-levels of services (\$100 per day), including extensive services for the children of families enrolled in the program. In contrast, in Kalamazoo, families in the study cohort used the least expensive transitional housing program two-thirds of the time, increasing the differences in costs for first-time homeless families among the four communities.

¹⁶ For homeless system costs, we recorded costs of all housing and services provided directly by the program. The homeless system costs do not include costs of services provided by mainstream systems if the services were also available to other people who were not enrolled in the homeless program. To the extent that families received services from mainstream programs that were included in the mainstream system cost analysis for that site, these costs would be reflected in the mainstream system cost analysis for that site. Some mainstream services such as employment and training were not included in either the homeless system or mainstream system costs, whereas services such as mental health and substance abuse treatment services were included more frequently.

¹⁷ If only one number is provided in the Range column, costs were only collected from one program.

3.2.4 Permanent Supportive Housing Programs for Families

For families, permanent supportive housing is most commonly provided using a Shelter Plus Care, scattered-site model, and services are primarily brokered through mainstream agencies. Most target families have severe and persistent mental illness or chronic substance abuse, although some programs also target families with HIV/AIDS. Kalamazoo and Upstate South Carolina both use only a scattered-site model and target families with mental illness. The District of Columbia also uses mainly Shelter Plus Care, making units available to the clients of agencies serving homeless families with various types of qualifying disabilities. The few small facility-based supportive housing programs for homeless families in DC are privately funded, not integrated into the homeless services system, and not included in this study.

Houston provides both facility-based and scattered-site permanent supportive housing. Under agreements with providers of mental health and substance abuse services, slots in permanent housing are made available to homeless clients referred by those agencies. The referring agencies commit to providing case management while their clients are living in the housing and provide or link their clients to behavioral and physical health care and to other services such as job training and job support.

In all four of the family study sites, the cost of permanent supportive housing per family per day is less than the cost of any other program type in the residential system for homeless families (Exhibit 3.6), with an average cost of \$22 in Upstate South Carolina, \$27 in Houston, \$29 in Kalamazoo, and \$42 in the District of Columbia. The costs of operating the housing (i.e., for renting the housing units) and for managing the program (i.e. for administering the program) constitute all of the costs recorded in DC, Kalamazoo and Upstate South Carolina, and represent 73 percent of the cost of permanent supportive housing in Houston. Service costs explain the other 27 percent in Houston. This does not mean families in Shelter Plus Care or other scattered-site permanent supportive housing programs do not receive services. Rather, most services are delivered by mainstream agencies, and residents were eligible to receive them before they moved into permanent supportive housing and will continue to receive if they move to alternative housing. Anecdotally we heard that clients moving into permanent supportive housing already are enrolled in mainstream care and may even be referred to the housing by their mainstream providers. Analysis of Medicaid records in Kalamazoo, discussed later in Chapter 5, supports this hypothesis, since 89 percent of families in the group who used permanent supportive housing were enrolled in Medicaid in the period prior to homelessness.

Exhibit 3.10 reports the average cost per family per day, the range of costs per day across programs within each housing model at each site, and the average cost per day of each program type as it was actually used by the study cohort.

Exhibit 3.10: Average Cost Per Day of Permanent Supportive Housing for Homeless Families

Site	Housing Model	Average Cost Per Family Per Day	Range of Costs Per Family Per Day ^a	Average Cost Per Day As Used By The Cohort
District of Columbia	Scattered Site	\$42	\$42	\$42
Houston	Scattered-Site and Facility-based	\$27	\$16 - \$59	\$38
Kalamazoo	Scattered Site	\$29	\$19 - \$58	\$20
Upstate South Carolina	Scattered Site	\$22	\$22	\$0 ^b

^a If only one number is provided in the Range column, costs were only collected from one program.

^b None of the families in the Upstate South Carolina cohort used permanent supportive housing.

Only a small percentage of permanent supportive housing units in most communities are dedicated to families, and an even smaller percentage of families in our study cohorts used permanent supportive housing during our study period. None of the families in the South Carolina cohort used permanent housing, so while the average cost per day of permanent supportive housing is \$22, the cost for the cohort shown on Exhibit 3.10 is \$0. Low utilization occurred across all of the family sites. In Houston, the cohort spent only two percent of its total days in residential homeless programs in permanent supportive housing. In DC, five percent of the cohort's days were spent in permanent supportive housing programs. The higher percentage for DC is affected by the 30-month observation period, which is one year longer than in the other sites. While the Kalamazoo study cohort spent 8 percent of its days in homeless programs in permanent supportive housing; these stays represent only 11 families or 3 percent of the cohort. These 11 families were in permanent supportive housing for most of the observation period.

The relatively low use of permanent supportive housing by first-time homeless families is related to a number of factors. Most families do not have a disability sufficient to qualify them for the program. Furthermore, many communities do not have many permanent supportive housing units for families, and the low turnover among those housed within them limits opportunities for families who are eligible to be housed in permanent supportive housing. Finally, other families in our study cohort may eventually have been housed in permanent supportive housing, but the 18-month observation period for three of the four communities in this study may not have been long enough to include these stays.

3.3. Policy Implications of Program Costs

This chapter summarized the wide-ranging costs of providing residential homeless programs to individuals and families. Several key policy considerations emerged related to the costs of different types of homeless programs, as well as individual programs within a community.

Emergency shelters for families are generally similar in cost and sometimes even more expensive than transitional housing programs, whereas transitional housing for individuals is generally more expensive than shelter. This broad finding has several policy and planning implications. First, given the low daily cost of emergency shelter for individuals, it would be very difficult to fund a prevention response that would yield cost savings. However, the higher costs of emergency shelter for families

may make homelessness prevention programs more cost-effective than emergency shelter for some families. Communities could also look at the cost structure of current emergency shelter programs for families to determine if the environment and services offered are appropriate to the needs of those who are using them. If shelter is intended to house families only briefly, it may not be necessary or cost-effective to provide non-crisis-related services within shelter. Therefore, it may be possible to reduce daily costs of shelter programs for families by scaling back on the therapeutic resources offered to families on-site. For those with greater needs who need longer stays or more intensive services, it may be more cost effective to quickly move them into transitional housing (facility-based or scattered site), permanent supportive housing, or permanent housing with mainstream supportive services.

Given, the high costs of transitional housing for both individuals and families, communities may want to consider whether alternative interventions or combinations of rent subsidies and standalone supportive services could achieve similar outcomes at lower costs. Permanent supportive housing is generally less expensive from the perspective of the homeless system than other types of residential homeless programs for families, often similar in cost to a deep rental subsidy. To the extent that individuals or families have disabilities that qualify them for permanent supportive housing, communities should expedite their placement into these units. The low cost of permanent supportive housing is largely attributable to lower homeless system service costs made possible by formally linking clients to mainstream services. Communities could also explore creating transitional housing modeled like permanent supportive housing with housing and limited housing-focused services provided by the homeless system and non-housing services intentionally provided by mainstream systems.

In general, communities may want to examine program costs to determine if there are less expensive ways of delivering comparable interventions. The huge range of costs within program types—for example among transitional housing programs for families—may or may not reflect differences in the quality of services delivered or in the outcomes for families.

Individual program features can also have substantial impacts on the costs of delivering homeless assistance. For instance, we discussed the substantially higher costs of an extended stay emergency shelter program in Houston for single women compared with an extended stay shelter program serving single men. The women’s shelter provided more services and more privacy and also had higher per-person administrative costs due to its smaller size. The study did not explore whether programs with higher costs also have better outcomes. Nonetheless, the agency operating both of these may want to consider whether it would be more cost-effective to develop a program for single women with housing costs and administrative overhead more similar to those of the program for single men. Compounding the variability of daily costs from one program to another, homeless families and individuals do not use homeless programs evenly. Communities will be able to reduce homeless system costs the most by reducing costs of programs used most heavily by homeless individuals and families. The converse is also true: adding a program feature that raises the cost of a heavily used program will have a disproportionate effect on the costs associated with homelessness in that community.

The differences between community average costs for each program type and the costs associated with each study cohort discussed in this chapter illustrate the point that costs are driven by actual program utilization. Further, utilization varies for people with different demographic characteristics and needs. For instance, first-time homeless individuals may use a different set of programs than

individuals with chronic medical needs. Local efforts to shift costs to create a more effective response to homelessness must be conducted within the context of the programs serving the group of greatest interest to the community.

None of this is to suggest that communities should always seek to lower program costs. Strong outcomes may require a sizable investment; however, policymakers should understand what drives costs in their communities, so they can consider cost implications as part of the decision-making.

Cost per day is only one dimension of the costs of homelessness to the homeless services system. Lengths of stay, or the number of days an individual or a family uses residential programs for homeless people, also have a powerful influence on costs. The next two chapters combine information on costs per day and on patterns of utilization of the homeless services system, first for individuals (Chapter 4) and then for families (Chapter 5).

4. First-time Homelessness for Individuals and its Associated Costs

This study confirms the findings of some prior research on homelessness for individuals and presents new findings about first-time homelessness for individuals and its associated costs. The most important themes about costs of first-time homelessness for individuals that emerged from the study are that:

- The overall experience of homelessness, program utilization, and associated costs vary widely from one subpopulation of first-time homeless individuals to another, with only a small subgroup incurring substantial costs. The half of the cohort with the lowest homeless system costs—individuals who only briefly use emergency shelter—incurred only 2 to 3 percent of the total homeless system costs. The highest-cost 10 percent of the cohort incurred 62 percent of the homeless system costs in Jacksonville, 70 percent in Des Moines, and 83 percent in Houston.
- The type of program used by individuals who are homeless appears to have the greatest influence on costs and certain program types and specific programs within those types are more expensive than others. The cost to the homeless services system of the most expensive 10 percent of individuals in the study cohort at each site generally reflects continuous use of expensive transitional housing programs for much or all of the 18-month observation period.
- For some subgroups, total homeless system costs incurred per person exceed the cost of an annual direct housing subsidy. Communities may want to consider whether housing assistance (without supportive services) would be a lower cost and potentially equally effective intervention for some of these groups.
- Single women are associated with statistically significant higher homeless system costs, even when controlling for their longer stays and the types of programs they use. Combining all of these factors, single women over 40 years old frequently have high system costs in the current system structure and may benefit from alternative interventions designed specifically to meet their needs. Other demographic groups, such as African-Americans and older adults are also associated with statistically significant higher costs.
- Cost savings may be achievable within the homeless system for first-time long-stayers based on providing housing assistance in different ways. However, the relationship between intensive use of the homeless system and high-cost mainstream use is not strong enough to expect significant cost savings within mainstream systems by ending homelessness for long-stayers as a whole.
- Higher mainstream costs in some domains were associated with individuals who had multiple episodes of homelessness. Communities could target individuals who return to shelter for a second (or third) non-consecutive program stay. This group may particularly benefit from intentional prevention-oriented discharge planning strategies.
- Mainstream system utilization and associated costs spike during homelessness, but costs also increase substantially immediately before first-time homelessness. Thus, costs peak

in the period just after the individual enters the residential homeless system. This finding suggests a need for discharge planning to ensure that individuals leave mainstream programs, such as inpatient treatment or jails, with adequate housing.

This chapter begins with a discussion of existing research, presents the findings of this study and then discusses the findings within the context of existing research.

4.1. Existing Research

4.1.1 Patterns of Homelessness among Individuals

Analysis of longitudinal shelter administrative data conducted a decade ago by Kuhn and Culhane (1998) in New York and Philadelphia provided a new typology of patterns of homelessness: transitional homelessness, episodic homelessness, and chronic homelessness. Although there had been prior research and discussion of typologies of homelessness, Kuhn and Culhane's framework was popularized by the National Alliance to End Homelessness (NAEH, 2000) and by the federal government when it adopted a ten-year goal to end chronic homelessness as part of its FY2003 budget (OMB, 2002). Transitional homelessness was characterized by short, single episodes of homelessness and described the pattern experienced by 80 percent of homeless individuals. Episodic homelessness described repeated short episodes of homelessness experienced over the course of years, often by younger individuals with chronic addictions. Chronic homelessness described a pattern of continuous stay in shelters extending over a year or more, generally by older individuals with mental illness. Ten percent of the individuals in Kuhn and Culhane's dataset experienced episodic homelessness, and the remaining ten percent were chronically homeless. The ten percent who experienced chronic homelessness consumed close to half of the emergency shelter bed nights, since they were present almost every night of the year, whereas other homeless individuals moved in and out of the system relatively quickly. While their study did not quantify the costs associated with each of these patterns of homelessness, the findings gave rise to a view among policymakers that communities could free shelter space and homeless system resources by identifying and addressing homelessness for the 10 to 20 percent of individuals who experienced episodic and chronic homelessness.

4.1.2 Mainstream Service Use by Homeless Individuals

Culhane, Metraux & Hadley (2002) also contributed to the literature on homelessness with a study of formerly homeless individuals with severe mental illness housed in permanent supportive housing in New York City, ("the NY/NY Cost Study"). Almost three-quarters of these individuals had used city-funded shelters within the two-year period prior to placement in permanent supportive housing, with an average shelter use of 137 days.¹ The study also found that these individuals experienced very high use of mainstream service systems (such as emergency rooms, inpatient psychiatric hospitals, and jails) in the two-year period prior to placement in permanent housing. The NY/NY study cohort incurred an average cost of \$40,500 per year (Exhibit 4.1). In the absence of other research covering multiple mainstream programs used by homeless individuals, the costs associated

¹ A history of homelessness was an eligibility requirement for the study, so the other quarter of the study sample presumably had some type of homeless episode in non city-funded shelters prior to placement or spent time on the "streets".

with the two-years prior to placement in permanent supportive housing have become for many a proxy of the costs of chronic homelessness.

Exhibit 4.1: NY/NY Cost Study Service Use during Two Year Period prior to Placement in Permanent Supportive Housing				
	Average days during 2 yr period prior to placement	Per Diem	Cost for 2 Year Period prior to placement	Annualized Cost
City Homeless Services	137	\$68	\$9,316	\$4,658
State Inpatient Psychiatric Hospitals	57.3	\$437	\$25,040	\$12,520
City Inpatient Public Hospitals	16.5	\$755	\$12,458	\$6,229
Medicaid (inpatient)	35.3	\$657	\$23,192	\$11,596
Medicaid (outpatient)	62.2	\$84	\$5,225	\$2,613
Veterans Affairs	7.8	\$467	\$3,643	\$1,822
State Corrections	9.3	\$79	\$735	\$368
City Corrections	10.0	\$129	\$1,290	\$645
TOTAL			\$80,899	\$40,451
<i>Source: Culhane et al., 2002</i>				

Other studies have shown that homeless people use emergency rooms at a much higher rate than the general population, attributing this greater use to many different factors, including a higher rate of assault-related and unintentional injuries, general poor health status, barriers to accessing routine healthcare, and a high rate of substance abuse and mental illness among homeless people (D'Amore, Hung, Chiang, & Goldfrank, 2001; Kushel, Vittinghoff & Haas, 2001; Mandelberg, Kuhn & Kohn, 2000; Padgett, Struening, Andrews, & Pittman, 1995). Kushel, Perry, Bangsberg, Clark and Moss (2002) analyzed a sample of 2,500 homeless and marginally housed adults in San Francisco and found that the 40 percent who went to the emergency room were more likely to be homeless rather than marginally housed, after controlling for other characteristics of study sample members. Kushel et al. (2002) also found that 8 percent of the study cohort visited emergency rooms four or more times within a year, accounting for 54.5 percent of all emergency room visits by the study sample. These high users also were more likely to be homeless than marginally housed. A 1998 study by Salit, Kuhn, Hartz, Vu and Mosso found that, after controlling for co-occurring substance abuse disorder or psychiatric disability and other patient characteristics, homeless patients had hospital stays 4.1 days (36 percent) longer than non-homeless patients. Folsom et al. (2005) found similar patterns of inpatient and crisis service use within the public mental health system. All of these findings suggest that homelessness is likely to be associated with high mainstream health costs.

Other studies have found a correlation between homelessness and involvement with the criminal justice system. Caton, Wilkins and Anderson (2007) cite findings of high rates of criminal history among individuals who experience long-term homelessness and suggest that the criminal justice system may be a safety net of sorts for individuals with severe mental illness who lack sufficient housing and treatment.

4.1.3 Opportunities for Cost Savings

With a growing body of research correlating costly mainstream system utilization with the chronic homelessness of people with significant levels of disability, policymakers and advocates became interested in understanding which interventions reduce the costs of mainstream system use associated with homelessness.

The NY/NY Cost Study concluded that placement in permanent supportive housing significantly reduced homeless and mainstream expenditures for formerly homeless, severely mentally ill individuals. This finding suggests that permanent supportive housing is an effective strategy to address chronic homelessness for persons with severe mental illness at little additional cost.² An experimental study of the cost-effectiveness of HUD-VA sponsored permanent supportive housing (VASH) for homeless veterans with severe mental illness (Rosenheck, Kaspro, Frisman, & Liu-Mares, 2003) found that the costs of permanent supportive housing were approximately 18 percent higher (\$2,067 annually) than the costs of standard care. Higher costs were largely attributable to the additional intensive case management costs and increased outpatient treatment costs incurred by this group. Rosenheck et al. did not observe differences between the intervention groups (VASH intervention, case management only, and standard care) in VA or other system costs significant enough to achieve cost offsets; however, the housing outcomes were greater for supported housing study participants so the study concludes that the intervention was most likely cost-effective.³ Different methodologies between the Rosenheck et al. and Culhane et al. studies limit the ability to compare results.

In a paper synthesizing findings on cost effectiveness—Rosenheck (2000) observes that while mainstream service use is frequently positively associated with homelessness, not all persons who are homeless and mentally ill have high service use. Interventions that target directly those individuals with high service use can more easily show cost-effectiveness than those that serve a broad group of homeless mentally ill persons. Rosenheck points out that in the evaluation of two programs targeting persons who were homeless and mentally ill but not necessarily high service users, only 10 percent of participants had annual inpatient costs sufficient to offset the costs of the intervention.⁴ He concludes that, while cost offsets are achievable, resource-intensive interventions must be narrowly targeted to high service users to realize the savings.

These studies are just a few among a growing body of research on costs associated with individuals who are homeless with severe mental illness. In addition, many localities have conducted, with varying degrees of rigor, their own cost studies of individuals who are chronically homeless or

² The NY/NY Cost Study found that the cost reductions in mainstream and homeless systems resulting from placement in permanent supportive housing were almost equal to the costs of providing the permanent supportive housing itself. This finding has fueled substantial investment in developing permanent supportive housing for chronically disabled homeless individuals around the country.

³ Cost-effectiveness is defined relative to societal value. In the absence of an established societal value for housing, Rosenheck reports cost-effectiveness for various monetary values.

⁴ The study evaluated the VA's Chronically Mentally Ill Veterans Program and the Access to Community Care and Effective Supportive Services Program evaluations. Rosenheck et al. measured fewer mainstream domains than Culhane et al. (2002) in the NY/NY Cost Study. With more comprehensive data, it is possible that more than 10 percent of participants would have realized cost savings equal or greater than the costs of the intervention.

individuals who are identified as frequent high-cost users. (See Culhane, Metraux, Park, Schretzman & Valente, 2007 for examples.) In many cases, this research has been used to build support and secure funding for interventions to assist individuals who may benefit from permanent supportive housing. The research has also left policymakers and advocates eager for parallel research on other populations.

Our study is intended to expand the base of knowledge on costs associated with other populations who experience homelessness, besides those with chronic patterns of homelessness or severe mental illness. Kuhn and Culhane (1998) noted that most other populations have relatively short episodes of homelessness and therefore can be expected to have much lower costs than those measured for homeless individuals with severe mental illness, but there has been little work to quantify the level and nature of those costs. This study examines first-time homelessness for individuals and the level of resources associated with their use of the homeless and mainstream systems in Jacksonville, Florida; Houston, Texas; and Des Moines, Iowa.⁵ While these results are not representative of the nation as a whole, they can help build our understanding of costs associated with homelessness to inform national and local policymaking.

4.2. Characteristics of First-time Homeless Individuals

We studied first-time homelessness among single adults in three study communities: Jacksonville, Florida; Houston, Texas; and Des Moines, Iowa.⁶ Across the three sites, we identified 7,502 individuals who became homeless for the first time between July 1, 2004 and June 30, 2005. More than half the study population was homeless in Houston, Texas. The characteristics of the study cohort in each site are shown in Exhibit 4.2.

Individuals who experienced first-time homelessness in the study communities were predominantly male, 73 to 81 percent across the three sites. On average, first-time homeless individuals were between 39 and 41 years of age at first program entry; only 15 to 18 percent were older than 50. In comparison to the national estimates in HUD's 2007 Annual Homeless Assessment Report (AHAR) (HUD, 2008), first-time homeless individuals in our three study sites were more likely to be male and somewhat younger. The AHAR estimates that the single adult homeless population who used emergency shelter or transitional housing is 69 percent male and that 24 percent are older than 50. The proportion of the study cohort that was African-American varied across the three communities, from 21 percent in Des Moines to 48 percent in Jacksonville to 57 percent in Houston.⁷

⁵ Past research has also found wide regional variations in costs of both homeless and mainstream services (Culhane et al., 2007).

⁶ Any adult who was served as part of a family at any time during the study period was not considered a single adult and was excluded from the study cohort. In Houston, these persons were studied as part of the family study cohort.

⁷ Information on ethnicity was missing from a high percentage of the HMIS records at our study sites. Therefore, ethnicity is not included in our demographic analysis. People who identified themselves as white and Hispanic were simply categorized as white.

Exhibit 4.2: Characteristics of the Study Cohort of Individuals Who Became Homeless between July 1, 2004 and June 30, 2005 as compared with National Estimates^a

	Size of Study Cohort	Women	African-American	Average Age	Age over 50 years
Jacksonville	1,972 persons	19%	48%	41 yrs	18%
Houston	4,406 persons	26%	57%	41 yrs	16%
Des Moines	1,124 persons	27%	21%	39 yrs	15%
National estimate ^b		31%	33%	N/A	24%

^a Percentages are based on sample members for whom we have data for the characteristic.

^b AHAR estimate for individuals who used emergency shelter or transitional housing between October 2006 and September 2007 (HUD, 2008).

Some of the differences between our study population and national estimates of the characteristics of homeless individuals may reflect differences among the three study sites and other communities or the fact that our study includes some individuals who used only outreach and some who used only permanent supportive housing programs, neither of which are included in the AHAR. However, the comparison with the AHAR estimates may also suggest differences between first-time homeless individuals (our study) and all homeless individuals (AHAR). In addition to describing the study cohort and placing it in a national context, demographic data about the study cohorts also were used to understand relationships between demographic characteristics and costs. Findings from multivariate regression analysis presented later in Section 4.3.2 show that higher homeless system costs are associated with being female, African-American, or older, even when controlling for homeless utilization patterns such as lengths of stay.

Section 4.3 focuses on utilization and costs of the homeless system itself; costs of mainstream services are discussed in Section 4.4.

4.3. Patterns of First-Time Homelessness and Associated Homeless System Costs

4.3.1 Homeless System Utilization

As shown in Exhibit 4.3, we found that more than half of the study cohort experiencing homelessness stayed “in the system” for substantially less than one month. The median length of time spent in homeless residential programs was 2 days in Houston, 10 days in Jacksonville, and just over 3 weeks in Des Moines. Average lengths of stay are longer than these medians: almost 6 weeks in Houston, 8 weeks in Jacksonville, and just over 10 weeks in Des Moines. The differences between the median and average lengths of stay reflect the skewed distribution of the homeless experience for individuals. While half of the first-time homeless population in Houston spends only a couple of days in homeless programs over an 18-month period, a sizable population has very long lengths of stay that substantially increase the average. As we show in the next section, costs for individuals in our study communities are similarly skewed. This finding on patterns of homelessness confirms the research by Kuhn and Culhane (1998) on patterns of homeless service utilization, extends those conclusions to communities other than New York and Philadelphia, and provides an important context for understanding the costs associated with homeless individuals. Local communities, such as Columbus

Ohio, have analyzed their own HMIS data and found similarly skewed patterns of use of the homeless services system.

Exhibit 4.3: Use of the Homeless System by the Study Cohorts of First-Time Homeless Individuals During an 18 Month Period					
	Average Days in Homeless Programs	Median Days in Homeless Programs	% of Cohort with One Program Stay	Average Number of Program Stays	Average “Gap Days” Between Stays
Jacksonville	57 days	10 days	50%	3 Stays	75 days
Houston	39 days	2 days	65%	3 Stays	44 days
Des Moines	73 days	24 days	53%	3 Stays	63 days

In addition to lengths of stay, other patterns also show a dramatically skewed distribution of the homeless experience. The average number of program stays (continuous days in a particular program) across the sites was three, as shown by Exhibit 4.3, but at least 50 percent of the cohort had only one stay, and the remainder of the cohort in each site averaged five or more stays.⁸ The “gap days” shown in the exhibit (days during the entire period of homelessness when an individual was not in a residential homeless program) are, by definition, associated with individuals with more than one stay and show that those with more than one stay were not just bouncing among residential homeless programs from one day to the next. In many cases, months elapsed between when an individual exited one program and when he entered another program. We cannot tell whether any particular individual was homeless on the streets during “gap,” living in his own housing unit, unstably housed with friends or family, or in an inpatient or institutional program.⁹

Multivariate regression analysis with covariates for demographic characteristics, program type, and sites was used to understand the factors that drive longer cumulative lengths of stay in homeless residential programs for the 7,502 individuals in the study cohort. The model’s results are presented in Exhibit 4.4.¹⁰ When multiplied by 100, the coefficients for the covariates can be interpreted as percentage differences in the number of days spent in homeless programs from the reference category because the outcome variable is in logarithm scale.

⁸ For purposes of this study, a stay is defined by continuous residence in a specific program. A new stay is counted each time the person enrolls in a new program. A “stay” is not to be confused with an “episode” as defined by Kuhn and Culhane (1998) as residence in homeless programs with gaps no longer than 30 days.

⁹ Some of these “gaps” may also represent incomplete data, since not every homeless program enters data about their clients in the HMIS.

¹⁰ See Appendix C.2.1, Model 2, for more detailed multivariate regression analysis results, including a model without the program type variable.

Individuals using both emergency shelter and transitional housing stayed more than 3 times longer than people who used only emergency shelter, the omitted category.¹¹ Individuals using only transitional housing stayed about 3 times longer. People served by outreach¹² or permanent supportive housing programs alone or in combination with emergency shelter or transitional housing stayed more than twice as long as those who used only emergency shelter. The shorter lengths of stays for people who use only emergency shelters likely reflect both the shorter-term nature of their need for residential assistance and the environment and design of most emergency programs, which encourage shorter stays or have explicit limits on days that can be spent in shelter. Shorter stays result in lower costs, as will be detailed in the next section.

The model results also highlight the influence of the nature and composition of the homeless services system at each site. After controlling for the program type used and demographics, individuals in Des Moines stayed 23 percent longer in homeless programs than individuals in Jacksonville (the reference category). Many members of the study cohort in Des Moines used a form of transitional housing in which residents have private living space and lengths of stay that suggest that outplacements to mainstream permanent housing are not a high priority for the programs. Everything else being equal, individuals in Houston stayed 47 percent *fewer* days in homeless programs

Exhibit 4.4. Regression Analysis of Lengths of Stay for First-Time Homeless Individuals in Des Moines, Houston, and Jacksonville

Explanatory Variables	Total Days Spent in Homeless Programs (log scale)
Types of Homeless Programs Used+	
Only Used TH Programs	2.029*** (0.063)
Used both ES and TH Programs	2.294*** (0.088)
Used Other Program Types or Combinations ^a	1.261*** (0.067)
Site Variables+	
Iowa	0.227*** (0.061)
Houston	-0.465*** (0.046)
Demographics+	
Age 18 – 24	-0.232*** (0.075)
Age 25 – 30	-0.043 (0.070)
Age 41 – 50	0.190*** (0.051)
Age 51 and over	0.261*** (0.062)
Female	0.735*** (0.047)
African-American	0.300*** (0.040)
Other Races	0.100 (0.080)
Constant	1.685*** (0.054)
Observations	7502
R-squared	0.36

+ Reference categories are: Used ES Only, Jacksonville, Age 31 – 40, Male, White.

Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Definitions: ES is emergency shelter, TH is transitional housing, and PSH is permanent supportive housing.

^aUsed Outreach Alone, Used PSH Alone, Used Outreach or PSH in Combination with ES or TH

¹¹ The coefficient of 2.294 indicates that these individuals spend 2.3 additional days for each reference day, or 3.3 times the reference category.

¹² In an attempt to capture the period of time that people experienced homelessness on the streets as part of length of homelessness calculations, each contact with a street outreach team was counted as one-day of homelessness—equivalent to a one-day program stay in a residential program—unless the contact was made on a day that the individual stayed in a residential homeless program, in which case the outreach contact was disregarded for length of stay calculations.

than individuals in Jacksonville. This probably reflects the time limits imposed on individuals in some of the emergency shelters and the fact that many individuals who were identified on the street did not use residential programs. Thus, individual program environments and rules may substantially influence lengths of stay. It is important to recall that this study does not measure the benefits of stays in the homeless services system, so we cannot say whether shorter or longer lengths of stay are positive or negative or whether the costs associated with these stays are worth the investment.

Ways in which the utilization of homeless programs varies by gender and race also are shown in Exhibit 4.4 and discussed below, along with cost variations by gender and race, in Section 4.3.3.

4.3.2 Costs to Homeless System of First-time Homelessness

The cost to the homeless services system for serving each first-time homeless individual is the sum of the costs of each program stay. The cost of each stay is the daily cost of the particular program used by the individual times the number of days in the stay. Daily costs varied tremendously from one program to the next. Differences in daily costs of programs used by members of the cohort generally explain differences in homeless costs from one person to another for individuals with otherwise similar patterns of homeless system use. (See Chapter 3 for a discussion of variations in the costs of homeless programs by site and program type.)

On average, individuals incurred \$2,101 in homeless system costs across the three study sites. The average homeless system cost incurred for each individual homeless person in the study cohort is similar in Houston and Des Moines (\$2,257 and \$2,308) and somewhat lower in Jacksonville (\$1,634).

Exhibit 4.5: Average Homeless System Cost per Individual			
	Jacksonville	Houston	Des Moines
Average Cost per Individual	\$1,634	\$2,257	\$2,308

Houston and Des Moines have similar average costs per first-time homeless individuals, despite having very different lengths of stay. Houston's shorter lengths of stay than Des Moines are offset by the higher daily program costs of the program types used by the Houston study cohort. Though average lengths of stay in Jacksonville were only slightly lower than the average for Des Moines, the Jacksonville cohort spent over half of its days in emergency shelter at an average cost of \$29 per day; whereas the Des Moines cohort spent over half of its days in transitional housing with individual rooms at an average daily cost of \$43 per day.

Average costs offer a general picture of the costs associated with homelessness, but they obscure important information about the wide variation in costs associated with first-time homelessness. Only a small group of homeless individuals incurred high costs at each site, while the majority had minimal costs. The half of the cohort with the lowest homeless system costs incurred only 2 to 3 percent of the total homeless system costs; whereas the highest-cost 10 percent of the cohort incurred 62 percent of the homeless system costs in Jacksonville, 70 percent in Des Moines, and 83 percent in Houston. As was discussed extensively in Chapter 3, transitional housing for individuals is more expensive on average than other program types, and programmatic factors also encourage longer lengths of stay, also driving up the costs for individuals who use transitional housing. Thus, it is not surprising that

the cost to the homeless services system of the most expensive 10 percent of individuals in the study cohort at each site generally reflects continuous use of expensive transitional housing programs for much or all of the 18-month observation period.

A multivariate regression model was also used to identify the relationship of different factors, including length of stay, to total homeless system costs per person (Exhibit 4.6) to better understand what is underlying the wide distribution of costs. The model R-squared statistics of 0.68, meaning that the set of explanatory variables used in the model was able to account for 68 percent of the variation in costs.

The model results suggest that, for these study cohorts of first-time homeless individuals, the influence on total cost per individual of the program type used is much greater than the influence of staying in the program for an additional month. Each additional month adds only 35 percent to the cost per individual, whereas using transitional housing (alone or in combination with emergency shelter) more than doubles an individual's total cost. Once both length of stay and program type are taken into account, the community in which the individual becomes homeless has no significant effect on the total cost per individual.

In addition to the length of stay and the type of program used, additional stays and the greater lengths of time between stays were both also associated with increased costs, but only with small increases.

4.3.3 Variations in Homeless System Utilization and Costs by Gender, Race, and Age

The multivariate analysis that predicts lengths of stay (Exhibit 4.4) shows that women stay in homeless programs 74 percent longer than single men. An alternative model specification excluding the program type covariate shows that women have 38 percent fewer distinct

Exhibit 4.6. Regression Analysis of Total Homeless System Costs for First-Time Homeless Individuals in Des Moines, Houston, and Jacksonville

Explanatory Variables	Total Homeless Costs (log scale)
Type of Homeless Program Used+	
Only Used TH	1.299*** (0.049)
Only Used ES and TH Programs	1.114*** (0.067)
Used Other Program Types or Combinations ^a	0.793*** (0.051)
Site Variables+	
Iowa	0.068 (0.045)
Houston	0.012 (0.033)
Homeless System Utilization	
Number of Homeless Program Stays	0.037*** (0.003)
Length of Stay (in months)	0.351*** (0.005)
Homeless Gap Days (in months)	0.073*** (0.004)
Demographics+	
Age 18 – 24	0.074 (0.055)
Age 25 – 30	0.105*** (0.051)
Age 41 – 50	0.098*** (0.037)
Age 51 and over	0.098** (0.046)
Female	0.974*** (0.035)
African-American	0.192*** (0.030)
Other Races	0.051 (0.059)
Constant	3.953*** (0.041)
Observations	7,502
R-squared	0.68

+ Reference categories are: Used ES Only, Jacksonville, Age 31 – 40, Male, White.

Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

^aUsed Outreach Alone, Used PSH Alone, Used Outreach or PSH in Combination with ES or TH

stays.¹³ This may reflect the different causes of homelessness for men and women. Men may be more likely to be asked to leave housing shared with family or friends due to disputes than women, resulting in short-term but repeated shelter stays. Or, alternatively, men may be more willing to leave unappealing shelter conditions for the streets. With longer lengths of stay, it is not surprising that women are also associated with higher homeless system costs. However even controlling for length of stay, being female is associated with 97 percent greater homeless system costs than being male, as shown in the model in Exhibit 4.6. Both the longer lengths of stay and higher costs are most likely a reflection of the specific homeless programs used by females.

As was discussed in Chapter 3, emergency shelters that serve women are more likely to be 24-hour, full-service shelters rather than overnight shelters, which have much lower daily costs. In addition, some women stay in service-intensive programs that also serve families. These programs have higher costs per day on average than those that exclusively serve single adult populations. Like single women, families tend to have fewer distinct stays, but their cumulative lengths of stay are longer on average than those of men. These similarities may be a reflection of the program influences, if single women and families are frequently served within the same setting, or they may reflect that the needs and decisions of single women are more similar to women with children than they are to single men.

Less dramatic, although still statistically significant, the models presented in Exhibits 4.4 and 4.6 also show that African-Americans have 30 percent longer stays than whites and 19 percent greater costs than whites after controlling for lengths of stay and program types. Again, the higher costs after controlling for lengths of stay probably reflect the fact that African-Americans used programs with more expensive daily costs than those used by whites within each program type. Nothing from our review of homeless programs suggests that certain programs encourage those who are African-American to stay in programs longer or that the homeless services system encourages African-Americans to use more expensive programs. However, African-Americans also have 14 percent more stays than Whites, which may also contribute to the greater cumulative number of days in homeless programs. Reasons related to the circumstances that led to homelessness, reduced housing stability after exit from a residential program for homeless people, more limited access to informal or formal supports, and greater involvement with criminal justice or other mainstream systems may help to explain the longer lengths of stay and more frequent stays for African American individuals.

Finally, the length-of-stay model (Exhibit 4.4) shows that relatively older individuals have longer stays than younger persons.¹⁴ For example, relative to the 31 to 40 year olds in the study population, individuals between the ages of 18 and 24 have stays 23 percent *shorter*, 41 to 50 years olds stay 19 percent *longer*, and individuals 51 and older stay 26 percent *longer*. Although this study examined only individuals who experienced homelessness for the first-time, the finding that longer lengths of stay are associated with older individuals is consistent with Kuhn and Culhane's (1998) research, which found that individuals who were chronically homeless were older than other homeless groups. The longer lengths of stay for older adults may be a function of age-related disabilities and associated barriers to housing stability, barriers to employment, or more fractured family relationships. Conversely, younger adults may have shorter lengths of stay related to the circumstances that led to their homelessness (e.g., if they became homeless due to family conflict or temporary income loss),

¹³ For details of the models that predict numbers of stays and gap days, see Appendix C.2.2.

¹⁴ In this study cohort, as in the homeless population in general (HUD, 2008), few people are elderly, that is, 62 or older.

have fewer employment barriers, have fewer long-term disabilities, or have greater access to family and other support networks that may be able to help resolve their homelessness. Older adults also have 10 percent greater costs than the 31 to 40 year old group after controlling for length of stay and program type, potentially attributable to residence in relatively more expensive programs within the transitional or permanent supportive housing program types. Somewhat counter-intuitively, the slightly younger group of 25 to 30 year olds was also associated with 11 percent higher costs. Again, this is likely a reflection of the specific programs used by this group. For instance, in Des Moines individuals who used only the more expensive form of transitional housing were younger than those who used other program types.

4.3.4 Costs for “Path” Groups: Individuals Who Use the Homeless System in Similar Ways

To better understand the heterogeneity of the homeless experience and its associated costs, we used multivariate cluster analysis to categorize individuals into “path groups” based on their lengths of stay, number of stays, length of gaps between stays, and the types and sequences of programs used. Cluster analysis was conducted independently for each site.

The following path groups emerged that described similar patterns of use across all three sites, representing 79 to 94 percent of the study cohort in each site:

- Emergency Shelter Short Stayers
- Emergency Shelter Long Gappers
- Sequential Program Users
- Circling Program Users

Exhibit 4.7 briefly describes each of these four common patterns of use of the homeless services system by first-time homeless individuals and shows the relative size of each group within each site.¹⁵ Each of the path groups making up these common patterns is discussed in more depth in the text that follows, followed by discussion of path groups unique to particular sites. Data on all path groups for each of the three sites are provided in Appendix 4.7.

¹⁵ For purposes of this section, the universe of individuals in the Houston study cohort is 3,535 adults. The full Houston study cohort of 4,406 individuals included 871 adults who were only found on the streets; who have been excluded from the discussion of path groups. The HMIS lacked identifiers for a large percentage of these individuals, and, therefore, it was not possible to determine if any of these people also used other programs.

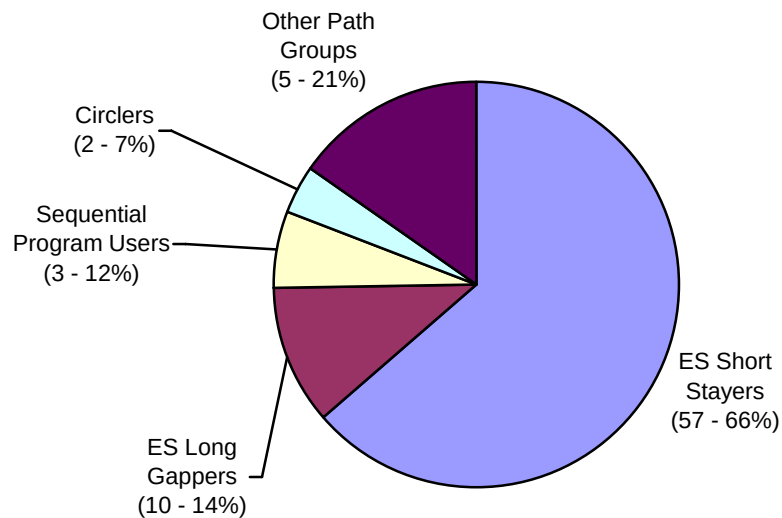
Exhibit 4.7: Path Groups Common to All Three Sites and their Relative Sizes				
Common Path Groups	Brief Description	Jacksonville (% of Study Cohort)	Houston (% of Study Cohort) ^a	Des Moines (% of Study Cohort)
Emergency Shelter Short Stayers	Used only emergency shelter, 1 or 2 brief stays totaling 1 to 3 weeks.	66%	65%	57%
Emergency Shelter Long Gappers	Used emergency shelter only, 7 to 40 times over 13 months, though only 1 to 5 months actually spent in shelter.	10%	10%	14%
Sequential Program Users	Used at least 2 program types (in this sequence): emergency shelter, transitional housing, and/or permanent housing.	12%	3%	4%
Circling Program Users	Used transitional housing or permanent supportive housing and later returned to emergency shelter.	7%	2%	4%
Total % of Study Cohort represented by these Common Path Groups in each Site		95%	80%	79%
^a Percentages exclude the portion of the Houston Study Cohort that was only found on the streets.				

The Emergency Shelter (ES) Short Stayers path group represents the majority of the study cohort of first-time homeless individuals in each site. The Sequential Program Users and Circling Program Users are the only two path groups that involve use of multiple program types, including those not combined into these common path groups. This means that 81 percent of individuals in Jacksonville, 92 percent of individuals in Des Moines, and 95 percent of individuals in Houston used only one type of homeless program over an 18-month period.

Very few individuals in our study cohort ever used permanent supportive housing. This may be because most people using permanent supportive housing programs were excluded from this study since they were homeless prior to the start of the study. Also, capacity of permanent supportive housing may be limited enough that turnover may not be sufficient to accommodate continued demand from individuals with chronic disabilities who become newly homeless.

The common path groups are shown graphically in Exhibit 4.8.¹⁶

Exhibit 4.8: Proportion of Study Cohort Represented by Common Path Groups



The groups are characterized by differences in their patterns of use of the homeless services system, but analysis of their demographic characteristics and mainstream program involvement¹⁷ help to describe further the differences among these common path groups. (Exhibit 4.9)

¹⁶ The pie chart is intended only to illustrate the relative size of each path group and should not be interpreted literally. The size of pie chart represents the size of the path group averaged across the three sites.

¹⁷ Based on mainstream domains collected in Jacksonville (Medicaid, mental health, substance abuse, entitlements, and jail) and Houston (mental health, City and County jail).

Exhibit 4.9: Characteristics of Individuals in Common Path Groups

Common Path Groups	Jacksonville	Houston	Des Moines
ES Short Stayers	Relatively fewer women Slightly fewer African Americans Relatively younger Average healthcare use Less substance abuse and criminal justice involvement	Very few women Fewer African-Americans Relatively younger adults Lowest rates of mental health care Lowest rates of criminal justice involvement	Not demographically distinct from other common path groups
ES Long Gappers	Almost no women More likely to be African-American Lowest rates of Medicaid managed care Highest criminal justice involvement	Very few women Slightly more African-Americans Slightly older (Frequent ES Longer Gappers much older) Fairly high mental health use High rates of criminal justice involvement	Not distinct from other path groups in percent women and African American Younger than other common path groups
Sequential Program Users	Relatively more women Fewer African-Americans Slightly older High use of Food Stamps Highest rates of mental health and substance abuse treatment prior to homelessness Low criminal justice involvement	Relatively more women Slightly more African-Americans Slightly older Moderate rates of mental health care Moderate criminal justice involvement	Relatively fewer women Oldest path group
Circlers	More likely to be African-American Slightly older Moderate use of mental health care, lower use of other healthcare High criminal justice involvement	Predominately women Slightly more African-Americans Slightly younger Highest rates of mental health care and State mental health Inpatient hospitalization Highest rates of criminal justice involvement	Very few women Older adults

Path Groups Using Only Emergency Shelter

Two of the common path groups describe individuals who only use emergency shelter: Short Stayers and Long Gappers. These two groups represent roughly three-quarters of each homeless individual study cohort.

Emergency Shelter Short Stayers are by far the largest path group in each of the three sites, representing 57 to 68 percent of each study cohort (Exhibit 4.7). Emergency Shelter Short Stayers use only emergency shelter and have one or two brief stays, totaling one to three weeks. In Des Moines, the demographic characteristics of this group do not appear substantially different from those of the other path groups, but in Jacksonville and Houston this group is younger (20 to 23 percent of the group are 30 years or younger), has fewer women, and has a slightly higher proportion of whites than other groups. In Jacksonville, this group had the lowest rates of substance abuse; in Houston, this group had the lowest rate of mental health system involvement and criminal justice involvement. Not surprisingly, this group incurs minimal homeless system costs, averaging only \$321 to \$686 total per person over the 18-month period (Exhibit 4.10). Despite the large size of this path group, the total homeless system costs associated with Emergency Shelter Short Stayers is disproportionately small, representing only 8 percent of the total homeless costs for the cohort in Des Moines and in Houston and 28 percent in Jacksonville.

All three sites had a sizable group, 10 to 14 percent, that stayed in emergency shelter an average of 7 to 11 times over the course of a year, but spent an average of only 23 to 124 cumulative nights in shelter (Exhibit 4.7).¹⁸ These are referred to as **Emergency Shelter Long Gappers** because of the long gaps between shelter stays. A small number of individuals within this group in Houston had a huge number of stays (more than 40 brief stays with gaps averaging less than a week between stays), and this group is much older than the study cohort as a whole or the other Houston Long Gapper Groups (Appendix C.1.2). Emergency Shelter Long Gappers are almost entirely male (95 percent in Jacksonville, 90 percent in Houston, and 72 percent in Des Moines), and slightly more likely than members of other path groups to be African-American. In Houston, more than a third of this group had mental health involvement, and more than a quarter had criminal justice involvement. In Jacksonville, this group had very high criminal justice involvement (62 percent). These individuals also had involvement in substance abuse and mental health treatment (26 and 21 percent), although other path groups had similar treatment rates. Even though individuals in this group experienced homelessness on and off for a full year, their total homeless system costs averaged only \$910 to \$2,494 per person since most of that time was not spent in shelter (Exhibit 4.10).

The cost variations for these two groups, all of whom used emergency shelter exclusively, relate primarily to the sheer differences in lengths of stay. However, another key cost driver is the cost per day of the programs used by each group. The total homeless system costs for Emergency Shelter Long Gappers represent 5 to 10 percent of the each study cohort's costs, slightly lower than the proportion of the study cohort they represent.

¹⁸ Although this study examined first-time homeless individuals, a number of individuals we studied such as members of this path group experienced patterns of chronic homelessness over time.

Path Groups Using Multiple Program Types

The other two common path groups describe individuals who used multiple types of programs either sequentially or in a circling fashion, using transitional or permanent housing and later circling back to emergency shelter.

Sequential Users, 3 to 12 percent of the study cohort at each site, used a combination of emergency shelter, transitional housing, and permanent supportive housing programs. Not all individuals used all three program types, but those they used were accessed in the emergency-transitional-permanent sequence. Jacksonville had two groups of Sequential Users: short stayers with an average of two stays totaling two months, and long stayers with an average of six stays totaling more than a year. In Houston and Des Moines, Sequential Users stayed an average of six and nine months over three and four stays respectively. Individuals generally had cumulative gaps of more than one month between stays (Appendix C.1 tables). In all three sites, more than half of this group's days in homeless programs were spent in transitional housing.

In Jacksonville, the combined Sequential Users groups were almost one-third female. The Sequential Long Stayers group had an average age of 47 years—the oldest of all of the path groups, although similar to Permanent Housing Long Stayers. More than 30 percent of Jacksonville's Sequential Users were shown by the match with mainstream data to have received substance abuse treatment, compared with an average of 22 percent for the Jacksonville cohort as a whole.

In Houston, almost half of Sequential Users were female, and almost 20 percent were over 50 years of age, compared with a cohort average of 12 percent. The Houston transitional housing system offers many possibilities for single women, including access to much of the scattered site transitional stock offered in conjunction with family programs. This helps explain the high percentage of women in Houston path groups that used programs other than emergency shelter.

The average homeless system cost in Jacksonville for Sequential Users was \$1,585 for Sequential User Short Stayers and \$10,416 for Sequential User Long Stayers. The figure for Long Stayers can be compared with the average total cost per person of \$8,539 for Sequential Users in Des Moines and \$14,418 in Houston. The costs for Sequential User Long Stayers were the highest of all path groups in Jacksonville and Houston, and in Des Moines the costs for Sequential Users were outpaced only by a path group that used only transitional housing (Exhibit 4.10). The total costs for Sequential Users represents 13 to 22 percent of the cohort's total homeless costs, two to four times higher than the proportion of the cohort they represent.

The high costs for the Sequential Users were driven both by the long lengths of stay and by the high percentage of nights (59 percent to 84 percent) that this group spends in transitional housing programs. Transitional housing for individuals has high costs in all sites compared with other program types (see Chapter 3 for further discussion), although particular programs of other types used by this path group are also expensive: for example, extended stay emergency shelter and permanent supportive housing with intensive services.

Circlers, 2 to 7 percent of the study cohort in each site, are individuals who used transitional housing or permanent supportive housing and later returned to emergency shelter. By definition, individuals in this group used more than one program type and, therefore had multiple stays. On average, each person had three stays in Houston, seven in Des Moines, and eight in Jacksonville. The cumulative length of gaps between stays is similar to the length of time actually spent in programs (Appendix

5.x). Circlers do not appear have distinguishing demographic characteristics that might help to identify them when they first enter the homeless services system. In Houston they were predominately women and slightly younger, while in Des Moines very few were women and they were relatively older than other path groups. In Jacksonville, Circlers had low rates of access to medical care (15 percent), high mental health involvement (30 percent), and high criminal justice involvement (44 percent). For Houston, Circlers had the highest rates of mental health (48 percent) and criminal justice (27 percent) involvement of all path groups. We do not have enough information to draw conclusions about why these individuals returned to shelter. For instance, the individuals may have been terminated from a transitional or permanent housing program without finding sustainable long-term housing or may have experienced barriers accessing appropriate permanent housing related to their mental health or criminal history. Alternatively, they may have had involvement with inpatient treatment or jail that disrupted housing and resulted in repeat homelessness.

The group had average homeless system costs of \$3,987 in Jacksonville, \$6,374 in Des Moines, and \$10,705 in Houston (Exhibit 4.10). In Jacksonville, the Circlers represented 18 percent of total cohort costs though the path group only comprised 7 percent of the cohort's population. The Des Moines Circlers represent only 4 percent of the cohort but incurred 12 percent of the cohort's total costs, and the Houston Circlers represent only 2 percent of the cohort but incurred 9 percent of the total costs.

Length of stay is a key factor driving this group's costs, but it does not explain the difference in costs across the sites. Houston's costs were significantly higher than Jacksonville's, in large part because the daily costs of the specific programs used by the individuals in this path group were higher and partly because the Houston group spent 89 percent of nights in extended emergency shelter, transitional housing and higher cost permanent supportive housing programs, whereas Jacksonville's cohort spent only 59 percent of nights in more expensive transitional or permanent programs. Des Moines Circlers' costs were higher than Jacksonville's in part because this path group spent 76 percent of its sheltered homeless days in transitional programs and more than half of its transitional housing days in the more expensive of the two transitional housing program models. (More detail about the costs of these models can be found in Chapter 3.)

Other Path Groups

The remaining portion of each site's study cohort was represented by path groups with other patterns. These groups all represent individuals who used a single program type for extended periods, and as a result, most are fairly high cost groups. However, the types of programs each group used differed, so they are described individually for each site. Very few individuals in this study used permanent supportive housing, either immediately upon entering the homeless services system or after a stay in emergency shelter or transitional housing.

Jacksonville Emergency Shelter Long Stayers. This group represents only 2 percent of the Jacksonville cohort, but they had almost year-long continuous stays in emergency shelter. The Emergency Shelter Long Stayers are the only path group across all three sites with patterns of homelessness consistent with Kuhn and Culhane's original chronically homeless group (Kuhn & Culhane, 1998), though not all members of this group would meet HUD's current definition of chronically homeless which has a disability component.¹⁹ While the size of this group is smaller than

¹⁹ HUD's definition of chronic homelessness also incorporates Kuhn and Culhane's episodically homeless, which is more parallel to the Emergency Shelter Long Stayers.

the percent identified by Kuhn and Culhane, the Jacksonville cohort only includes first-time homeless individuals; thus, one would not expect to find a sizable chronically homeless population. Rather, the small size of this path group may provide an indication of the proportion of first-time homeless individuals who may continuously use emergency shelters without an appropriate re-housing intervention.

In contrast to the study cohort as a whole, 54 percent of emergency shelter long stayers were female, and the group had the highest percentage of African Americans, 73 percent, compared with 47 percent for the Jacksonville study cohort as a whole. Compared with other first-time homeless individuals in Jacksonville, members of this group were more likely to receive income support from the Food Stamps program prior to homelessness (48 percent) or during their long stays in shelter (77 percent), but this does not appear to have helped them avoid homelessness or leave it quickly. Their use of mainstream systems suggests that medical illness may have contributed to their extended homelessness. Their rate of involvement with the criminal justice system was low (Appendix C.1.1).

The cost to the homeless system to house these individuals was very high, \$9,756 per person (Exhibit 4.10). Yet, due to the small size of the group, their total cost to the homeless services system was modest, representing 13 percent of the cohort's total costs. The average cost per Emergency Shelter Long Stayer is equivalent to 15 months of maximum rent subsidy at the FY2006 Fair Market Rent of \$643 per month for a one-bedroom unit (HUD, 2005) (Exhibit 4.11). Given the pattern of long-term homelessness that emerged over the 18-month observation period and the high costs associated with individuals in this group, an alternative permanent housing intervention may be a more appropriate intervention for this group than shelter.

Jacksonville Permanent Supportive Housing Long Stayers spent an average of one year in residential homeless programs, primarily in permanent supportive housing. This group was about one-third female, compared to 20 percent for the study cohort as a whole, and a similar percentage was more than 50 years old, much higher than in any other path group in Jacksonville. Not surprisingly, for a group that used mainly programs available only to persons with disabilities, their rates of use of mental health and substance abuse treatment were high (Appendix C.1.1). The homeless services system incurred approximately \$8,500 per person for this group (Exhibit 4.10), slightly greater than a maximum annual rent subsidy based on the Fair Market Rent. Permanent Supportive Housing Long Stayers represent 15 percent of the total Jacksonville cohort's homeless system costs, though these individuals represent only 3 percent of the overall cohort. Most of these expenses were incurred for project-based SRO housing or Shelter Plus Care vouchers, so conceptually these costs to the residential system for homeless people are essentially equivalent to paying rent in the private market and therefore are quite different from the residential homeless system costs incurred on behalf of other path groups. Most of the services associated with these units were provided through relationships with mainstream providers and may be reflected in the mainstream service system costs incurred for this path group or may not be fully captured.

Houston Users of Extended Stay Emergency Shelter. In Houston, 3 percent of the study cohort used extended stay emergency shelter programs for an average of 158 days, slightly more than 5 months. This subset had average per person homeless system costs of \$10,540. Extended stay programs are a hybrid model that provide clients a greater level of privacy and have a wider array of services than the shorter-stay model, in many ways paralleling the environment and programming provided at a transitional housing program. They are more expensive than less service-rich emergency shelters. The Extended Stay programs are primarily targeted to women with a history of

substance abuse. Fifty-five percent of the people in this group were women, and 69 percent were African American.

Houston Users of Transitional or Permanent Supportive Housing Only. In Houston, 16 percent of the study cohort went directly to transitional housing or to permanent supportive housing. These individuals were mainly women (77 percent), in sharp contrast to the users of transitional or permanent supportive housing programs who arrived there sequentially or who used them and then “circled” back to emergency shelter. This group is somewhat less likely to be African American than the study cohort as a whole. Their use of mental health care and encounters with the criminal justice system were not different from the study cohort as a whole. Their lengths of stay in the residential system for homeless people were slightly lower than Sequential Users or Circlers in Houston, and their costs to the homeless services system were slightly lower, \$8,799 on average (Exhibit 4.10). Nonetheless the average costs per person are still very high compared with the average cost per person of \$2,257 for the cohort overall. This path group represented the majority (52 percent) of homeless costs within Houston, substantially larger than the proportion of the cohort (16 percent) they represent.

Des Moines Transitional Housing Only, Shared Rooms. In Des Moines, 13 percent of the study cohort used transitional housing provided in shared rooms and, therefore, with relatively little privacy. This group was 42 percent female (compared with 27 percent for the study cohort as a whole) and less likely to be African American (12 vs. 21 percent). They were somewhat younger than the study cohort as a whole and stayed an average of just over 4 months (133 days), substantially less than Sequential Users, Circlers, or those who used only Transitional Housing provided in independent rooms, described below. We have no mainstream data for Des Moines from which to speculate further on the possible causes of their homelessness or the way in which they were served by transitional housing. However, one of the shared room transitional housing programs in Des Moines serves women who have recently been incarcerated. The average total cost to the homeless services system for members of this group is only \$3,103 (Exhibit 4.10), reflecting their use of a relatively low cost model for transitional housing for a relatively short period of time. Because of the relatively low costs per person, this group was associated with only 18 percent of the homeless system costs incurred by the cohort, a proportion only slightly higher than the size of the path group.

Des Moines Transitional Housing Only, Independent Rooms. Eight (8) percent of the study cohort in Des Moines used only a form of transitional housing that provides private rooms to clients. This group had lengths of stay averaging almost 8 months (237 days), perhaps due to the higher levels of privacy and relative independence provided to this group. Members of this path group were predominately male (85 percent compared to 73 percent of the study cohort as a whole), but similar to the rest of the study cohort in other respects. Given the long lengths of stay for this group and their use of an expensive type of transitional housing (see Chapter 3), they had the highest cost per person of any path group in Des Moines, \$11,731 (Exhibit 4.10). Cumulatively, they incurred 42 percent of the total homeless costs for the Des Moines cohort even though the group comprised only 8 percent of the cohort.

The average per person costs for individuals in each path group are shown in Exhibit 4.10.

Exhibit 4.10 Average Homeless System Costs Per Person By Path Group						
	ES Short Stayers	ES Long Gappers	Sequential Users	Circling Users	Other Path Groups	Average for Overall Cohort
Jacksonville	\$686	\$910	\$1,585 Short Stayers	\$3,987	\$8,493 PSH Long Stayers	\$1,634
			\$10,416 Long Stayers		\$9,756 ES Long Stayers	
Houston	\$353	\$880 ES Long Gappers	\$14,418	\$10,705	\$8,799 TH or PSH Only	\$2,257
		\$2,494 Frequent ES Long Gappers				
Des Moines	\$321	\$1,224	\$8,539	\$6,374	\$3,103 TH – Shared Rm	\$2,308
					\$11,731 TH – Indiv Rm	

Exhibit 4.10 clearly illustrates the range of average homeless system costs per person for each of the path groups, as discussed in the previous section. The highest cost path groups (long stayers in expensive programs) in each of the three sites had average costs per person 15 to 41 times the average costs per person of the lowest cost path group, Emergency Shelter Short Stayers. Since path groups correspond strongly with costs, policymakers could use information like this to determine how much they could invest in alternative interventions for different path groups while staying cost-neutral. This could be as simple as assessing whether there are less expensive ways of delivering similar services to single women, who are frequently served in a higher-cost family program environment.

For higher cost path groups, the CoC could also assess the level of housing and service assistance currently provided to long stayers relative to alternative interventions. Fair Market Rents (Exhibit 4.11) represent the equivalent of funding a deep rental subsidy for an individual for a month. For example, Jacksonville could fund a rental subsidy for 16 months with the resources currently spent on average to house a Sequential Long Stayer in homeless programs for one year. To determine the relative cost-effectiveness of the current strategy to alternative interventions, policymakers can compare the costs and long-term outcomes of the housing assistance and services provided to Sequential Long Stayers in these programs with the costs and outcomes that might be achieved by using these funds to support alternative interventions, such as a rental subsidy.

Exhibit 4.11: 2006 Fair Market Rent for One-bedroom Unit in Individual Study Sites			
	Jacksonville MSA	Houston MSA	Des Moines MSA
2006 Fair Market Rents: monthly rent for one-bedroom ^a	\$643	\$612	\$549
^a FMR Source: HUD, 2005. The FMR does not include the monthly fee paid to a public housing agency for administering the voucher program, which was about \$58 per unit per month in these three communities. (HUD, 2007)			

Thus, an important policy question is whether there is alternative prevention, housing, or other homeless interventions that could be offered at similar or lower costs that would achieve improved outcomes or be preferable for other moral, programmatic, or policy reasons? If the response is affirmative, then in addition to developing the alternative interventions, the CoC would also need to identify the individuals that need to be assisted differently. The path group analysis provided in this section provides some clues about what to look for in an assessment process, though more research in this area is needed.

A related finding is that all program types and all programs within each type do not have equal costs; thus, long-stayers do not have universally high-costs. For example, Jacksonville's Emergency Shelter Long Stayers (the group with homeless system use most comparable to Kuhn and Culhane's chronically homeless cluster) have lower average per person costs than the Sequential Long Stayers in Jacksonville who used transitional housing extensively. Setting aside ethical or programmatic reasons, Jacksonville may benefit more financially by seeking an alternative intervention for the Sequential Program Users than for other path groups. Similarly, if stakeholders in Houston undertake efforts to reduce lengths of stays in Houston's standard emergency shelters, they will not achieve cost-savings remotely approaching those that could be realized from efforts to reduce lengths of stays in the higher-cost extended stay emergency shelters. Again, that is not to say the extra investments in more expensive programs are not warranted based on additional benefits or outcomes for program clients. This cost analysis may help to identify programs about which cost-effectiveness analysis would be helpful.

4.4. Costs Associated with Mainstream System Use

In contrast to homeless residential system costs, mainstream system costs can occur before or after an individual's period of homelessness and there may or may not be a relationship between homelessness and increased or decreased involvement in mainstream systems. As described in section 4.1, prior research suggested that periods of homelessness are related to increased costs across most mainstream domains and that certain interventions may reduce acute care costs and other mainstream costs associated with crises that lead to homelessness. This research also assumes that reduced costs over time reflect positive client outcomes brought about by the intervention. At least theoretically, the cost reductions can be used to fund the homelessness interventions. This study was not designed to understand the client outcomes or cost-effectiveness of specified homelessness interventions. However, the study attempts to measure the study cohort's mainstream system involvement and associated costs incurred to serve these individuals before, during, and following

first-time homelessness. This information may help policy makers assess the extent of potential mainstream cost savings possible or recognize the limited opportunities for them.

For Jacksonville, we were able to obtain mainstream utilization and cost data for the Medicaid primary health care, Medicaid and State-funded mental health and substance abuse treatment, food stamps, and Temporary Assistance for Needy Families (TANF) systems aggregated by path group for the periods before, during and following homelessness. We also received client-level total mainstream costs for each domain and each study period. We were not able to obtain access to individual client encounter data, so we do not know the exact dates of the mainstream involvement or costs of individual services within these domains. The limitations of data aggregated by time period will be discussed later in this section. We were able to obtain client-level data documenting each arrest and jail stay throughout the full study period. In Houston, we were able to obtain client-level service utilization and cost data for City and County jails, mental health treatment, and inpatient stays in the state psychiatric hospital. For Des Moines, we were not able to obtain any data on any mainstream systems; therefore, this section discusses costs only for Jacksonville and Houston.

This section presents estimates of mainstream costs for the study cohorts in Jacksonville and Houston and also compares them with the results of previous research. Like past cost studies, these results may understate mainstream costs since we have not accounted for all mainstream domains.

4.4.1 Rates of Mainstream System Involvement

As it is for homeless system costs, utilization of mainstream systems is an essential building block for estimating costs. Examining rates of interaction with mainstream systems also yields a better understanding of the characteristics of the individuals in the study cohorts—at least the minimum percentage of the cohort with certain needs or experiences, since it is likely some members of the cohort have needs for services but did not access them during the study timeframe. Some individuals also may have used non-publicly funded services that were not captured in the datasets we analyzed. Exhibit 4.12 shows rates of cohort involvement with mainstream systems in Jacksonville and Houston across the study period. Use during the 12 months prior to homelessness can help show needs that were present during that period. It can also be compared to the patterns of use after the start of homelessness to suggest how homelessness or involvement with homeless programs may have affected mainstream use.

Exhibit 4.12 Rates of Involvement with Mainstream System Domains Prior to Homelessness, During Homelessness and Overall During the Study Period								
	Jacksonville				Houston			
	Prior	During	After	Overall	Prior	During	After	Overall
Average days in period	365	132	599	1096	365	83	689	1137
Medicaid Primary Health	13%	9%	16%	20%				
Mental Health	13%	8%	18%	25%	11%	9%	12%	18%
Substance Abuse	9%	7%	15%	22%				
Criminal Justice	19%	13%	22%	38%	6%	2%	9%	13%
Income Support	29%	22%	43%	52%				

In Jacksonville, almost one-third of individuals were receiving income support (mainly food stamps) in the 12-months prior to homelessness, and 13, 13 and 9 percent respectively had accessed publicly funded medical, mental health and substance abuse treatment. Almost one-fifth had been in arrested or in jail.

A relatively smaller percentage of individuals interacted with these systems during homelessness, providing a fairly small group of individuals for policymakers to target for potential cost offsets. The smaller percentage with service encounters primarily reflects the shorter period of time homeless for most of the study cohort, compared with the periods of time before and after homelessness. The average length of each period is shown in the first row of Exhibit 4.12. Food stamps eligibility may have dropped during homelessness for people in programs supplying meals. Nonetheless, as later sections on mainstream costs will show, these small percentages of individuals can incur substantial costs per person.

Use of mainstream systems rises following the end of homelessness. This may be primarily due to the longer period of time in which we tracked people following homelessness. In some cases— income support, Medicaid primary health care, and perhaps mental health and substance abuse services—the increased rates may also reflect the success of the homeless services system in linking homeless individuals to needed mainstream services. In other cases—criminal justice, and again perhaps mental health and substance abuse services—the higher rates of use following homelessness could indicate that spending time in the residential services system for homeless people does not change—and may even exacerbate—the negative behavior of individual homeless people. There clearly are cost implications associated with increased use of mainstream systems following homelessness.

The next section details the costs incurred by certain mainstream systems and sets the stage for the next step of analysis that a community can take: exploring whether the costs are positive or negative, and whether there are opportunities to reduce costs for the percentage of clients who interact with these systems through homeless interventions.

4.4.2 Costs to Mainstream Systems During Homelessness

First we present costs incurred during the study cohort's period of homelessness (Exhibit 4.13),²⁰ the primary costs that we assume to be influenced by homelessness. The costs shown in the exhibit reflect only the domains for which we were able to obtain data, so they are minimum costs associated with our cohort of first-time homeless individuals.

²⁰ "During" homelessness is used to describe the period from the first day of the first stay in a residential program to the last day in the last stay within the 18-month study period. For individuals with more than one homeless program stay, during homelessness also includes gaps or periods of time between homeless stays when the individual may be housed.

Exhibit 4.13: Average Mainstream System Costs per Person Incurred “During” Homelessness				
	Jacksonville		Houston	
	<i>Average Costs During Homelessness Per Person Involved in this Domain</i>	<i>Average Costs During Homelessness Per Person in Cohort</i>	<i>Average Costs During Homelessness Per Person Involved in this Domain</i>	<i>Average Costs During Homelessness Per Person in Cohort</i>
Medicaid Primary Health	\$2,436	\$219		
Mental Health	\$1,318	\$106	\$4,157	\$391
Substance Abuse	\$2,265	\$158		
Criminal Justice	\$3,057	\$397	\$6,520	\$157
Income Supports	\$627	\$138		
Average Total Per Person Costs for these Domains		\$1,018		\$547
Total Incurred During Homelessness by the Cohort for these Domains	\$2,006,539		\$2,412,227	

For each mainstream domain, Exhibit 4.13 shows the average costs per person for those who were served or interacted with that mainstream system and average per person costs when considering all individuals in the cohort. Per person costs for those who actually interacted with each system were relatively high, ranging from \$627 for food stamps and TANF to \$3,057 for those arrested or jailed during homelessness. The criminal justice expenses are high in part due to the large number of people who were involved with criminal justice (13 percent of the cohort, Exhibit 4.12). And those who were jailed, stayed in jail a long time—an average of 40 days each. When spread across the entire Jacksonville cohort, the costs are diluted.²¹

Therefore when considering the average mainstream cost per person in the overall cohort, costs during homelessness were relatively low, because most people spent only a brief time homeless and because only a portion of the cohort actually incurred costs in each of the domains. In Houston, average criminal justice costs are much lower than average mental health costs (Exhibit 4.13) for each cohort member, in part because only 2 percent of the study cohort had criminal justice costs during homelessness, compared with 9 percent who received mental health services (Exhibit 4.12). In fact, average costs per person for those who interacted with each system were higher for those involved with criminal justice than for those who received mental health care. As with Jacksonville, the average per person costs for both domains is diluted by the large percentage of individuals (more than 90 percent) who were not involved with either the mental health or the criminal justice system. Thus this further illustrates the point that an intervention can most easily achieve cost savings if it is targeted to those with high use (or any use). Conversely, interventions targeted to subgroups of

²¹ The Jacksonville case study Appendix provides greater detail on these mainstream costs.

homeless individuals that are not heavily involved in mainstream systems, and probably interventions targeting all first-time homeless individuals, are unlikely to achieve cost savings sufficient to fund them.

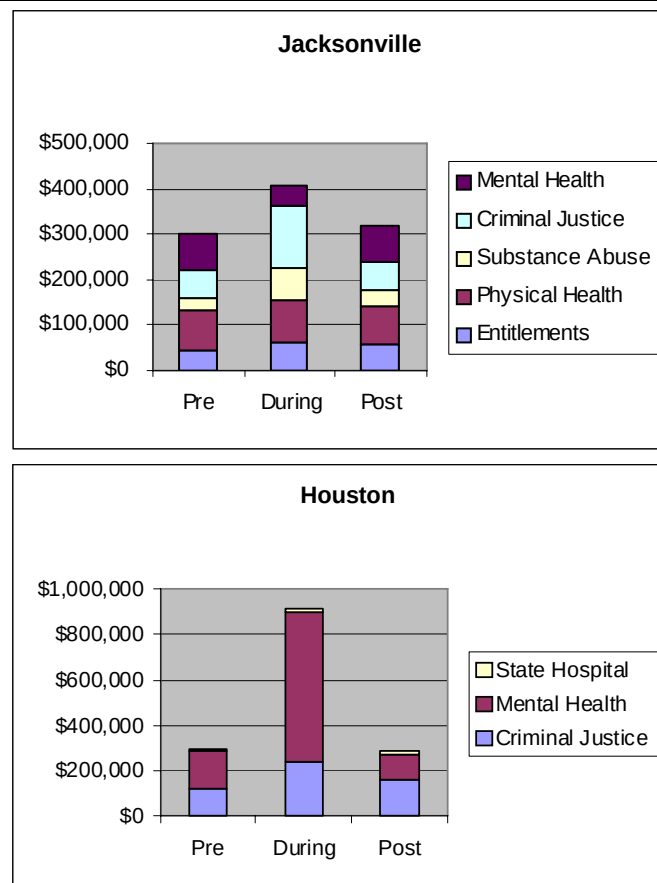
4.4.3 Mainstream Costs Before, During, and After Homelessness

Although utilization rates for the study cohort go down during homelessness, as shown on Exhibit 4.12, this is largely a reflection of shorter time periods. Costs, expressed as one-month costs to control for the different lengths of the time periods before, during and following homelessness, go up during homelessness for most domains, as shown on Exhibit 4.14. In Jacksonville, the total monthly mainstream costs incurred by the study cohort increased from an average of \$161 per month per person to \$231 per month (43 percent increase) during homelessness and went back down to an average of \$166 per month per person following homelessness. (See the Jacksonville case study in Appendix A for more detail.) In Houston, mainstream costs increased from an average of \$67 per month per person to \$197 per month during homelessness (194 percent increase) and then reduced back to an average of \$65 per month per person following homelessness.²²

A smaller portion of the cohort interacts with each system during homelessness, so the increase in average monthly costs reflects concentrated usage of services by these users within a relatively brief period of time. In the periods before and after homelessness, more people interacted with the systems but the interactions were spread over longer periods and therefore the adjusted monthly cost is lower. More on the relationship of these costs before homelessness is provided in the next section. The lower rates of involvement with mainstream service systems may also reflect that some individuals may have received alternative services from homeless programs alleviating their need for mainstream care, and that those who did not have their needs met by the program internally may have needed higher cost clinical or acute care. However, not all of the change is explained by concentrated service use.

In some cases, individuals used, on average, more expensive services during homelessness. For instance, in Jacksonville, the average cost per unit of physical health care covered by the Medicaid fee-for service

Exhibit 4.14: Monthly Mainstream Costs by Domain and Period, Jacksonville and Houston



²² See the Houston case study (Sokol, Leopold, Spellman, & Khadduri, 2009) for more detail.

plan was \$100 per unit during the period prior to homelessness, \$117 during homelessness, decreasing slightly to \$110 following homelessness. More dramatic is the change in the Jacksonville cohort's Medicaid-funded mental health average cost per unit: \$87 prior, \$129 during, and \$98 following homelessness. However, for Medicaid substance abuse treatment, the average cost per unit during homelessness was lowest (\$426) compared with \$471 per unit before and \$508 per unit following homelessness. In Houston, the mental health treatment cost per unit was highest (\$218) in the period preceding homelessness, dropping to an average cost per unit of \$154 during homelessness and \$141 per unit following homelessness. While bearing in mind that the average costs could reflect high-cost use by a handful of individuals and limited use by others, the higher cost per unit during homelessness for some domains is consistent with the theory raised in prior research that some people may receive more expensive acute care during periods of homelessness, but this pattern is not universal.

4.4.4 Mainstream Costs Immediately before Homelessness

While total mainstream costs increased during homelessness compared to the period prior to homelessness, suggesting more intensive mainstream use by particular individuals during homelessness, we come to a slightly different conclusion about the pattern by graphing mainstream utilization month by month, as shown in Exhibit 4.15 for jail stays in Jacksonville. The number of jail stays increases substantially immediately before first-time homelessness and peaks in the period immediately following first entry into a homeless program.²³ We see similar patterns for criminal justice involvement and mental health treatment costs in Houston, shown in Exhibits 4.16 and 4.17. The patterns graphed in these exhibits are very similar to those found in analysis of inpatient hospitalizations by homeless individuals in Philadelphia conducted by Culhane, Averyt and Hadley (1997). This pattern is not apparent when the cost analysis relies on average total monthly costs for the time periods before, during, and after homelessness shown in Exhibits 4.14.²⁴ This examination of data by month requires client-level service utilization data with actual dates of service, which we were not able to obtain from any of the Jacksonville mainstream systems except criminal justice.²⁵

²³ Other research analyzing rates of homelessness among ex-offenders found that individuals released from state prisons or jails have a greater risk of homelessness than individuals with similar characteristics who have not been recently incarcerated. In the communities studied, risk of homelessness among ex-offenders was higher for individuals with certain demographic characteristics. The same research also found that longer periods of incarceration were associated with greater risks of homelessness after release. (Graham, D., Locke, G., Bass Rubenstein, D. & Carlson, K., unpublished)

²⁴ These findings also corroborate those of Scully and Shank (2007), presented at the Summer 2007 National Alliance to End Homelessness conference. Scully's presentation prompted us to analyze data in this way to better understand patterns of use relative to homelessness

²⁵ The three period analysis was specified in the original data request to mainstream agencies who were not authorized to disclose client-level data. Now that this spike has emerged consistently for multiple domains, in the future we would explore alternate data specifications to capture this phenomenon more comprehensively.

Exhibit 4.15: Jacksonville Jail Stays Relative to Homelessness

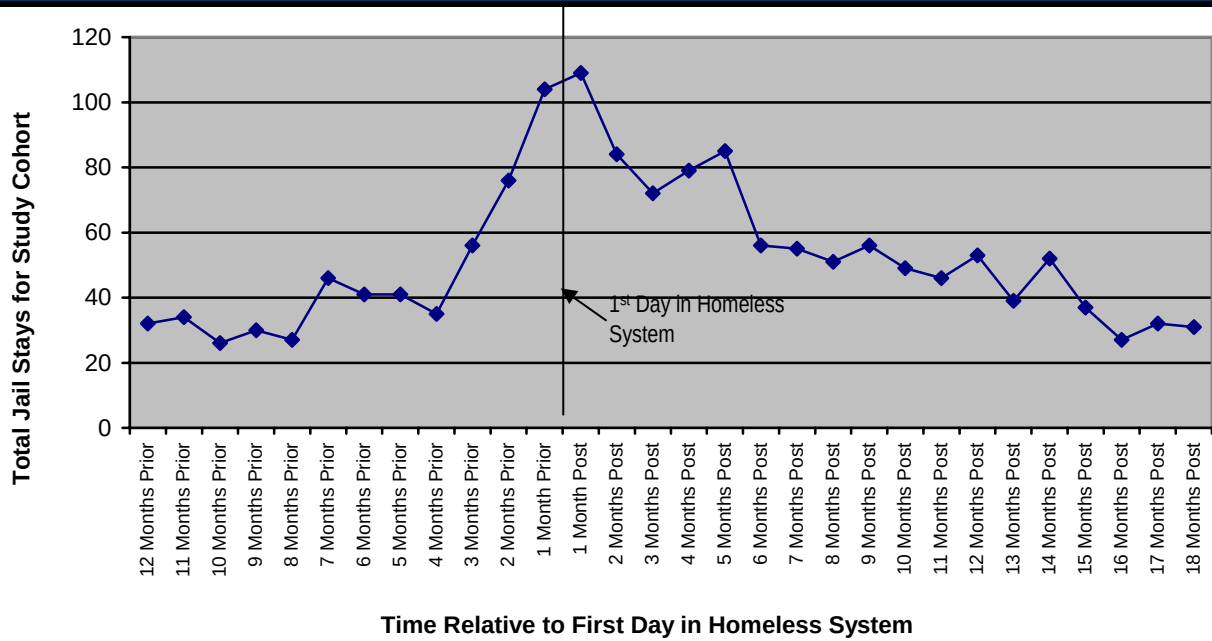
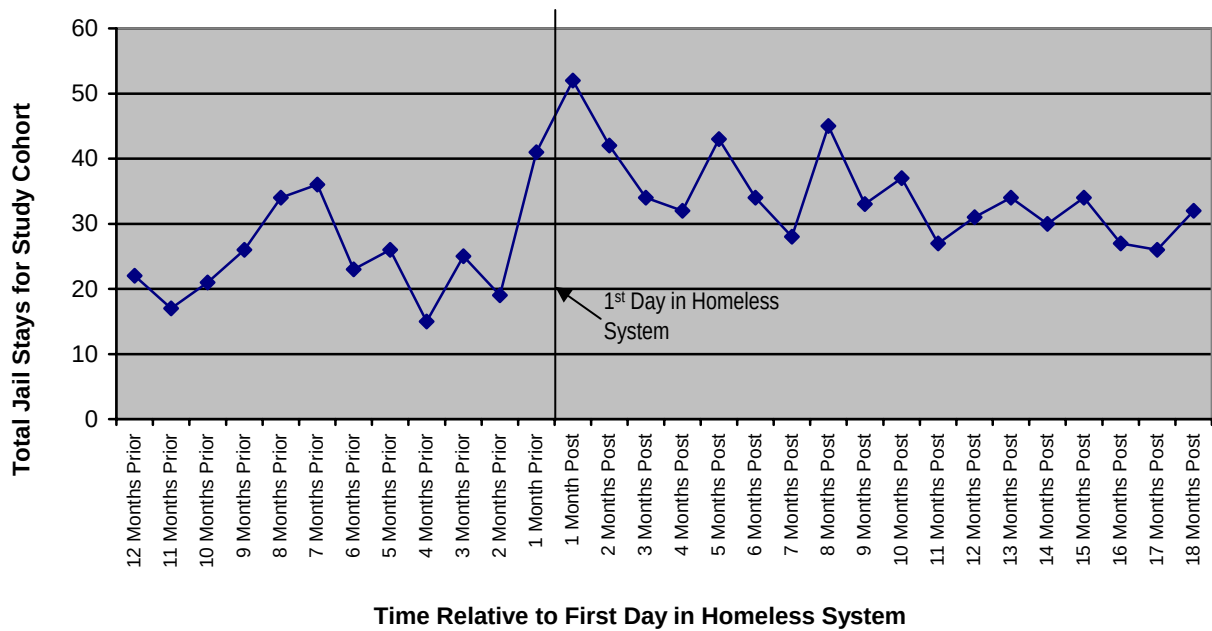


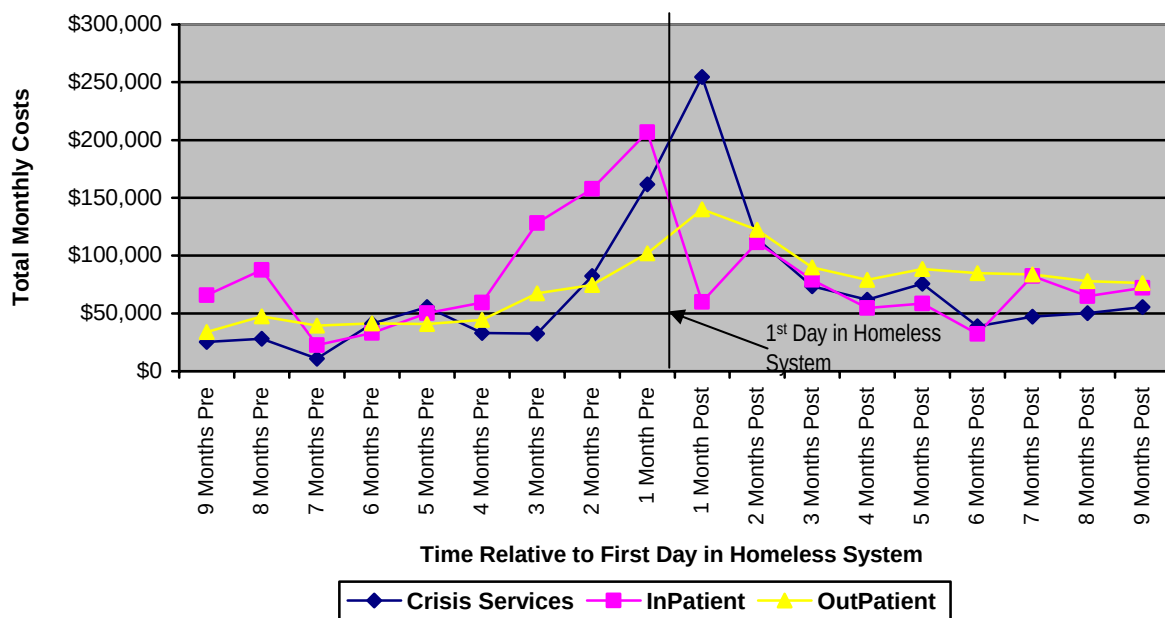
Exhibit 4.16: Houston (Individuals) Jail Stays Relative to Homelessness



Adding another layer of detail to the analysis, Exhibit 4.17 graphs mental health system costs separately for crisis services, inpatient treatment and outpatient treatment in Houston. The exhibit shows a dramatic increase in costs for inpatient and crisis treatment and a slight increase in outpatient treatment immediately before homelessness. Particularly interesting is the fact that inpatient treatment costs peak in the month prior to homelessness and then decline sharply in the month following the start of homelessness, whereas crisis and outpatient service costs peak in the month following the start of homelessness and then drop to levels slightly higher than the period before homelessness. It is logical that inpatient costs would decline once someone enters a residential homeless program, since a person cannot be staying in an inpatient facility at the same time he is in a homeless facility. However, the dramatic increase in use immediately prior to homelessness suggests that individuals may be exiting inpatient programs with inadequate housing placement services or that the mental health crisis that necessitated inpatient care is related to housing instability and homelessness in some other way.

The images are compelling and suggest a strong relationship between mainstream involvement and the start of homelessness. However, the current analysis has several important limitations. These exhibits depict total numbers of jail stays and total mental health costs for the cohort. We would need much more analysis to determine whether the individuals experiencing the crises before homelessness are the same people who later are shifting to outpatient mental health use. Furthermore, the analysis is built up from each individual's service utilization relative to his or her actual first day in the homeless system. The first month in the homeless system is roughly equivalent for all persons in the cohort and exactly the same for the 12 months prior to entry into the homeless system, so the pattern of progressively increasing mainstream costs is defensible for those timeframes. However, following the first day some people in the cohort quickly exit homeless programs, while others stay homeless

Exhibit 4.17: Houston (Individuals) Mental Health Costs by Month Relative to Homelessness



for long time periods or later return to homeless programs. Subsequent episodes of homelessness may also be related to increased mainstream involvement, but later increases are muted in these

graphs, since the costs of those who have subsequent episodes in month 6, for example, are summed with those in the cohort who are no longer homeless.

We did not collect and structure data in ways that facilitate conducting time-series analysis of mainstream system use relative to the end of homeless residential stays or subsequent episodes of homelessness. However, we believe that these interesting exploratory findings suggest opportunities for further research.

4.4.5 Characteristics Associated with Mainstream System Costs

A regression model was used to explain mainstream costs for different systems using covariates for demographic characteristics and homeless system utilization (Exhibit 4.18). Unlike the previous models presented in this chapter, we did not use a logarithm specification for the outcome variable for this analysis. These regression coefficients thus represent the differences in dollar costs between individuals with and without a particular characteristic.

Findings on the relationship between homeless utilization patterns and mainstream system costs over the total study period (before, during, and after homelessness) were somewhat inconsistent between the two sites.²⁶ In Jacksonville, multivariate analysis controlling for demographics and homeless experience showed a statistically significant relationship between length of stay in homeless residential programs and most mainstream costs (Exhibit 4.18). For each additional 30 days spent in homeless programs, physical healthcare costs increase by about \$199, costs for food stamps and TANF increased by \$80, and costs for substance abuse treatment increased by \$61. In contrast, criminal justice costs dropped slightly for individuals in the Jacksonville study cohort who spent more time in homeless residential programs. Criminal justice costs increased by \$150 for every 30 “gap” days spent between homeless program stays, which suggests a possible link between engagement with the criminal justice system and homeless recidivism.

The multivariate analysis for Jacksonville did not show a statistically significant relationship between mental health costs and lengths of stay in homeless programs. This may mean that homeless programs, especially those that encourage longer lengths of stay, link mentally ill clients with routine outpatient treatment or otherwise stabilize clients sufficiently to reduce their need for more expensive crisis or in-patient psychiatric treatment. Alternatively, it is possible that more expensive service-rich programs provide mental health services themselves, offsetting the need for mainstream mental health services. Or perhaps persons who successfully stay in transitional housing or permanent supportive housing are not the individuals with the greatest or most severe mental health needs, therefore suggesting that those with higher needs and associated treatment costs leave earlier or never enroll in the first place.²⁷ Many other explanations are possible, but the relationship between homeless system and mental health costs is notable.

²⁶ We were not able to analyze changes in mainstream costs from one period to another using regression analysis, since we did not have access to client-level data by domain and period in Jacksonville.

²⁷ A 2006 HUD study of leavers and stayers in permanent supportive housing indicates that higher use of mainstream mental health systems such as inpatient mental hospital admissions and emergency services during residence in permanent supportive housing is a strong predictor of leaving permanent supportive housing rather than staying long-term. (HUD, 2006) This finding supports the idea that people with greater mental health needs or less stable routine mental health treatment may have shorter lengths of stay in some homeless program types.

Exhibit 4.18. Regression Analysis of Mainstream System Costs for First-Time Homeless Individuals in Jacksonville

Outcome Variable: Costs of Mainstream Domains	Physical Health Costs	Mental Health Tx Costs	Substance Abuse Tx Costs	Income Supports Costs	Criminal Justice Costs
Homeless System Utilization					
Number of Homeless Program Stays	-74.742** (36.628)	-15.781 (37.545)	-15.465 (14.559)	-5.599 (10.013)	-34.855 (21.201)
Homeless Length of Stay (in months)	198.681*** (47.651)	-47.273 (48.844)	60.639*** (18.941)	80.128*** (13.027)	11.861 (27.582)
Homeless Gap Days (in months)	13.062 (43.528)	-18.746 (44.618)	40.846** (17.302)	0.982 (11.900)	149.972*** (25.196)
Demographics+					
Female	2,170.849*** (430.825)	1,663.730*** (441.617)	257.364 (171.251)	1,770.719*** (117.779)	-992.334*** (249.377)
Black	560.360* (337.435)	-907.569*** (345.888)	-378.032*** (134.129)	280.946*** (92.248)	380.364* (195.320)
Other race	209.352 (925.260)	575.892 (948.438)	-745.892** (367.788)	-174.340 (252.948)	814.333 (535.575)
Age: 18-24	646.639 (656.886)	1,237.724* (673.342)	-192.726 (261.110)	416.656** (179.580)	91.847 (380.230)
Age: 25-30	128.096 (589.908)	636.365 (604.686)	-196.469 (234.486)	248.953 (161.269)	-59.916 (341.461)
Age: 41-50	47.339 (416.223)	237.133 (426.649)	15.568 (165.447)	-152.958 (113.787)	-639.606*** (240.925)
Age: 51 or above	912.642* (503.089)	1,065.059** (515.691)	-43.218 (199.976)	-104.207 (137.534)	-1,094.955*** (291.206)
Constant	477.218 (380.681)	1,183.239*** (390.217)	727.681*** (151.319)	394.947*** (104.071)	1,820.685*** (220.352)
Observations	1972	1972	1972	1972	1972
R-squared	0.04	0.02	0.02	0.16	0.04

+ Reference categories are Males, Whites, and Ages 31 – 40.

Covariates for missing gender, race, and age were included in the full models (Appendix B).

Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

In Houston, unlike Jacksonville, a positive and statistically significant relationship was found between homeless program lengths of stay and mental health costs (Exhibit 4.19), as well as between homeless system costs and mental health costs (Appendix C.3). Among persons who received mental health treatment, on average each additional month spent in homeless programs was associated with an increase of \$136 in mental health costs. The Mental Health and Mental Retardation Authority of Harris County offers numerous mental health programs targeting people who are homeless, including mental health programs that work in conjunction with local law enforcement officials and hospitals to divert individuals who are homeless from jail and inpatient hospitals. The higher mental health costs associated with long periods of sheltered homelessness likely reflect this local system of care. Alternatively, higher costs could reflect that individuals with mental illness are more likely to stay longer in the homeless system because their mental illness affects their ability to secure and maintain permanent housing outside the homeless services system.

Exhibit 4.19. Regression Analysis of Mainstream Costs for First-Time Homeless Individuals in Houston		
Outcome Variable	Mental Health Costs	Criminal Justice Costs
Homeless System Utilization		
Number of Homeless Program Stays	2.035	-23.043*
	(15.330)	(12.658)
Homeless Length of Stay (in months)	135.568***	-33.204
	(31.638)	(26.123)
Homeless Gap Days (in months)	207.498***	136.029***
	(28.694)	(23.693)
Demographics+		
Females	408.504*	-174.216
	(233.006)	(192.393)
African-Americans	-281.174	62.298
	(216.820)	(179.028)
Other Races	-671.700**	-813.770***
	(308.407)	(254.652)
Ages 18 – 24	-625.156	-388.749
	(414.834)	(342.528)
Ages 25 – 30	-28.563	-321.642
	(369.645)	(305.216)
Ages 41 – 50	-797.297***	-1,250.060***
	(268.755)	(221.911)
Age 51 and Above	-1,498.154***	-1,635.552***
	(334.779)	(276.428)
Another covariate was also included for mainstream system involvement.		
Constant	1,990.985***	2,520.263***
	(262.855)	(217.039)
Observations	4,404	4,404
R-squared	0.04	0.04
+ Reference categories are Males, Whites, and Ages 31 – 40.		
Standard errors in parentheses *significant at 10%; **significant at 5%; ***significant at 1%		

In addition, individuals in Houston who have gaps between homeless program stays have even higher mental health costs. For each additional 30 days of time spent between homeless stays, mental health costs increase by \$207. This correlation suggests that in addition to facing challenges remaining in permanent housing, individuals with mental illness may also have a difficult time staying in homelessness programs.

Like the Jacksonville results, criminal justice costs in Houston are associated with gaps between homelessness. For each additional 30 days spent between various homeless program stays, criminal

justice costs for individuals in Houston increase by \$136.²⁸ Data were not available for Medicaid, substance abuse services, or entitlement programs in Houston.

The regression models also included covariates for gender, age, and race (Exhibits 4.18 and 4.19). Controlling for homeless system use, single women are associated with much higher mainstream costs in most domains than men. In Jacksonville, first-time homeless women are associated with \$2,171 more in physical health costs, \$1,664 in mental health costs, and \$1,771 in food stamps and TANF than first-time homeless men in Jacksonville. Women are also associated with \$992 less in criminal justice costs. Similarly, first-time homeless women in Houston have higher mental health costs of \$409. The cost differences for criminal justice expenses are not statistically significant.

Older age is also associated with statistically significant cost differences. Individuals in Jacksonville and Houston over 40 are associated with lower criminal justice costs, \$640 to \$1,250 less for individuals between 41 and 50 years of age and \$1,095 to \$1,635 less for individuals over 50. In Jacksonville, individuals over 50 have \$913 *higher* physical health costs and \$1,065 *higher* mental health system costs. In Houston, older adults are associated with *lower* mental health costs, \$800 for individuals between 41 and 50 years of age and \$1,498 for individuals over 50.

Race is also associated with statistically significant cost differences (Exhibits 4.18 and 4.19). In Jacksonville, African-Americans are associated with \$560 more in physical health costs, \$281 more in food stamps and TANF, and \$380 more in criminal justice costs, but \$907 less in mental health treatment costs and \$378 less in substance abuse treatment costs. These results provide a mixed picture, since they suggest that African-Americans are better connected to income support programs and may have fewer behavioral health needs, but have greater involvement with criminal justice. From this analysis, we cannot tell when the costs occurred in relation to homelessness. In Houston, individuals of “other” races had significantly lower mental health and criminal justice costs, but the results for African-Americans are not statistically significant.

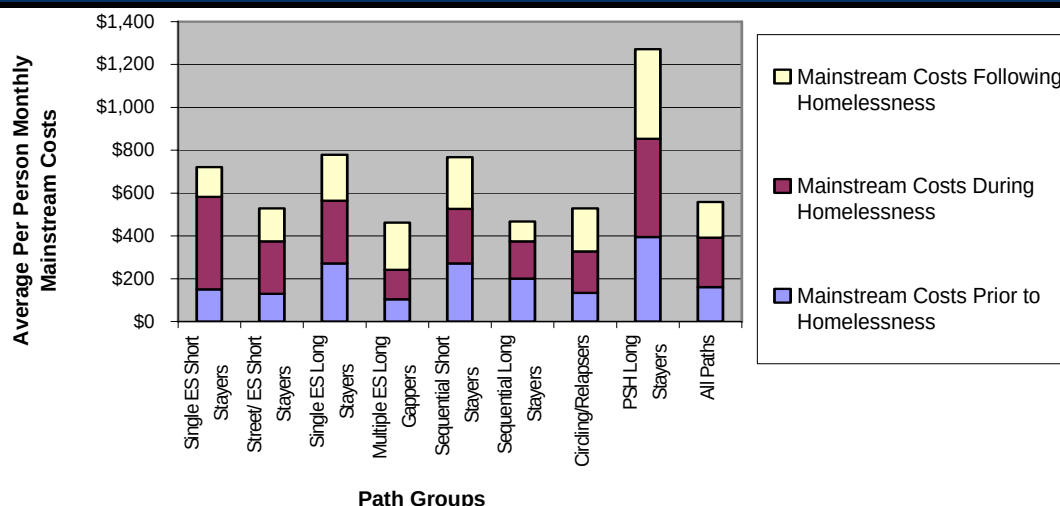
The results for cost differences associated with gender, age, and race are very interesting considering that women, African-Americans, and relatively older individuals are all associated with higher homeless system costs.

4.4.6 Mainstream Costs Associated with Different Path Groups of First-Time Homeless Individuals

The average per person mainstream system costs for each of Jacksonville’s path groups in the periods before, during, and following homelessness are shown in Exhibit 4.20. This exhibit illustrates the wide-range of mainstream costs for different subgroups of the study cohort defined by ways in which they use the homeless services system. Permanent Supportive Housing Long-Stayers incur the most mainstream costs when compared with other path groups. For this group, the period during homelessness refers almost entirely to the time individuals spent in permanent supportive housing programs that were part of the homeless system. Since eligibility for permanent supportive housing is contingent upon having a chronic disability, it is not surprising that this group has high mainstream costs across all three periods.

²⁸ The multivariate regression analysis for criminal justice may be affected by missing identifiers for the street only path group. The matching algorithm and process used for mental health records was more comprehensive.

Exhibit 4.20: Jacksonville Cohort's Average Per Person Monthly Mainstream Costs By Path Group and Period



We conducted multivariate analysis to show the extent to which mainstream costs for the total study period are greater for certain subgroups defined by the paths they take through the homeless services system. An extract of the regression models for each mainstream domain in Jacksonville is shown in Exhibit 4.21, and the complete model is provided in the Jacksonville case study Appendix B. Descriptions of the path groups were presented in Section 4.3.4.

Exhibit 4.21: Modeling Mainstream Costs for First-Time Homeless Individuals in Jacksonville by Path Groups

Mainstream System Costs	Medicaid Costs	Mental Health Tx Costs	Substance Abuse Tx Costs	Entitlement Costs	Criminal Justice Costs
Emergency Shelter Short Stayers	Omitted: reference category				
Emergency Shelter Long Stayers	1,629.965 (1,118.827)	-1,238.011 (1,158.049)	-12.359 (448.596)	2,326.988*** (306.924)	47.142 (656.299)
Emergency Shelter Long Gappers	-540.835 (576.914)	-163.468 (597.138)	349.426 (231.315)	-93.135 (158.263)	1,677.589*** (338.415)
Street/ES Short Stayers	-134.925 (400.498)	-2.881 (414.539)	312.461* (160.581)	-4.741 (109.867)	541.743** (234.931)
PSH Long Stayers	7,562.911*** (1,005.047)	-177.606 (1,040.280)	1,174.122*** (402.976)	439.888 (275.711)	839.736 (589.556)
Sequential Program Users (Short Stayers)	910.630 (577.251)	1,306.901** (597.487)	883.603*** (231.450)	-247.596 (158.355)	43.786 (338.613)
Sequential Program Users (Long Stayers)	-634.893 (1,233.235)	-716.680 (1,276.468)	1,345.077*** (494.468)	43.305 (338.309)	42.512 (723.410)
Circling Program Users	-342.969 (658.072)	-501.256 (681.141)	491.023* (263.855)	325.064* (180.526)	1,099.228*** (386.022)
Model also included covariates for Gender, Race, and Age					
Constant	476.466 (410.918)	978.383** (425.323)	587.542*** (164.758)	467.889*** (112.726)	1,682.568*** (241.042)
Observations	1972	1972	1972	1972	1972
R-squared	0.06	0.02	0.02	0.18	0.04

Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

The model shows that those who go directly to permanent supportive housing and stay there for relatively long periods have on average Medicaid costs \$7,563 higher and substance abuse costs \$1,174 higher than short-stayers in emergency shelter, the reference category. Surprisingly, long stayers in permanent supportive housing do not have higher mental health costs than short stayers in emergency shelter. This may be because some of the permanent supportive housing programs target individuals with chronic addictions who may have fewer mental health treatment needs. Another possible explanation is that permanent supportive housing programs may be serving as caretakers for individuals with less severe mental health needs rather than a therapeutic model for those with acute needs. However, the model that predicts mental health costs has R-squared statistics of only .02, so patterns of homelessness and demographic characteristics may not be most relevant covariates for explaining results.

The two path groups who move in sequence from emergency shelter to transitional housing or permanent supportive housing and do not come back to emergency shelter have high substance abuse costs and (for one of the path groups) high mental health costs. Sequential Users (Short Stayers) were associated with over \$1,300 in additional mental health costs, and an additional \$884 in additional substance abuse costs on average, compared with Emergency Shelter Short Stayers. Sequential Users (Long Stayers) were associated with an additional \$1,345 in substance abuse costs, but did not have higher mental health costs. As we discussed earlier in this chapter, the Sequential Users spend a long time in transitional housing, in which program staff may play a role in facilitating access to intensive substance abuse treatment. It is not clear whether the higher costs for this path group reflect greater service needs of these individuals or whether they merely had greater access to services.

Three path groups had high criminal justice costs: those who had long gaps between emergency shelter stays; those who spent time on the streets; and those who circled back and forth between program types. This finding clearly links the criminal justice system to those individuals whose needs are not fully met by the homeless residential system. Individuals whose criminal justice costs are rooted in jail time served prior to homelessness may be more likely to follow one of these three paths. At the same time, those who have long gaps between stays are often incarcerated during these gaps.

A similar model, shown in Appendix C.3, predicts which of the path groups in Houston have particularly intensive use of mental health services and the criminal justice system. Four path groups are associated with higher mental health costs. Individuals with long gaps between stays had on average \$2,300 to \$3,000 more in mental health costs than individuals with brief stays in emergency shelter. These higher mental health costs may reflect recurring stays in in-patient treatment programs prior to and during homelessness. The Sequential Users with long stay in homeless programs, primarily in transitional housing, also have mental health treatment costs \$2,085 higher than brief users of emergency shelter. These costs may be related to inpatient treatment prior to homelessness or during, but may also be a reflection of service linkages with mental health programs established as a result of staying in certain types of homeless programs. Two of the groups with multiple homeless stays and long gaps between stays were associated with higher criminal justice costs than emergency shelter short-stayers. Emergency Shelter Long Gappers had \$1,179 in higher jail and arrest costs, and Circlers had \$1,943 more in criminal justice costs. Individuals who used transitional or permanent supportive housing only were also associated with \$791 more in criminal justice costs.

4.5. Homeless System and Mainstream Costs for First-Time Homeless Individuals During the Period of Homelessness

Exhibit 4.22 compares the costs per person for the homeless services system and selected mainstream systems in Jacksonville and Houston and shows that the homeless system costs were much higher. It is important to note that this study was not able to collect utilization and cost information for some high-cost mainstream domains, such as locally funded emergency room care or emergency medical transport. The ratio of homeless to mainstream costs to some degree reflects the relatively low levels of involvement with mainstream systems during homelessness for most in the cohort and the fact that the majority of costs are concentrated among a smaller percentage of the study cohort. This suggests that while there may be limited opportunities for cost offsets in mainstream systems for most of the first-time homeless cohort, there may be opportunities within the homeless system to allocate resources to support better outcomes for homeless individuals. There continue to be opportunities to identify cost-effective interventions targeting individuals with intensive or high-cost use of mainstream systems.

In Section 4.1, we discussed past research on patterns of homelessness and the growing body of research that has been completed on costs associated with homeless individuals who are severely mentally ill or individuals who are identified as frequent users of inpatient or high-cost mainstream systems. Past research on homeless individuals has recognized that costs can be assumed to be quite low for the majority of homeless individuals, but has not quantified them. This study shows that the

Exhibit 4.22: Homeless and Selected Mainstream System Costs per Person Incurred during Homelessness				
	Jacksonville		Houston	
	Costs	% of Total	Costs	% of Total ^a
Homeless System	\$1,634	62%	\$2,257	80%
Selected Mainstream Systems	\$1,018	38%	\$547	20%

^aThis percentage is not very meaningful, since the Houston case study includes such limited mainstream domains.

overall Jacksonville study cohort incurred an average total cost of just over \$2,600 per person during homelessness (totaling homeless and mainstream systems costs shown on Exhibit 4.22), substantially lower than the annual estimates of \$40,500 per person from the NY/NY Cost Study (Culhane et al., 2002).²⁹ However, examining the average costs of the full cohort is not nearly as meaningful for policy purposes as focusing on costs associated with more specific subgroups that could be targeted with alternative interventions.

Exhibit 4.23 presents the costs of five of the eight path groups from the Jacksonville case study (our most comprehensive findings) to illustrate the range of costs that have been identified for different

²⁹ Note that these figures are provided for discussion purposes only. The two studies are not directly comparable because of the differences in the research objectives and designs, study populations, geographic locations, and timeframes for analysis.

homeless single adult populations in comparison with the NY/NY Cost Study.³⁰ This discussion assumes that local stakeholders have a mechanism to predict future patterns of homelessness as the basis for targeting various interventions—presumably the subject of future research.

Emergency Shelter Short Stayers represent more than half of the first-time homeless study cohort in Jacksonville. Individuals in this group have average stays of less than one month and could theoretically be targeted for prevention strategies. Thus, a major policy question is whether resources currently used to house these individuals in shelter could be allocated differently to fund a prevention approach. The exhibit shows that, because of their short stays in shelter, the group is associated with only \$686 per person in homeless system costs and incurs only \$452 in mainstream system costs per person while homeless. While prevention strategies might hope to decrease some of the mainstream costs such as criminal justice involvement (\$138), other mainstream use is desirable, such as receipt of food stamps/TANF (\$69) and Medicaid Managed Care (\$19). Therefore, to be cost-neutral, stakeholders in Jacksonville would need to limit a prevention intervention to an average per person cost of \$1,000 if cost offsets from both mainstream and homeless systems were used. Given the difficulty of reprogramming mainstream resources, only the \$686 under the control of the homeless system might be available.

Exhibit 4.23: Comparison of Costs During Homelessness Among Select Jacksonville Path Groups and Costs from the NY/NY Study Cohort Prior to Placement in Permanent Supportive Housing

	Jacksonville ES Short Stayers	Jacksonville ES Long Stayers	Jacksonville Circlers	Jacksonville PSH Long Stayers	NY/NY Cost Study SMI Cohort
Path Group Description	Less than one month spent in ES; 43% also had contact with street outreach teams	Continuous stay in ES averaging 10 months	Average 5 months (8 distinct stays) in homeless programs, returning to ES after TH or PSH; spread over 10 months	Average one year in homeless programs across 3 stays, primarily in PSH. Evidence of disability criteria for PSH.	4½ months in shelter over 2 yr period All psychiatrically disabled with severe mental illness
Homeless System	\$686	\$9,756	\$3,987	\$8,493	\$4,658
Medicaid (Primary Health, Mental Health, Substance Abuse)	\$126	\$829	\$282	\$3,716	\$14,208
Local Hospitals					\$6,229
State Mental Health Treatment	\$57	\$126	\$40	\$467	\$12,520
State Substance Abuse Treatment	\$62	\$164	\$92	\$786	-
Criminal Justice	\$138	\$57	\$1,400	\$561	\$1,012
Income Supports	\$69	\$1,777	\$243	\$667	
Veterans Affairs					\$1,822
Total Per Person	\$1,138	\$12,709	\$6,044	\$14,691	\$40,451

Total may not reflect the sum of the domains due to rounding.

³⁰ Emergency Shelter Short Stayers combines Jacksonville’s ES Short Stayers and Street/ES Short Stayers; therefore, five of the eight Jacksonville path groups are represented by the four groups discussed in this section.

Emergency Shelter Long Stayers represent a small percentage of the Jacksonville cohort, but they had almost year-long continuous stays in emergency shelter and were associated with substantial costs. More than one-third of these individuals received Medicaid-funded primary health care (average \$829 per person), so it is possible that medical conditions contributed to their long lengths of stay. If a locality wanted to target these individuals, they could flag individuals with stays longer than a specified length. Three-quarters of the costs associated with this group were incurred within the homeless system itself, an average of \$9,756 per person. These costs were equivalent to 15 months of rent subsidy at the FY2006 Fair Market Rent of \$643 per month (HUD, 2005). Mainstream costs were substantial, but mainly because 77 percent of the group received food stamps during homelessness with an average total benefit of \$1,551 per person. Future research would be required to know if an alternate housing intervention could achieve cost offsets through reductions of primary or behavioral healthcare expenses.

Circlers, 7 percent of the Jacksonville study cohort, spent almost 5 months in residential homeless programs spread over the course of more than 10 months. Individuals in this path group were characterized by a pattern of returning to emergency shelter at some point after an earlier stay in transitional or permanent housing. Because this group had frequent gaps when individuals were not staying in homeless programs, the homeless costs (almost \$4,000 per person) were not as high as some other groups. About one-third of this group received mental health care at some time during the study period, but a smaller portion accessed primary health care than in other groups. More than 40 percent were involved with criminal justice at an average cost of \$1,400 per person, more than two-thirds of all mainstream costs incurred by this group during homelessness. Arrests and jail sentences may have occurred between homeless stays, or may have caused the disruption in program usage resulting in the return to shelter. Criminal justice agencies may be interested in partnering to design an intervention to target this group.

Permanent Supportive Housing Long Stayers were associated with the highest costs per person, an average of almost \$15,000 per person for homeless and mainstream services. The individuals in this group spent an average of one year staying in residential homeless programs, primarily in permanent supportive housing. Thus, rather than identifying costs associated with homelessness, data for this path group essentially illustrates the homeless and mainstream costs that were incurred when the homeless system stably housed disabled individuals who experienced first-time homelessness. Most of the \$8,500 in homeless system costs per person in this group was incurred for permanent housing, so conceptually these costs are quite different from costs for the other path groups. These individuals each received an average of \$6,200 in mainstream services while in homeless programs, most for primary health care (\$3,452) and substance abuse treatment (\$950). This group also had a fairly high-level of criminal involvement (\$561 per person) during this period. It is somewhat surprising that the individuals in permanent supportive housing did not receive higher levels of mental health treatment, though several of these projects targeted individuals with chronic addictions, rather than persons with severe mental illness. These data would need to be parsed further to understand how homeless and mainstream costs varied when the individuals were in shelters or transitional housing as compared with permanent housing, but most of the mainstream costs were incurred while in permanent housing.

The final column of the Exhibit displays the costs incurred by the NY/NY Cost Study cohort in the two years prior to placement in supported housing. This group averaged close to five months in shelter during this period and incurred high levels of mainstream services during this timeframe. The differences in costs between the NY/NY cohort and the Jacksonville path groups reflect several

factors. The most significant is that all members of the NY/NY cohort were severely mentally ill and presumably had greater treatment needs and service utilization than any of the Jacksonville path groups. The figures also reflect significant differences in costs in different parts of the country, as well as state-to-state and city-to-city differences in service levels and access to services.³¹ Therefore, communities have varying opportunities to achieve cost offsets when employing alternative interventions. This comparison clearly illustrates the point made by Rosenheck (2000) that high-cost interventions must be targeted to individuals with high-cost service utilization in order to be cost-neutral. That is not to suggest that other populations should not be targeted with high-cost interventions for ethical, social and other reasons.

4.6. Policy Implications and Recommendations for Further Research

This chapter documents the patterns and costs associated with first-time homelessness for individuals, and perhaps most importantly, the wide range of costs incurred by individuals with different patterns of using homeless residential programs. For the majority, stays in homeless programs are a single brief occurrence, and costs are minimal. For a small percentage, stays are long, and costs are significant. High homeless system costs frequently reflect extended use of higher cost transitional housing. Average homeless system costs per person appear to overshadow average mainstream costs per person for most during homelessness, since a relatively small percentage of individuals interact with mainstream systems during homelessness. And those with extended periods of homelessness are not consistently associated with intensive or high-cost mainstream use. Further, while average monthly mainstream costs peak during homelessness, when graphed based on the month-by-month utilization, mainstream system costs actually increase dramatically immediately before homelessness and peak immediately after the individual enters the homeless residential system. Thus, while cost savings may be achievable *within the homeless system* for long-stayers, the data from these three sites do not suggest significant cost savings *within mainstream systems* can be achieved by ending homelessness for first-time long-stayers as a whole.

4.6.1 Opportunities for Cost Savings

From a policy perspective, this study affirms past research and emphasizes that communities should be cautious when extending per person averages to a broad group of homeless individuals. The greatest costs and the greatest potential for cost savings are found among the very small percentage of individuals who stay the longest in the homeless system or who have intensive involvement in high cost mainstream systems. Policymakers seeking cost-effective interventions for homelessness will need to appropriately target strategies to each group.

Communities can use this type of cost analysis to explore in much more detail how individuals use homeless residential programs, the associated costs, and the potential for cost offsets. But communities must recognize that cost offsets may not be possible for some of the largest groups of individuals who become homeless, and saving money is not the only reason to deliver housing and services differently. The majority of individuals who experienced first-time homelessness in this

³¹ For instance, in 2006, New York was ranked first with \$2,316 in per-capita Medicaid spending for 2006, whereas Florida was ranked 46th with \$706 per-capita spending (Public Policy Institute of New York State, n.d.).

study had very short stays with low associated homeless system costs. Nonetheless, communities could consider whether the average shelter cost per person for this subgroup could be reprogrammed (and potentially augmented) to support prevention and shelter diversion strategies.

Other policy considerations and cost saving possibilities are raised or affirmed by this research.

- Emergency shelter has low costs for short stayers, but is expensive and presumably an inappropriate intervention for longer stayers. Although the idea of prevention is appealing, the emergency shelters seem to provide an immediate, low-cost response to homelessness for the majority of individuals. It would be very difficult to fund a prevention response at such low cost, particularly since it may be challenging to identify up front which of the individuals' homelessness could be prevented with minimal assistance. Perhaps the emergency shelter system is an "adequate" response to an immediate housing crisis for most individuals, and a place in which individuals who are not able to quickly resolve their housing crisis can be more deliberately assisted or referred to more intensive interventions. For instance, emergency shelters could target case management or specialized assistance to individuals who have been in shelter for 30 days or more.
- Higher mainstream costs in some domains were associated with individuals with multiple episodes of homelessness (Long Gappers). Communities could target individuals who return to shelter for a second (or third) non-consecutive program stay. This group (and others) may also particularly benefit from intentional prevention-oriented discharge planning strategies and other strategies implemented in conjunction with criminal justice systems to reduce repeat incarceration.
- For some subgroups, total homeless system costs incurred per person exceed the cost of an annual direct housing subsidy. Communities may want to consider whether housing assistance would be a lower cost and potentially equally effective intervention for some of these groups.
- Transitional housing is generally one of the most expensive homeless program models. While this study does not look at long-term efficacy of this program model or its overall cost-effectiveness, communities may want to consider whether it is possible, and still consistent with program objectives, to shorten lengths of stay in transitional housing through more rapid out-placement, to target transitional housing more specifically to those who are less stable or more likely to interact inappropriately with mainstream systems and therefore need longer term housing support with intensive services, or to reduce the costs of the most expensive transitional housing programs.
- We surmise that one reason individual women cost more than individual men is that they may be more likely to be housed in programs that also serve families and therefore have a higher cost structure. Communities that are advancing a transitional housing solution may want to develop transitional housing for single women that can take advantage of a lower cost structure for individuals.
- Very few individuals in this study used permanent supportive housing, either immediately upon entering the homeless services system or after a stay in emergency shelter or transitional housing. We did not examine whether a larger percentage were eligible or appropriate for this model, but communities may want to assess whether capacity constraints in permanent

supportive housing may be contributing to episodic homeless behavior or longer stays in shelter or transitional housing for others.

- Any local system that attempts to change how individuals experience homelessness must presume that there are valid strategies to identify and triage people based on their predicted use of system resources. This study suggests that certain groups, such as single women over 40 years old, have higher costs than others; lower cost strategies may be able to be developed to house these subgroups more effectively. In this case, age and gender could be coupled with other basic screening criteria to triage potential high cost users to alternative interventions. More work is needed to understand both predictors and interventions that may be more effective for various subgroups.
- Some individual homeless programs used by first-time homeless individuals were extremely expensive, as shown in this chapter by the high costs of the homeless services system for particular groups of individuals even when lengths of stay are controlled for. (See Chapter 3 for more detail on program costs.) Communities should examine homeless program cost outliers for possible efficiency gains.

In identifying these ideas, we hope to increase understanding of how diverse the patterns of first-time homelessness are, as are presumably the needs of those who experience it, and the strategies and resources that are deployed to address it. These possibilities for cost-savings are offered to spark discussion about ways to identify opportunities to use existing resources to improve local homeless systems. However, to reiterate, this study did not examine cost-effectiveness and therefore, we do not mean to imply that lower cost assistance is better. This study measured only costs associated with homelessness. Although the methods we use may be useful in other circumstances to measure costs of alternative interventions, any effort to alter current programs or to create new interventions should be conducted with a comparable understanding of their relative effectiveness for different groups.

4.6.2 Methodological Lessons

An important methodological finding of the study is that analysts should be cautious using averages to calculate costs for a group of homeless individuals. Not all people incur the same level of costs, nor do they present an opportunity to achieve the same level of cost savings. If a community intends to target all people who are homeless, then applying an average to understand costs or cost savings is less of a concern, but a community planning a targeted intervention should recognize that most of the cost savings will be achieved for a small minority of homeless individuals and that they must use appropriate subgroup data to estimate the savings for the individuals they are targeting. For instance, if Jacksonville were to develop a prevention initiative for individuals who would otherwise spend less than a week in shelter, analysts in Jacksonville must assume that the homeless system cost offset is approximately \$600, not the average homeless cost of \$1,600 incurred by the complete Jacksonville study cohort.

Client-level data allowed us to: understand and graph the distribution of costs to the homeless system and some select mainstream systems; conduct multivariate analysis to understand whether costs were associated with certain demographic characteristics or homeless patterns that may be able to be used by communities to predict costs or target interventions; and avoid misusing averages for service utilization, costs, and misleading average costs calculated for broad time periods. Future studies should attempt to collect and analyze client-level data whenever possible.

4.6.3 Recommendations for Future Research

In numerous places throughout this chapter, we have cited limitations of our findings. Future research could examine several areas to further our understanding of costs of homelessness for first-time homeless individuals. One of the most important findings on mainstream data was the pattern of costs peaking around the first day of homelessness. These patterns need more analysis to understand how costs taper off after homelessness, teasing out the associations with subsequent episodes of homelessness. This study also defined the period during homelessness broadly as the period between the first day in a homeless program and the last, inclusive of gaps between stays. More analysis could be conducted on mainstream system costs to understand the frequency and types of service use relative to the times when individuals were staying in homeless programs and gaps between stays, and whether use varied by the type of homeless program used.

Additional data could also be gathered on other mainstream domains (or all of the mainstream domains for the Des Moines case study) to build a more comprehensive understanding of costs. To address methodological limitations, client-level service utilization data should be collected, if at all possible, for all (new and existing) mainstream domains to enable communities to more closely examine trends relative to periods before and immediately following the start of homelessness. With more complete client-level data, additional multivariate regression analysis could also be conducted to further understand the factors that are associated with higher costs for various path groups.

Finally, these methodologies could be employed as part of broader research examining the cost-effectiveness of various interventions for different subgroups—arguably, one of the most important policy question facing communities today.

5. First-time Homelessness for Families and its Associated Costs

This chapter examines the patterns of sheltered homelessness for families and associated costs to the homeless services and mainstream systems. The most important themes about costs associated with first-time homelessness for families that emerged are that the study:

- Confirms earlier research that long stays in the homeless services system are very expensive and makes explicit that most families with long periods of sheltered homelessness use transitional housing, either exclusively or in combination with emergency shelter.
- Shows that housing vouchers are less expensive than transitional housing per day or per month. Whether the cost of transitional housing is ultimately lower than the cost of a permanent voucher—because transitional housing is temporary—is an open question.
- Identifies a group of highly troubled families that cycle in and out of the homeless services system and have very unstable household composition, often including men for part of the total period of homelessness. Unlike heavy users of transitional housing, the outcomes of the use of the homeless services system by these highly unstable families are unambiguously negative in that they are never stably housed. An alternative treatment model for these families that focuses on their family instability rather than their housing instability may be needed.
- Shows that African-American families, shown by other research to be homeless at higher rates than other poor families, are associated with lower average costs per family in comparison to white families.
- Shows that, among the domains for which we were able to collect data, the highest rates of utilization and costs for homeless families are the medical costs reimbursed by Medicaid.
- Concludes that short-term costs to the criminal justice system, while troubling, do not appear high enough to suggest opportunities for offsets. We were not able to collect cost data for the use of the child welfare and foster care systems by homeless families in any of the study communities. This is an area in which additional research might find opportunities for cost offsets.
- Suggests—on the basis of the limited information collected for this study—that local policies designed to prevent families from becoming homeless and divert those on the brink of homelessness can succeed.

5.1. Existing Research

The 2007 Annual Homeless Assessment Report (AHAR) describes some salient characteristics of sheltered homeless families across the nation (HUD, 2008). Most adults who become homeless with their children are women (82 percent), a higher percentage than the two-thirds of adults in all poor families who are women. More than half of sheltered homeless families are African American. Homeless families are particularly likely to include children younger than age six.

Like the AHAR estimates based on HMIS data from a nationally representative sample of communities, most previous research on homeless families describes their characteristics. The literature has focused on trying to predict which poor families are at greatest risk of becoming homeless, given that few families become homeless even among the very poor. Rog, Holupka and Patton (2007) found that only 8.7 percent of a study sample of “fragile families”—recent mothers with incomes below 50 percent of the poverty level—became homeless during a three-year follow up period. Various studies have shown that mental health, substance abuse, and domestic violence are factors that put parents at risk of becoming homeless, but researchers have not been able to predict which families with these risk factors will become homeless (Rog and Buckner, 2007; Shinn, Rog, and Culhane, 2005).

5.1.1 Patterns and Costs of Family Homelessness

Based on a literature review, an expert panel, and some reanalysis of data, Rog, Holupka and Patton (2007) developed a framework for a typology of homeless families, but not a typology itself. They concluded that two typologies of homeless families are needed: a “prevention” typology that would help communities focus their resources on families at highest risk of becoming homeless, and a “resource allocation” typology that would help communities assist families who become homeless in cost-effective ways.

Culhane, Metraux, Min Park, Schretzman and Valente (2007) began to develop a resource allocation typology, based on cluster analysis of administrative data, conducted separately for New York City, Philadelphia, Columbus OH, and Massachusetts. Generalizing across the results of cluster analysis based on number of shelter stays and cumulative days of shelter use over a three year period in New York and Philadelphia and a two-year period in Columbus and Massachusetts, they identify three groups of first-time homeless families:

- Temporary: Families who use shelters or transitional housing for a single, relatively short, period of time and do not return to the residential system for homeless people after leaving it;
- Episodic: Families who cycle in and out of programs for homeless people, with relatively short stays for each homeless episode; and
- Long-Stayer: Families who stay for long periods of time in shelters, transitional housing, or both.

Culhane and his co-authors (2007) find that “Long-Stayer” families are by far the most expensive for the homeless services system. The average lengths of stay for this group ranged from six months (187 days) in Columbus to more than a year (444 days) in New York City, costing \$21, 692 per family in Columbus, \$30,812 in Philadelphia, \$48,440 in Massachusetts, and \$55,200 in New York (Exhibit 5.1). They question whether this is a cost-effective use of resources, given that these “Long Stayers,” who make up about a fifth of all sheltered homeless families, are not more intensive users of targeted social services than other groups of homeless families. They base this assessment on the rates at which families use such social services as mental health and substance abuse treatment and the foster care system.

Exhibit 5.1: Average Cost per Family to the Homeless Services System, based on Lengths of Stay and Shelter Reimbursement Rates for Each Community

	Columbus, OH	Philadelphia	Massachusetts	New York City
Temporary	\$3,828	\$4,900	\$11,550	\$13,900
Episodic	\$17,168	\$19,043	\$21,450	\$38,500
Long Stayer	\$21,692	\$30,812	\$48,440	\$55,200

Source: Culhane, Metraux, Park, Schretzman, and Valente, 2007.

Culhane et al. (2007) match families in their study sample to selected mainstream systems for which they were able to obtain data. However, they do not report the costs of mainstream system use or suggest whether these costs could be reduced by preventing or ending homelessness for particular families. Such analysis of cost offsets has been confined to the individual homeless population and is discussed in Chapter 4.

As far as we know, this is the only previous analysis of the costs of homelessness for families. Other studies have been program evaluations that have reported on the outcomes of interventions for homeless families, but not systematically on their costs.¹

5.1.2 This Study and Previous Research on Costs of Family Homelessness

This study of family homelessness in four additional communities—Kalamazoo, MI, Houston, TX, Upstate South Carolina, and Washington, D.C.—builds on and differs from Culhane et al. (2007) in the following ways:

- Like Culhane et al., we use cluster analysis, conducted separately for each of our four communities, to identify groups of first-time homeless families who follow different patterns or “paths” of use of the homeless services system. However, we use additional dimensions—type of program used, sequences of program use, and the lengths of “gaps” during which families are not in a residential program for homeless people—to create these clusters.
- Like Culhane et al., we use data from selected mainstream systems to which we were able to gain access to interpret the relative neediness of families and also to infer what caused them to become homeless.
- Instead of standard reimbursement rates for public funding of residential programs for homeless people, we use actual costs of programs collected from program budgets. This enables us to explore the influence of different types of programs on homeless costs.
- For three of the four communities, we are able to report data on the costs of the use of mainstream systems by homeless families and to make some inferences about potential cost savings and offsets.

¹ For a summary of this literature, see Locke, Khadduri, and O’Hara, 2007.

5.2. Characteristics of First-Time Homeless Families

We studied first-time homelessness among families in Houston, Washington DC, Kalamazoo, and Upstate South Carolina.² Across the four sites, we identified 1,374 families as first-time homeless between July 1, 2004 and June 30, 2005.³ Although Houston is by far the largest community in the study in terms of general population, only 35 percent of the study population is in Houston and Washington DC had almost as many first-time homeless families as Houston (Exhibit 5.2).

The characteristics of the families in the study cohort in each site are shown in Exhibit 5.2. At all sites, most were single-parent families, and most adults were female. However, all sites included some adult men. The percentages of family members identified as black or African American reflect differences among the four communities. At the same time, as is the case for the AHAR national estimate, homeless families at these sites were disproportionately African American, compared with the African American percentage of the poverty population in the same communities. Nevertheless, all sites except for DC have many white families. Because of limitations of the HMIS data for these four communities, we were not able to determine the percentage of families who identified themselves as Hispanic or Latino. The AHAR estimate is that, nationally, 22 percent of homeless families identify themselves as Hispanic (all races), considerably lower than the percentage of all poor families who are Hispanic (HUD 2008). In each of the communities and especially Houston, the percentage of first-time homeless families who are minorities, including families identifying themselves as Hispanic, doubtless is somewhat higher than the percentage who are African American.

Exhibit 5.2: Characteristics of the Study Cohort of Families Who Became Homeless between July 1, 2004 and June 30, 2005

	Number of families	Adults who are male	African American	Average Age of Adults	Average Family Size
Houston	477	13%	61%	32	3.2
DC	410	17%	93%	32	3.5
Kalamazoo	342	15%	61%	30	3.2
Upstate SC	145	11%	53%	31	3.0

The age of adults and average family size for the study cohorts in the four communities are very similar to those characteristics for homeless families nationally, as estimated by the AHAR (HUD 2008). Nationally, adult men are somewhat more common among adults in homeless families (18 percent), compared to the first-time homeless study cohorts in the study communities except for Washington, DC.

² A family was defined as a group of people who were served together at any time during the study period and who, at any time during the study period, included at least one adult (18 or older) and one child (17 or younger) when served by a program for homeless people. As a result, members of homeless families sometimes were found in programs serving homeless individuals at the study sites. "Stays" in individual programs were considered part of the overall period of homelessness, and their costs were included in the costs of serving homeless families.

³ In Kalamazoo, we identified families for the study cohort based on first entry into the homeless system between January 1, 2005 and December 31, 2005.

We followed all members of each family in the study cohort for 18 months after the family (or one of its members) first appeared in the homeless services system. For DC, we were able to follow the study cohort for 30 months following the beginning of homelessness, and we decided to take advantage of this longer observation period because we found few families in the study cohort in transitional housing or permanent supportive housing when we followed them just for the first 18 months after their first entry into the homeless residential services system for homeless people.

When a family had more than one “stay” in a homeless program during the observation period, we often found that the composition of the household changed over the family’s total period of homelessness. Change took a variety of forms: different adults appeared together with children; different children appeared together with adults; adults appeared without children during some program stays and with children in others; two adults were present at some times and not at others. Exhibit 5.3 shows the percentage of families with more than one program stay in each of the sites and also the extent of change in household composition.

Exhibit 5.3: Changes in Household Composition among Homeless Families			
	Families with change in composition (entire study cohort)	Families with more than one program stay	Families changing composition among those with more than one program stay
Houston	25%	28%	65%
Washington, DC	34%	42%	76%
Kalamazoo	13%	32%	35%
Upstate SC	17%	35%	43%

At every site, at least one quarter of the families had more than one program stay, and a substantial fraction of those changed household composition when comparing household membership at the start of one program stay to the next. In the District of Columbia, which has the highest rates of composition change, more than a third of the study families changed in composition between stays during their period of sheltered homelessness.

Multivariate analysis presented later in this chapter will show that, after controlling for many other potential cost drivers including total days spent in homeless programs, families that changed composition had substantially higher costs to the homeless services system than those that did not.

5.3. Patterns of Family Homelessness and Associated Homeless System Costs

5.3.1 Homeless System Utilization

Central to costs to the homeless services system is how the system is used and, in particular, how many days a family spends in residential programs for homeless people. As shown in Exhibit 5.4, we found that the average total time that families spent in homeless programs during their period of homelessness varied dramatically across the four communities in the study, from just over 3 months in Kalamazoo to more than 9 months in DC.

The exhibit does not reflect lengths of stay for families in DC who used only a program--Community Care Grants—that places families directly from a central intake system into permanent housing and provides them with case management and short-term rental assistance. The “stays” reported to the HMIS for Community Care Grants reflect long periods of program enrollment during which families may receive case management provided by the homeless system but are not in the residential system for homeless families. Such lengths of stay are not comparable to lengths of stay within emergency shelter, transitional housing, or permanent supportive housing. The observation period in DC was longer—30 months rather than 18 months. The figures in parentheses on Exhibit 5.4 show lengths of stay and other patterns for the DC families for the first 18 months after they became homeless and show that DC still has the longest lengths of stay of any of the four communities.

The communities with relatively shorter lengths of stay, Kalamazoo and Houston, had a more skewed distribution, as shown by the difference between the average days spent in homeless programs and the medians and lowest quartiles (Exhibit 5.4). In Houston, half the study sample spent fewer than two months in homeless residential programs, and a quarter of the families were sheltered for 15 days or less. In Kalamazoo, half the study sample was in a program for a month or less, and a quarter of the families stayed 5 or fewer days. In DC, by contrast, the quarter of the sample with the briefest periods of sheltered homelessness still was in the system for more than a month.

Long periods spent by families in residential programs for homeless people may reflect housing market characteristics—for example a tight and expensive housing market and long waiting lists for assisted housing in Washington, DC—but may also reflect the way the homeless services system is organized and the relative attractiveness of the emergency and transitional housing facilities available in the community. Other factors that may affect long stays in DC include a central intake and screening process that may divert some families who otherwise would be short-stayers. In addition, DC had both congregate emergency shelters and “second stage” emergency shelters that provided private apartments without the time limits imposed by federal law on many transitional housing programs. Kalamazoo and Houston’s systems may be structured to move families out faster.

Exhibit 5.4: Use of the Homeless System by the Study Cohorts of First-Time Homeless Families during an 18-Month Period^a

	Average days in homeless programs	Median days in homeless programs	25th percentile days in homeless programs	Average number of program stays	Average “Gap Days” between stays ^b
Houston	114	50	15	1.4	29
DC	289 (223)	168 (129)	46 (38)	2.6 (2.1)	92 (35)
Kalamazoo	94	31	5	1.5	61
Upstate SC	186	103	27	1.4	25

^aFor DC, the figures outside the parentheses are for the full 30-month observation period. The figures inside the parentheses show utilization patterns by the same families for the first 18 months following their entry into the homeless services system.

^bIncludes the total of all days during entire period of homelessness when no family members were in residential programs for homeless people. If a family had only one program stay or consecutive stays, the gap would be 0 days.

Families in the homeless services system experienced between 25 and 92 “gap days” on average—that is, days during the family’s entire period of homelessness when no family members were in a residential program for homeless people. We cannot tell whether families were living in their own housing units or unstably housed with family or friends during these periods. It is unlikely that all family members were homeless on the street (DC, for example reports to HUD that there are no families with children among its street homeless population) or that all members of the family were incarcerated or in hospitals or other inpatient programs.⁴

Multivariate analysis shows that, even after controlling for other factors that may influence lengths of stay, such as the type of program used (emergency shelter, transitional housing, or a combination of the two) and a large number of family demographic characteristics, the community in which a family was homeless had a powerful effect on its length of stay. Exhibit 5.5 reports the results of the multivariate analysis. When multiplied by 100, the coefficients for the covariates can be interpreted as percentage differences from the reference category, since the outcome variable is in logarithm scale. Compared with Kalamazoo (the reference category), DC families were sheltered 91 percent longer, Upstate South Carolina families 71 percent longer, and Houston families 45 percent longer.

Exhibit 5.5: Regression Analysis of the Length of Stay for First-Time Homeless Families

Total length of stay (log scale)	
Site	
Families in DC ^a	0.913*** (0.115)
Families in South Carolina	0.714*** (0.135)
Families in Houston	0.449*** (0.098)
Household Characteristics	
Total number of adults in household	-0.045 (0.183)
Total number of children in household	0.077** (0.032)
Any change in household composition during the study period	0.443*** (0.104)
Program Types Used	
Transitional Housing-only program type	2.436*** (0.100)
Emergency Shelter and Transitional Housing-only program type	1.988*** (0.137)
Other program type	1.921*** (0.164)
Demographics	
Male adult-only household type	-0.127 (0.271)
Female adult-only household type	-0.361* (0.210)
African American household head	-0.132 (0.097)
Household head of other race	-0.182 (0.191)
Household head ages 18-24	-0.269** (0.113)
Household head ages 25-30	-0.057 (0.105)
Household head ages 41-50	0.145 (0.123)
Household head ages 51 or above	0.538* (0.281)
Household with youngest child born after study entry	0.224 (0.238)
Household youngest child ages 6-12	0.103 (0.101)
Household youngest child ages 13-17	0.176 (0.162)
Household head race missing	-0.312 (0.245)
Household head age missing	-0.522 (0.634)
Youngest child age missing	-0.183 (0.299)
Constant	2.812*** (0.407)
Observations	1285
R-squared	0.48

Reference categories are: clients in Kalamazoo, Emergency Shelter-only program type, mixed-adult household type, white household head, household head ages 31-40, household youngest child ages 0-5

^a Excluded CCG/SAFAH-only families in DC

Standard errors in parentheses.

*significant at 10%; **significant at 5%; ***significant at 1%

Not unexpectedly, the most powerful factor for determining families’ lengths of stay in the homeless services system was the type of program they used. (Again, this analysis does not include families who used only the Community Care Grants program in DC, for which lengths of stay reflect a period

⁴ Some of these “gaps” may represent incomplete HMIS data. Not every provider in these communities contributes data to the HMIS.

of case management rather than shelter within the homeless services system.) Controlling for other factors, including the community in which the family was served, those using only transitional housing spent 3.4⁵ times as many days in the homeless services system, and those using both emergency shelter and transitional housing spent approximately three times as many days as those who were only in emergency shelters. This model and others for which results are reported in this chapter were quite successful in explaining patterns and costs of family homelessness, as demonstrated by their large R-squared statistics.

Among the demographic characteristics tested, having more children had a small but statistically significant positive effect on length of stay, and changing household composition during the period of homelessness led to a 44 percent longer length of stay, after controlling for study site and type of program used. Race was not found to have a statistically significant effect on lengths of stay among study cohort families. This is an interesting finding, as the 2007 AHAR found that long-stayers in emergency shelter (among all families, not just first-time homeless families) were disproportionately African American (HUD, 2008).

Additional multivariate analysis predicting lengths of stay for first-time homeless families can be found in Appendix D.2.5.

Even controlling for length of stay, the program type a family uses is a powerful determinant of costs to the homeless services. Exhibit 5.6 shows the number of families in the study cohort using each type of residential program for homeless people across the four study sites. In every community, more families used emergency shelter than transitional housing. The numbers of families shown in the exhibit to have used each type of program sum to more families than the study cohort because some families used both emergency shelter and transitional housing or some other combination of programs

As shown in Chapter 3, emergency shelter and transitional programs have roughly equivalent daily costs when congregate shelters are compared with facility-based transitional models and apartment-based shelters are compared with scattered-site transitional models (See Exhibit 3.6). However, the costs of particular programs within each type of emergency shelter and transitional housing varied widely at each site. In addition, the first-time homeless families in our study cohort sometimes used particular programs that were either more expensive or less expensive than the typical emergency or transitional program serving families in that community. For example, in Houston the study cohort used extensively the most expensive transitional program, more costly in part because it offers many on-site services. In DC, use of the least expensive emergency shelter program by the study cohort was relatively rare. Whereas in Kalamazoo, the study cohort tended to use a particularly inexpensive transitional housing program;⁶ in Upstate South Carolina, first-time homeless families often used a relatively expensive emergency shelter program with a high ratio of staff to families served.⁷

⁵ The coefficient of 2.4 indicates that these families spent 2.4 additional days for each reference day, or 3.4 times the reference category.

⁶ One of the property-based transitional housing programs in Kalamazoo has very low housing operating costs, moderate service costs, and very low administrative overhead. The property also has very low market value, and adding an estimate for capital costs would have increased the daily cost by only \$1.

⁷ The program is heavily staffed by volunteers, and we included an estimate of the value of their time in the program cost.

Exhibit 5.6: Numbers of First-Time Homeless Families using Basic Types of Residential Programs for Homeless People by the Study Cohorts of First-Time Homeless Families				
	Houston	DC	Kalamazoo	Upstate SC
Emergency shelter	400	317	271	109
Transitional housing	131	107	91	63
Permanent supportive housing	16	26	11	0
Other program types ^a	6	119	n/a	1

^aOther types include outreach (Houston) and the Community Care Grants program (DC). We have not included families who used only these programs in the multivariate analysis of the determinants of the use of program types or in the multivariate analysis of the determinants of total program costs per family. Among other reasons, the meaning of a “day” is ambiguous for these programs

As shown in the exhibit, few first-time homeless families in any community used permanent supportive housing (PSH). Permanent supportive housing is available only to families with a disabled adult. However, an examination of overall usage of permanent supportive housing during the study period also suggests a capacity constraint. Most PSH units available for families were already occupied by families who had become homeless before the start of our study period.

We conducted multivariate analysis (Multinomial Logit model) to determine which types of families are most likely to use which types of residential program for homeless people. In this analysis, families who used Permanent Supportive Housing were grouped with the “other” category. Families that used only the Community Care Grants program in DC were not included in the model, so across the four study communities the “other” category usually means permanent supportive housing, either alone or in combination with emergency shelter or transitional housing. The results are reported in Exhibit 5.7. The regression coefficients for the model are expressed in odds ratio format, with values greater than one showing that a particular type of household is more likely to use a program type than the reference group. The coefficients for the community in which a family is homeless show that families in Upstate South Carolina are more likely to use transitional housing in combination with emergency shelter than families in other communities, which may reflect a stronger pattern of referrals from emergency shelter to transitional housing in that community compared with others. Families in DC are relatively more likely than those in other communities to use an “other” program type, which reflects the relatively greater availability of permanent supportive housing units for families in that community.

The model shows that families with only adult women are not more likely to use transitional housing (alone or in combination with emergency shelter) than the small number of families in the study sample that have only adult men or that have both men and women. The odds ratio for families with only adult women is greater than one, but the result is not statistically significant. The only demographic characteristic that helps explain which families use transitional housing, is whether the family has a child born during the family’s period of homelessness. Such families are eight times as likely as those without a child born homeless to use both emergency shelter and transitional housing, suggesting that these vulnerable families often get referred from emergency shelter to transitional housing and pass whatever screening criteria transitional programs may use.

Finally, the model shows that African American families and families with a younger head of household (18 to 24 years) are only about a quarter as likely to use the “other” program type (basically permanent supportive housing) as white families or relatively older families. This suggests that young families and African American families who become homeless for the first time are relatively less likely than other first-time homeless families to have a disabling condition that made them vulnerable to becoming homeless. Having an adult household member with a disability condition is a requirement for receiving permanent supportive housing.

Exhibit 5.7: Regression Analysis of Program Types used by First-Time Homeless Families in Kalamazoo, DC, South Carolina, and Houston

Program type Category (ES only; TH only; ES and TH only; Other)	Multinomial Logit Model					
	Base category = Emergency Shelter Only					
	Transitional Housing Only		Emergency Shelter and Transitional Housing Only		Other	
Clients in DC ^d	0.852	(0.201)	1.346	(0.414)	9.246***	(3.822)
Clients in South Carolina	1.622	(0.404)	3.433***	(1.080)	0.224	(0.237)
Clients in Houston	0.990	(0.186)	0.984	(0.283)	1.433	(0.562)
Total number of adults in household	1.102	(0.445)	1.220	(0.603)	2.156	(0.849)
Total number of children in household	0.972	(0.064)	0.890	(0.080)	1.127	(0.096)
Male adult-only household type	0.965	(0.579)	0.899	(0.643)	1.732	(1.190)
Female adult-only household type	1.512	(0.705)	0.925	(0.509)	1.369	(0.688)
African American household head	0.934	(0.173)	1.155	(0.302)	0.286***	(0.101)
Household head of other race	0.713	(0.268)	0.164	(0.171)	0.000	(0.000)
Household head ages 18-24	0.747	(0.168)	1.009	(0.316)	0.265**	(0.118)
Household head ages 25-30	0.961	(0.199)	1.370	(0.395)	0.925	(0.290)
Household head ages 41-50	1.034	(0.261)	1.829	(0.585)	1.319	(0.424)
Household head ages 51 or above	0.780	(0.465)	1.391	(0.948)	0.553	(0.451)
Household with youngest child born after study entry	1.376	(0.745)	7.974***	(3.403)	1.124	(0.703)
Household youngest child ages 6-12	0.763	(0.158)	1.013	(0.274)	1.016	(0.303)
Household youngest child ages 13-17	1.164	(0.365)	1.035	(0.440)	1.454	(0.640)
Household head race missing	0.432	(0.247)	0.290	(0.306)	0.198	(0.215)
Household head age missing	0.575	(0.757)	0.000	(0.000)	0.000	(0.000)
Youngest child age missing	3.324*	(1.685)	0.912	(0.987)	3.284	(2.813)
Constant	0.222	(0.197)	0.086*	(0.094)	0.029***	(0.028)
Observations	1285					
Log likelihood	-1109.4261					

Reference categories are: clients in Kalamazoo, mixed-adult household type, white household head, household head ages 31-40, household youngest child ages 0-5. Coefficients for households with missing values are included in the full model in Appendix Sections D.2.3 and D.2.4.

Coefficients in relative risk ratio format

Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

^d Excluded CCG/SAFAH-only families in DC

Additional multivariate analysis predicting the type of program used by first-time homeless families can be found in Appendix Sections D.2.3 and D.2.4.

5.3.2 Costs to Homeless System of First-Time Family Homelessness

The cost for serving each first-time homeless family is the sum of the costs of each program stay by one or more family members. The cost of each stay is the daily cost of the particular program used by the family times the number of days in the stay. The average cost to the homeless services system for each family in the study cohort ranges from only \$3,184 in Kalamazoo, to \$9,663 in Upstate South Carolina, to \$11,627 in Houston, to \$20,031 in Washington DC, as shown in Exhibit 5.8. The cost per family in DC drops to \$16,205 if we consider only costs for program stays that occurred during the first 18 months after a family enters the residential system, but is still much higher than any of the other study communities.

Exhibit 5.8: Average Homeless System Cost per Family				
	Kalamazoo	Upstate South Carolina	Houston	Washington, DC ^a
Average Cost per Family	\$3,184	\$9,663	\$11,627	\$20,031
^a The DC cost per family does not include families who used only the Community Care Grants program. Including such families would drop the average cost per family in DC to \$17,962.				

With the exception of DC, these costs are substantially lower than the average costs identified by Culhane et al. in their study of homelessness in four other communities.⁸ However, like patterns of utilization, the distribution of costs for each family in our study cohort is quite skewed, more so in some communities than in others. In Upstate South Carolina, the highest-cost 10 percent of the study cohort accounts for 32 percent of the total cost to the system, while in Houston the 10 percent highest-cost group accounts for 57 percent of the total system cost. In every study site, the lowest-cost half of the families accounts for less than one-seventh of the total cost incurred by the community for serving first-time homeless families, although this ranges from 13 percent in Upstate South Carolina to 5 percent in Houston.

The multivariate analysis of homeless costs includes covariates for sites, length of stay, program types used and other variables that reflect program use patterns, including number of stays, and number of “gap days.” We also included whether the family changed composition during the period of homelessness, and the following basic family demographic characteristics: age of adults, age of children, number of adults, number of children, gender of head of household and race of head of household. Exhibit 5.9 presents the results of this analysis. Since the outcome variable is in logarithm scale, the coefficients for the covariates can be interpreted as percentage differences from the reference category when multiplied by 100.

Appendixes D.2.1 and D.2.2 show how we arrived at this final model specification, using two different model construction approaches. Approach 1 starts with the basic building block of costs per family, first adding length of stay (Model 1) to dummy variables controlling for site differences.

⁸ Culhane et al. (2007) found average costs per family to be \$24,000 in New York City over three years and \$19,690 in Massachusetts over two years.

Model 2 adds program type to site dummy variables and length of stay. Models 3 and 4 add program use, number of stays, number of gap days between stays, and whether the family changed composition between homeless stays. The final models (5 and 6) add basic family demographic characteristics. See Appendix D.2.1 for detailed results for all 6 models in Approach 1.

Exhibit 5.9: Regression Analysis of Total Homeless Costs

	Total homeless costs (log scale)	(cont.)	Total homeless costs (log scale)
Site		Demographics	
Washington, DC ^a	0.836*** (0.103)	African American household head	-0.290*** (0.084)
Upstate South Carolina	0.693*** (0.119)	Household head of other race	-0.042 (0.166)
Houston, TX	0.862*** (0.086)	Household head ages 18-24	-0.038 (0.099)
Homeless System Utilization and Program Types			
Length of stay (in days) divided by 30	0.219*** (0.008)	Household head ages 25-30	0.020 (0.091)
Transitional Housing-only program type	0.475*** (0.111)	Household head ages 41-50	0.086 (0.107)
Emergency Shelter and Transitional Housing-only program type	0.437*** (0.133)	Household head ages 51 or above	0.156 (0.245)
Other program type	-0.427*** (0.158)	Household with youngest child born after study entry	-0.465** (0.209)
Total number of stays	0.031 (0.024)	Household youngest child ages 6-12	0.205*** (0.088)
Total gaps between stays (in days), divided by 30	0.028*** (0.009)	Household youngest child ages 13-17	0.195 (0.141)
Household Composition			
Any change in household composition during the study period	0.350*** (0.099)	Household head race missing	-0.191 (0.213)
Total number of adults in household	-0.024 (0.160)	Household head age missing	-0.802 (0.551)
Total number of children in household	0.055** (0.028)	Youngest child age missing	-0.061 (0.260)
Male adult-only household type	-0.230 (0.236)	Constant	6.283*** (0.355)
Female adult-only household type	-0.245 (0.183)	Observations	1285
		R-squared	0.64

Reference categories are: Kalamazoo, MI, Emergency Shelter-only program type, mixed-adult household type, white household head, household head ages 31 - 40, household youngest child ages 0-5.

Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%

^aExcluded CCG/SAFAH-only families in DC

Approach 2 (Appendix D.2.2) starts with site dummies and basic family demographics (Model 1) and then adds program type (Model 3), length of stay (Model 4), and then numbers of stays and gap days (Model 5). Models 2 and 6 also add the variable that reflects whether the household changed composition. See Appendix D.2.2 for detailed results for all 6 models in Approach 2. These alternative model specifications enable us to grasp the interactions among the variables in the full model.

The analysis shows that DC, Upstate South Carolina, and Houston all have costs per family 70-90 percent higher than Kalamazoo (the reference category). The lower cost per family in Kalamazoo reflects the use by first-time homeless families of particular emergency shelter and transitional housing programs that have low costs. For example, the average daily cost of the transitional housing programs used by the study cohort in Kalamazoo is only \$22, much lower than the daily cost of transitional housing used by the study cohorts in the other three communities. Kalamazoo has several transitional housing programs, with a wide range of daily costs per unit, as described in Chapter 3.

The differences in total cost per family among the other three communities are not very large when controlling for type of program used and patterns of use such as lengths of stay. Coefficients range from .693 to .862 and show that the study cohort in Houston used slightly more expensive programs within particular program types compared with the study cohorts in DC and Upstate South Carolina. Houston has a transitional housing program with very high operating and services costs, totaling \$177 per day.

Overall, the regression results show that each additional 30 days spent in residential homeless programs compared to the mean length of stay of 144 days adds about 22 percent to the cross-site average total family cost to the homeless services system of \$10,311. The effect of long lengths of stay in DC and Upstate South Carolina compound the already high costs in these communities. A model that does not control either for length of stay or for program type (Approach 2, Model 1) shows that first-time homeless families in DC and Upstate South Carolina cost the homeless services system more than twice as much as families in Kalamazoo. The coefficients are 1.630 for DC and 1.442 for Upstate South Carolina. Families in Houston cost twice as much as families in Kalamazoo. (The coefficient is 1.016).

Families who used emergency shelter together with transitional housing and no other programs (8 percent of the study cohort across the three sites) cost 44 percent more than families that use just emergency shelter, whereas families that use just transitional housing (13 percent of the study cohort) cost 48 percent more than families that use just emergency shelter. Those who used “other” combinations of programs beyond emergency shelter and transitional housing incurred 43 percent lower costs than those who used only emergency shelter. These lower costs reflect the relatively low cost of permanent supportive housing for the small number of families in the study cohorts that used it.⁹ As detailed in Chapter 3, the cost of permanent supportive housing to the homeless services system is low compared with both emergency shelter and transitional housing since services are primarily provided by mainstream systems, rather than directly by the homeless services system.

The model results also revealed some differences in total cost per family related to family characteristics. Families that change composition during their period of homelessness have costs about 35 percent higher than families that do not change. Despite the correlation between “gap days” spent in between program stays and changes in family composition, gaps (measured in 30-day increments) also have a statistically significant, although small, positive effect on costs per family to the homeless services system. Given that length of stay and program types are also controlled, these

⁹ This model did not include families in DC who used only the Congregate Care Grants or SAFAH programs. SAFAH provides housing placement assistance. Congregate Care Grants provides short-term rental assistance and longer-term case management for families who never enter the residential system for homeless families. The resulting costs are extremely low for each day that the HMIS counts a family as being in the program.

results suggest that families with unstable housing and unstable family composition on average use more expensive programs within each program type.

African-American families (70 percent of the study cohort across the four communities) have costs 29 percent lower on average than white families. The implication is that, within each site and each program type, African American families are using relatively less expensive homeless services programs. This could be because African-American families, shown by other research to be homeless at higher rates than other poor families, have fewer service needs and are homeless related to poverty and limited social supports that do not require intensive social services to address. Use of less expensive programs could also reflect an informal or clinical bias that results in fewer referrals or admissions for African-American families into more intensive programs.

In the full model, there is no significant difference in cost between families headed by people between the ages of 18 and 24 those headed by 31 to 40 year olds. Without controls for program types and length of stay, those between 18 and 24 cost about a third less than those between 31-40 (Approach 2, Models 1 and 2). Adding a control for program type reduces this difference to 25 percent (Model 3). The difference disappears when the control for length of stay is added (Model 4). Thus, younger families are using less expensive types of programs and using them for shorter periods of time than relatively older families.

Larger families (those with additional adults or additional children) cost the homeless services system little more than smaller families. An additional child (compared to the mean of 2.12 children) produces a modest 6 percent increase in costs. Additional adults or adults of different genders have no discernable effect on costs, and this result holds for models with and without a control for whether the composition of the family changed. To some extent, these results may stem from the way we collected program costs. We did not distinguish between the costs of different amounts of space needed for different families (e.g., numbers of beds or bedrooms) or for other costs that might vary by family size such as the number of meals provided. We simply assumed that a particular program incurs on average the same cost for each family using the program. As a whole, larger families do not use programs that, across all families served, have higher costs than the programs used by smaller families.

We did find a relationship between the age of a family's children and its costs to the homeless services system. Families whose youngest child is grade school age (6 to 12 years) cost 21 percent more than families with younger children. Families with children in that age range may choose to use programs—or be directed to programs—with more costly housing types or with additional services, compared with other first-time homeless families.

5.3.3 Costs to the Homeless System for “Path Groups” of Families Who Use the System in Similar Ways

To understand better the heterogeneity of the homeless experience and its associated costs among first-time homeless families, we used multivariate cluster analysis to categorize families into “path groups,” based on their total lengths of stay, number of discrete stays, total number of “gap days,” and types and sequences of programs used. Cluster analysis was conducted independently for each site, and each of the communities was found to have paths that were not replicated precisely at the others.

However, the following broad categories of path groups emerged in each of the four study sites.

- Brief users of emergency shelter
- Heavy users of transitional housing
- Repeat users of residential homeless programs with long gaps

Exhibit 5.10: Common Paths Taken by First-Time Homeless Families			
	Brief users of emergency shelter (% of study cohort)	Heavy users of transitional housing (% of study cohort)	Repeat users of one or more program types with long gaps (% of study cohort)
Houston	66%	29%	5%
DC ^a	33%	30%	16%
Kalamazoo	61%	24%	16%
Upstate South Carolina	49%	42%	10%

Percentages within each site may sum to greater than 100 percent due to rounding.

^aDC percentages exclude those who were served exclusively by the Community Care Grants program. In addition, eleven percent of families in DC followed paths not found in other sites, See Section 5.3.4.

Exhibit 5.10 shows the size of these groups across the four communities. Brief users of emergency shelter make up roughly two-thirds of the families in Houston and Kalamazoo, almost half of the families in Upstate South Carolina, and one-third of the families in DC. Heavy users of transitional housing are more than a quarter of the study cohort in Houston, DC, and Kalamazoo, and 42 percent in Upstate South Carolina. “Long gappers,” families with multiple program stays and long cumulative periods in between stays, make up a relatively small portion of all first-time homeless families. They are most common in DC and Kalamazoo.

The path groups are characterized by their shelter use patterns, but analysis of demographic characteristics and mainstream program involvement helps to describe further the differences among the groups. Exhibit 5.11 summarizes some of the ways in which families who followed particular path groups differ from other first-time homeless families in the study cohort.

Brief Users of Emergency Shelter have one or two stays in emergency shelters, spend a few days to a few months there, and then do not return to the residential system for homeless people.¹⁰ Across our four study communities, they had relatively younger and smaller households and, based on their use of mainstream systems, had relatively lower needs than other families in the study cohort (Exhibit 5.11).

¹⁰ This pattern held in DC, where we were able to follow families over a 30-month period after their first appearance in the homeless services system.

Exhibit 5.11: Selected Characteristics of First Time Homeless Family Path Groups			
	Brief users of emergency shelter	Heavy users of transitional housing	Repeat users of one or more program types with long gaps
	<i>Compared with other First-Time Homeless Family Path Groups at each site:</i>		
Houston	Younger adults and children Least involvement with mental health treatment and criminal justice systems	Fewer men More likely to be white Heavy users of mental health system	More men More likely to be "other" race 68% experienced household change High arrest rates
DC	Demographics not distinct from rest of cohort Lower use of substance abuse services	Fewer men Somewhat younger adults and children Among highest use of substance abuse and mental health services	More men 92% experienced household change High rates of involvement with child welfare High use of substance abuse services
Kalamazoo	Younger adults, smaller households Lower arrest rates Lower use of Medicaid	More men More likely to be white	58% experienced household change High arrest rates
Upstate South Carolina	Younger adults and children, smaller households Lower use of Medicaid	Demographics not distinct from rest of cohort	More men More likely to be white 64% household change High arrest rates

Across the four study sites, this group represented between 33 percent and 66 percent of each cohort, but accounted for only 9 percent to 30 percent of total homeless system cost. Exhibit 5.12 shows the average household cost to the homeless services system for the path groups in each community following this pattern. They range from under \$1000 to almost \$9,000, depending on a combination of the average number of days spent in programs (shown on the Exhibit) and the relative cost of programs used. For example, costs in Upstate South Carolina are relatively high for its brief-user families compared with the number of days spent in programs, because many first-time homeless families used a very expensive type of emergency shelter.

Exhibit 5.12: Average Household Cost to the Homeless Services System for Brief Users of Emergency Shelter		
	Average Total Length of Stay	Average Total Cost per Family
Houston Emergency Shelter Short Stayers	37 days	\$2,321
Houston Emergency Shelter Repeat Users	101 days	\$5,748
DC Congregate Emergency Shelter Short Stayers	67 days	\$5,098
Kalamazoo Emergency Shelter Single Use Short Stayers	15 days	\$1,172
Kalamazoo Emergency Shelter Repeat Users	48 days	\$2,977
SC One-Week Single Stayers	9 days	\$784
SC One-Month Returners	31 days	\$2,508
SC Three-Month Single Stayers	88 days	\$8,890

Heavy Users of Transitional Housing use transitional housing exclusively, in combination with emergency shelter, or (in a few cases) together with permanent supportive housing. Their average length of stay ranges from 8 to 18 months, depending on the community and the specific path revealed by the cluster analysis for that community (Exhibit 5.13).

Across the four communities, heavy users of transitional housing were somewhat more likely to be white and had a smaller percentage of men. However, in Kalamazoo this group includes more men, probably because one of the primary transitional housing programs in Kalamazoo accommodates two-adult families. In DC, heavy users of transitional housing are on average somewhat younger families than other path groups.

Unlike Culhane et al., (2007) we did not find that these “long stayers” in the residential services system for homeless families were less likely to be heavy users of mainstream behavioral health services than the study cohort as a whole. In Houston, they were heavy users of the mental health system, and in DC they had among the highest rates of use of mental health and substance abuse services of the path groups.¹¹ However, Culhane et al. (2007) looked only for use of intensive behavioral health services such as inpatient or acute care (in Philadelphia and Massachusetts), whereas we recorded any contact with the mental health system (in Houston and DC) or the substance abuse agency (in DC).

Like Culhane et al. (2007), we found that the long periods of time spent in the homeless services system made this by far the most costly group of families. Exhibit 5.13 shows that the average cost per family to the homeless services system for heavy users of transitional housing ranged from \$6,474 in Kalamazoo, a community with the relatively small percentage of such families and frequent use of a particularly inexpensive transitional housing program by first-time homeless families,¹² to \$38,742 in Washington DC for a group that first used emergency shelter and then moved to transitional housing, with an average total length of stay of 551 days. Heavy users of transitional housing represented only 24 percent to 42 percent of the families in each community, but incurred between 47 percent and 82 percent of total homeless system costs.

¹¹ Culhane et al.’s “long stayers” group does not distinguish between long stayers in emergency shelter and long stayers in transitional housing. Our most comparable group may be a path group in DC (discussed below in Section 5.3.4) that uses apartment-style emergency shelters as well as congregate emergency shelters and has long stays. The homeless services system in DC may be more similar to New York City and Philadelphia than the systems in our other study communities, in which we did not find a path group of long-term users of emergency shelter. This path group in DC has rates of involvement with the behavior health systems similar to rates for heavy users of transitional housing and a higher rate of involvement with the child welfare agency.

¹² One of the property-based transitional housing programs in Kalamazoo has very low housing operating costs, moderate service costs, and very low administrative overhead. The property also has very low market value, and while we did not record capital costs for any of the programs in Kalamazoo, Houston, or DC, adding an estimate for capital costs would have increased the daily cost by only \$1. In contrast, one of the transitional housing programs that was heavily used by the Houston family study cohort, representing 47 percent of the transitional housing stays by families in Houston, has high operating costs and extremely high service costs. The overall program costs are two to seven times higher than other transitional programs in Houston, and the services alone are almost triple those of the other family facility-based transitional housing programs for which we collected costs.

Exhibit 5.13: Cost to the Homeless Services System for Heavy Users of Transitional Housing

	Average Total Length of Stay	Average Total Cost per Family	Average Monthly Cost Per Family (including gap days)	Local Two- Bedroom Fair Market Rent FY 2006 ^b
Houston Multi-Program Users	236 days	\$26,913	\$2,544	
Houston Housing-Program Users	284 days	\$35,344	\$3,584	\$743
DC Progressing Long-Stayers ^a	551 days	\$38,742	\$1,960	
DC Transitional Housing Only ^a	477 days	\$31,822	\$2,001	\$1,225
Kalamazoo Long Stayers	289 days	\$6,574	\$664	\$612
SC Progressing Long-Stayers	329 days	\$16,036	\$1,358	
SC Transitional Housing Only	375 days	\$15,478	\$1,226	\$599

^aIf only the first 18 months following the family's first entry into the homeless services system are counted, the average cost per family for DC is \$31,951 for progressing long-stayers and \$25,771 for those who use only transitional housing.

^bFY2006 FMR is provided for Greenville, SC MSA, which is part of the Upstate South Carolina CoC geography and appears to have the highest FMR in the CoC (HUD, 2005). The FMR does not include the monthly fee paid to a public housing agency for administering the voucher program, which ranged from \$50 to \$90 per unit per month in these four communities. (HUD, 2007)

The exhibit also shows the cost per family standardized to a one-month cost and compares it to the cost of housing a family similar in size to most homeless families with a Housing Choice Voucher, assuming that the family's share of the rent would be the same in both cases—that is, that transitional housing, like the voucher program, would require a family rent payment of 30 percent of income. The far greater cost of transitional housing in every community except for Kalamazoo to some extent may reflect the use of more expensive residential structures by transitional housing programs, but probably mainly reflects higher costs associated with on-site supervision for some programs and case management and other services for all transitional housing programs.

Whether the additional cost of transitional housing produces offsetting benefits, compared with placing a homeless family directly into permanent housing with a voucher, is beyond the scope of this study. For example, the services provided in connection with transitional housing might enable a parent to become economically self-sufficient and pay the cost of a private market rent from earned income. The short-term cost of transitional housing then might offset the cost of a longer-term voucher rent subsidy. The evidence we have to date suggests that is not the case. Burt (forthcoming 2009) interviewed former users of transitional housing deemed by program staff to have left successfully. She found that longer stays in transitional housing were associated with some positive outcomes, but that the most successful leavers of transitional housing did so with a voucher.

Repeat Users of Residential Homeless Programs with Long Gaps may use just emergency shelter or may use a combination of emergency shelter and transitional housing. What distinguishes this relatively small group of families (5 to 16 percent of the study cohort) is that they leave the residential homeless services system and then return—not a few days later, but after long absences. The cumulative “gaps” in service during their entire periods of homelessness range from 134 days for the path group in South Carolina (where the “gapper” pattern was less pronounced than in other communities) to 515 days for families following this path in the District of Columbia, who have an

average of 7.2 discrete program stays and on average remain in a residential program for only 38 days at a time. Their average gap ranges from two and a half months in DC to six months for one of the groups in Kalamazoo (Exhibit 5.14).

Exhibit 5.14: Patterns of Use of the Residential Homeless System for “Long Gapper” First-Time Homeless Families				
	Average Number of Program Stays	Average Days per Program Stay	Average Cumulative gap days	Average gap between each stay
Houston Emergency Shelter Long Gappers	3.4 stays	19 days	346 days	144 days
DC Long Gappers	7.2 stays	38 days	515 days	79 days
Kalamazoo Emergency Shelter Long Gappers	3.1 stays	12 days	378 days	180 days
Kalamazoo Multi-Program Long Gappers	3.3 stays	44 days	275 days	120 days
Upstate South Carolina Six-Month Returners	2.3 stays	77 days	134 days	103 days
<i>Note: The average gap is average cumulative gap days divided by one fewer than the average number of stays, since gaps have to take place between stays.</i>				

We do not know the extent to which these “long gappers” attempt to establish themselves as leaseholders between homeless program stays or how frequently they temporarily move in with family or friends. Suggestive characteristics of these families are that they experience very high rates of change in household composition and often include men at some point during their periods of sheltered homelessness (Exhibit 5.15). Thus, their housing instability may be linked to unstable situations involving family conflict or, in some cases, arrests and jail time.

Families with long gaps had high arrest rates in Houston, Kalamazoo, and Upstate South Carolina. In Upstate South Carolina, 71 percent of this group of families had a family member arrested at some point during the study period. We did not obtain criminal justice data for DC. In Washington, DC, the only community for which we were able to obtain any data at all from the child welfare system, we found that 55 percent of this group of families had a service record with the child welfare agency during the year before homelessness or following the start of homelessness.

Compared with all first-time homeless families in the community, families in the long-gapper group in Upstate South Carolina were relatively more likely to be white rather than African American. In Kalamazoo, they were somewhat more likely to be African American than the cohort overall (Exhibit 5.15). In DC, where almost the entire study cohort is African American, the long gapper group includes more families identifying their race as white, Asian, or “other.” In Houston, where the long-gapper group makes up only 5 percent of the study cohort, this group is slightly more likely to be African American than the study cohort as a whole. At the same time, a relatively high percentage of long gappers in Houston (23 percent) reported their race as “other” or refused to identify their race.

Exhibit 5.15: Selected Demographic Characteristics of “Long Gappers”			
	Change in Household Composition	Percent of Adults who are Men	Percentage African American: Gappers/ study cohort
Houston Emergency Shelter Long Gappers	68%	28%	67% / 61%
DC Long Gappers	92%	24%	89% / 93%
Kalamazoo Emergency Shelter Long Gappers	61%	16%	67% / 61%
Kalamazoo Multi-Program Long Gappers	53%	10%	68% / 61%
Upstate South Carolina Six-Month Returners	64%	18%	35% / 53%

Because of the relatively small number of days spent in the homeless services system, the cost to the system for this group of highly unstable families is relatively low. Across the four sites, the group represented only between 5 percent and 16 percent of each cohort and incurred between 1.5 percent and 20 percent of total costs. As shown in Exhibit 5.16, cost per family ranges from \$3,295 for a group in Kalamazoo that used only emergency shelter to \$17,314 for a group in Washington DC that spent a relatively long time in residential programs, despite being out of the system for long periods as well over their total period of homelessness.

Exhibit 5.16: Average Cost Per Family to the Homeless Services System for Repeat Users of the Residential Services System with Long Gaps		
	Average Total Length of Stay	Average Total Cost per Family
Houston Emergency Shelter Long Gappers	63 days	\$3,885
DC Long Gappers	273 days	\$17,314
Kalamazoo Emergency Shelter Long Gappers	38 days	\$3,295
Kalamazoo Multi-Program Long Gappers	144 days	\$5,925
Upstate South Carolina Six-Month Returners	176 days	\$12,475

Opportunities for cost savings to the homeless services system through helping these families to achieve stable rather than unstable housing when they leave shelter seem to be largest in Washington DC and in Upstate South Carolina. In DC we tracked families for a longer period after they first became homeless, 30 months instead of 18 months, and this is reflected in the relatively large number of days spent in homeless programs, almost 10 months on average and the large number of stays, 7.2.¹³ The high cost in DC reflects both this relatively long length of stay for a “gapper” group and

¹³ If only the first 18 months following the family’s first entry into the homeless services system are counted, the average number of stays per family for DC long gappers is 4.7 and the average total length of stay is 164 days. The average total cost per family is \$10,462.

the high cost of the particular programs used. In DC and perhaps in other communities as well, cost offsets may be possible within the homeless services system, as well as for mainstream public systems, if costs over a period of many years are considered.

The group most similar to long gappers in the Culhane et al. (2007) study of New York City, Philadelphia, Columbus OH, and Massachusetts is “Episodic” users of the shelter system, but this group has longer lengths of stay, ranging from 148 days in Columbus to 385 days in New York. The “Episodic” group has considerably higher homeless system costs than the costs of the “long-gapper” groups in Houston, Kalamazoo, and Upstate South Carolina: \$17,168 in Columbus, \$19,043 in Philadelphia, \$21,450 in Massachusetts, and \$38,500 in New York. Only in Washington DC are the costs for “long gappers” similar to the costs of “Episodic” users in the Culhane et al. study.

The longer stays and higher cost measured by Culhane et al. (2007) may be in part a result of how total days in the homeless service system are measured (they ignore program exits if the family returns to shelter within 30 days) and also a three-year observation period in New York and Philadelphia. At the same time, the costs per day of shelter used by Culhane, based on “jurisdictional reimbursement rates” are high compared with the cost per day for many of the programs for which we collected cost data directly from financial records. Columbus reimburses programs at \$116 per day, Massachusetts at \$110 per day, Philadelphia at \$94 per day, and New York City at \$100 per day. By comparison, we found the average cost of congregate emergency shelters used by our study cohort was \$71 per day in Houston, \$85 per day in DC, \$75 per day in Kalamazoo, and \$81 per day in Upstate South Carolina.

Unlike heavy users of transitional housing, the outcomes of long-gapper families’ use of the homeless services system as it currently is constituted are unambiguously negative. An alternative treatment model for these families that focuses on their family instability rather than their housing instability may be needed.

5.3.4 Costs to the Homeless System of Other Patterns of First-time Homelessness in Washington DC

Washington DC has two program types not found at the other sites, and families using those programs are not included in the path groups discussed in Section 5.3.3.

Apartment-style Emergency Shelters in DC are considered emergency shelters because, unlike transitional housing programs, they do not have admission requirements other than homelessness and because they are not subject to the two-year time limit for federally funded transitional housing. During the period in which we conducted the study, almost all families using the three facilities that comprised this program type went there after an initial stay in a congregate emergency shelter.¹⁴ Apartment-style emergency shelters had a cost per day for first-time homeless families in the study cohort of \$79.80, slightly lower than the average cost of congregate shelters (despite providing each family with a self-contained apartment) and slightly higher than the daily cost of transitional housing.

We identified a separate path group in DC consisting of families who used both congregate and apartment-style emergency shelters and no other type of residential program, 9 percent of the study

¹⁴ Subsequently, DC’s main congregate emergency shelter for families was closed down, and the central intake center for homeless families began sending families directly to apartment-style emergency shelters.

cohort of first-time homeless families.¹⁵ Selected characteristics of this path group are shown in Exhibit 5.17 and compared with the characteristics of the path groups that used transitional housing. In many ways this path group is similar to the group that used both emergency shelter and transitional housing. Lengths of stay are similar, and the total cost per family to the homeless services system is similar. The only notable demographic characteristics for the group using both types of emergency shelter but not transitional housing are the high percentage that have five or more persons in the household and the high percentage of male adults. Other demographic characteristics, not shown on the exhibit, are similar to those of other path groups. This path group also had the highest rate of service encounters with the child welfare agency of any of the DC path groups, 56 percent. These family characteristics may help explain the long stays within what is supposed to be an emergency shelter system: large families and families that include adult men may be hard to place into transitional housing programs or into permanent housing in the private market.

Other factors that may influence the long lengths of stay for families using both congregate and apartment-style emergency shelter may be the fairly rich services available in the apartment-style programs¹⁶ and the relative attractiveness of these apartments that come with some restrictions on privacy and independence but are rent free in a housing market with high rents and long waiting lists for assisted housing.

Exhibit 5.17: First-Time Homeless Families Using both Congregate and Apartment-Style Emergency Shelter (and not transitional housing) in Washington DC				
	Total cost per family	Average length of stay	Families with 5 or more persons	Percent of adults who are men
DC Congregate and Apartment ES	\$38,444	513 days	42%	23%
DC Progressing Long-Stayers	\$38,742	551 days	29%	16%
DC Transitional Housing Only	\$31,822	477 days	13%	4%

The Community Care Grants program in Washington, DC, places qualifying families in mainstream permanent housing immediately after intake, without a shelter stay. The Continuum of Care considers this diversion program a key element in its homeless services system. The central intake center first determines that a family qualifies as homeless because the family cannot be stabilized in its own housing unit or someone else's for more than a month—that is, that the alternative to the CCG program would be a placement into emergency shelter. A further assessment determines whether the family should be admitted to emergency shelter or could become a successful

¹⁵ The small size of this group is somewhat surprising, given the capacity of this type of shelter to serve 93 families at a time. However, the long lengths of stay for families using apartment-style emergency shelter in DC meant that many families occupying those units had already become homeless before the start of our study period.

¹⁶ The average daily services cost for apartment-style emergency shelter is \$42.32, slightly higher than the services cost for scattered-site transitional housing (\$29.59) and only slightly lower than the services cost for facility-based transitional housing (\$44.69).

leaseholder immediately. Factors in the assessment are whether the family head has ever been a leaseholder, head of household's employment history, and whether the family has a current problem with substance abuse or untreated mental illness.

Ninety-six families in the DC study cohort of first-time homeless families were placed directly into mainstream permanent housing the Community Care Grants program, and only eight of these families subsequently entered either emergency shelter or transitional housing during the 30-month follow-up period for DC. Thus, the program appears to be successful in diverting families away from the residential system for homeless families, though it is not clear how many of these families would have become homeless without assistance.

The average cost for each family reimbursed by the DC government was \$10,677, which includes some combination of move-in expenses, short-term rental assistance (typically for one or two months), and case management provided on an as-needed basis for a year on average. Not surprisingly given the screening criteria for the Community Care Grants program, the path group that is dominated by these families had by far the lowest rates of any path group of service contacts with DC's mental health and substance abuse agencies, less than 14 percent for mental health and only 1 percent for the substance abuse agency. The rate of involvement with the child welfare agency was also low, although still almost 29 percent.¹⁷ Because of the program's screening, had these families been placed into emergency shelter, they likely would have stayed relatively short periods of time. Whether they would have had short lengths of stay in the residential services system as a whole is unclear, because these families may have been considered good candidates for DC's transitional housing programs.

5.4. Costs Associated with Mainstream System Use by First-Time Homeless Families

The literature on individual homeless persons, particularly those with chronic patterns of homelessness, suggests that the costs of providing certain homeless individuals with stable permanent housing may be offset by savings from reduced use of mainstream public systems such as emergency rooms and hospitals by people no longer homeless.¹⁸ No similar claim has been made about cost offsets that might be produced by ending homelessness for families. In this study, we attempted to collect data on the use of mainstream systems and associated costs incurred on behalf of homeless families before, during, and after their periods of homelessness. This data collection had three purposes:

- Helping to characterize the families that follow different patterns of use of the homeless services system, as described in Sections 5.3.3 and 5.3.4;
- Understanding the extent to which homeless families are connected to mainstream income and other supports that might avert or soften financial or health crises that lead to homelessness; and

¹⁷ More information on these programs patterns of program use is available in a separate case study on the study's findings for Washington DC. See Khadduri, J., Spellman, B., Sokol, B., Leopold, J., & Rothschild, L. (2009a).

¹⁸ See the discussion in Chapter 4.

- Exploring whether savings in mainstream costs might result from reducing family homelessness.

As has been true for other studies that have attempted to match data on users of homeless services systems to mainstream data, we were not able to obtain data for all mainstream systems in each community. For DC, we were able to learn which members of the study cohort of first-time homeless families had service records with the Medicaid, child welfare, mental health, and substance abuse systems between July 2003 and June 2008, but we did not obtain cost data, and we do not know the timing of those service encounters in relation to the family's period of homelessness.

For Houston, we obtained client-level service utilization and cost data for City and Harris County arrests and jail stays, and we imputed associated court costs. We also obtained data on mental health treatment, and stays in the state psychiatric hospital, but we did not obtain data on Medicaid, income supports such as Food Stamps and Temporary Assistance for Needy Families (TANF), or on service encounters with the child welfare system.

For Kalamazoo, we obtained data on the use and costs of Medicaid managed care payments, Medicaid fee-for-service care, and state emergency financial assistance, aggregated by path groups of families and by the periods before, during, and following homelessness, on both program utilization and costs. We obtained client-level data from local law enforcement agencies on arrests and jail costs. Here again, we have no data on Food Stamps, TANF, or the child welfare system.

For Upstate South Carolina, we obtained data aggregated by path groups of families and by the periods before, during, and following homelessness on both program utilization and costs for Medicaid, Food Stamps, and the criminal justice system, but not for TANF or the child welfare system.

Thus, for the mainstream domain which may have the greatest potential for cost offsets for a family homeless population—child welfare—we have data only for DC and only evidence of some encounter with the system, not how serious or how costly the encounter was.

5.4.1 Rates of Mainstream System Involvement by First-Time Homeless Families

Exhibit 5.18 shows the rates at which families in the study cohort were involved with the mainstream systems for which we were able to collect data. Use of Medicaid and Food Stamps is high, more than 90 percent in the three places for which we have Medicaid data and 92 percent for Food Stamps in Upstate South Carolina. Earlier studies have shown that homeless families are able to access the income supports available in general to poor families with children (Burt, Aron, and Lee, 2001). We have no data on TANF, other than a statement from the South Carolina data warehouse administrator that the match rate to TANF records for the study cohort was low.¹⁹ Without information on the timing of receipt of TANF by the families in the Upstate South Carolina study cohort, we cannot infer whether the low rate reflects families being sanctioned or exhausting their time limit for TANF assistance before becoming homeless. The match rate would be expected to vary by state because of the flexibility in state administration of TANF, and the low match rate for a study cohort in Upstate South Carolina may not be typical.

¹⁹ The small number of matches and associated privacy concerns was stated as the reason for not providing TANF data even in aggregate tables.

Exhibit 5.18: Rates of Utilization of Selected Mainstream Systems by First-Time Homeless Families

	DC	Houston	Kalamazoo	Upstate SC
Medicaid	95%		94%	>90% ^a
Food Stamps				92%
Child Welfare	43%			
Criminal Justice		8%	42%	34%
Mental Health	36%	16%		
Substance Abuse	9%			
Emergency financial assistance			>39% ^b	

^a More than 90 percent of the cohort received both Medicaid Managed Care and Medicaid Fee For Service treatment. A de-duplicated rate of involvement was not provided by the State.

^b De-duplicated data across types of financial assistance types was not provided. Thirty-nine percent of families received rental assistance, which was the greatest proportion for each type. Thirty-three percent of families received cash assistance and 17 percent received food assistance. Only one family received mortgage assistance and four families received security or utility-deposit assistance.

The emergency financial assistance program used by at least 39 percent of the study cohort in Kalamazoo is a state-funded program operated through local non-profits and intended to help families through financial crises that can lead to homelessness by providing them with cash, food assistance, mortgage payments, rental payments, or security and utilities deposits.

The high rate of service encounters with the child welfare system in DC is interesting, although we do not know the extent to which they happened in response to immediate threats to children's well being and we do not know the extent to which they led to out-of-home placement of children. While we have no information about service encounters with the child welfare system in our other study communities, considered together with the high rates of involvement with the criminal justice systems in Kalamazoo and Upstate South Carolina, we might infer that rates of involvement with child welfare among first-time homeless families would be high in those communities as well.

In Upstate South Carolina, 53 percent of family members between the ages of 18 and 24 had at least one arrest during the study period, which extended from a year before the start of homelessness for each family through December 2006. Fifty-four percent of families that changed composition during their period of homelessness had a family member who was arrested, as did 71 percent of the Upstate South Carolina families we have identified as "long gappers." White families were more than twice as likely to have a member arrested as African-American families. This could be a geographic effect (Upstate South Carolina covers a large area), or it could suggest that black families in Upstate South Carolina become homeless as a result of extreme poverty,²⁰ while white families are more likely to experience a domestic crisis that triggers both extreme housing instability and an encounter with the criminal justice system. Across the three communities for which we were able to obtain data on involvement with the local criminal justice system, we found that many adult women were arrested, but arrest rates were higher for adult men than for adult women.

²⁰ Suggested also by the fact that a higher percentage of brief users of emergency shelter in Upstate South Carolina are black, compared to families following other patterns of use of the homeless services system.

The relatively lower involvement with the criminal justice system among first-time homeless families in Houston is difficult to interpret, but consistent with the relatively smaller percentage of families in Houston with a “long-gapper” pattern of homelessness (5 percent, vs. 10 percent in Upstate South Carolina and 16 percent in Kalamazoo).

5.4.2 Costs to Mainstream Systems of First-Time Family Homelessness

The fragmentary nature of our data on mainstream system costs for the three communities for which we have cost information—Houston, Kalamazoo, and Upstate South Carolina—makes it difficult to assess the potential opportunities for cost savings through reducing family homelessness. Exhibit 5.19 shows what we know about the magnitude of costs to the mainstream systems. The exhibit shows average costs for each family over the entire study period, which extended from one year before the start of homelessness to an average of three years after the beginning of homelessness.

Across the study cohorts, most costs were incurred for basic social safety net programs, Medicaid and food stamps. For those at the income levels of most homeless families, reducing food stamps costs does not make sense. Food stamps benefit levels are set by formula based on family size and income, and there is little potential for “excess” or inefficient use of the program by homeless families.²¹ Some residential homeless programs, especially emergency shelters, may provide food, and families may be less likely to use Food Stamps during their period of literal homelessness.

Exhibit 5.19: Average Costs for Selected Mainstream Domains per First-Time Homeless Family during the Entire Study Period			
	Houston	Kalamazoo	Upstate South Carolina
Medicaid		\$21,770	\$15,615
Food Stamps			\$7,248
Criminal Justice	\$409	\$597	\$175
Mental Health	\$722		

Note: The study period varies for each family, depending on when the family became homeless compared to the last date for which mainstream costs were collected. Patterns change little when costs are measured over a uniform period, such as one year, for each family.

Homeless families might use Medicaid in ways that are more costly than other families participating in the program—for example, by using emergency room visits in place of routine outpatient care. The evidence we have from the two communities for which we have Medicaid costs is mixed. In Kalamazoo, Medicaid costs for the children in the study cohort of homeless families were 26 percent higher than statewide average Medicaid costs for children. Medicaid costs for adults were 78 percent higher than the statewide average (Kaiser Family Foundation, n.d.). The data only distinguish between services covered by managed care and services covered by fee-for-service, and the distribution of costs across these types is the same as for other Medicaid recipients in Michigan. Without more detail on types of services received, we cannot tell whether homeless family members have higher medical needs or whether homeless families are using the system inefficiently.

²¹ This is not to say that fraudulent use of the program is non-existent, but Food Stamps fraud is unlikely to vary based on whether a family is homeless or housed.

In Upstate South Carolina, Medicaid costs for the cohort of homeless families are similar to statewide averages for children who do not have disabilities and for adults who are neither elderly nor disabled. The type of services used by the study cohort compared with the general Medicaid population shows that homeless families were more likely to use standard medical services such as visits to doctors' offices and less likely to use outpatient hospital care (Kaiser Family Foundation, n.d.).

Exhibit 5.20 shows costs per family for each of the mainstream domains, during the periods before, during, and following homelessness. The costs are standardized to a one-month period to take into account the different lengths of the three periods—in particular, the relatively short period during homelessness for most families.²² In both Kalamazoo and Upstate South Carolina, the use of Medicaid-reimbursed services rose during the family's period of homelessness, which could suggest that health crises contributed to homelessness or could reflect the success of the homeless services system in referring family members to needed medical care.

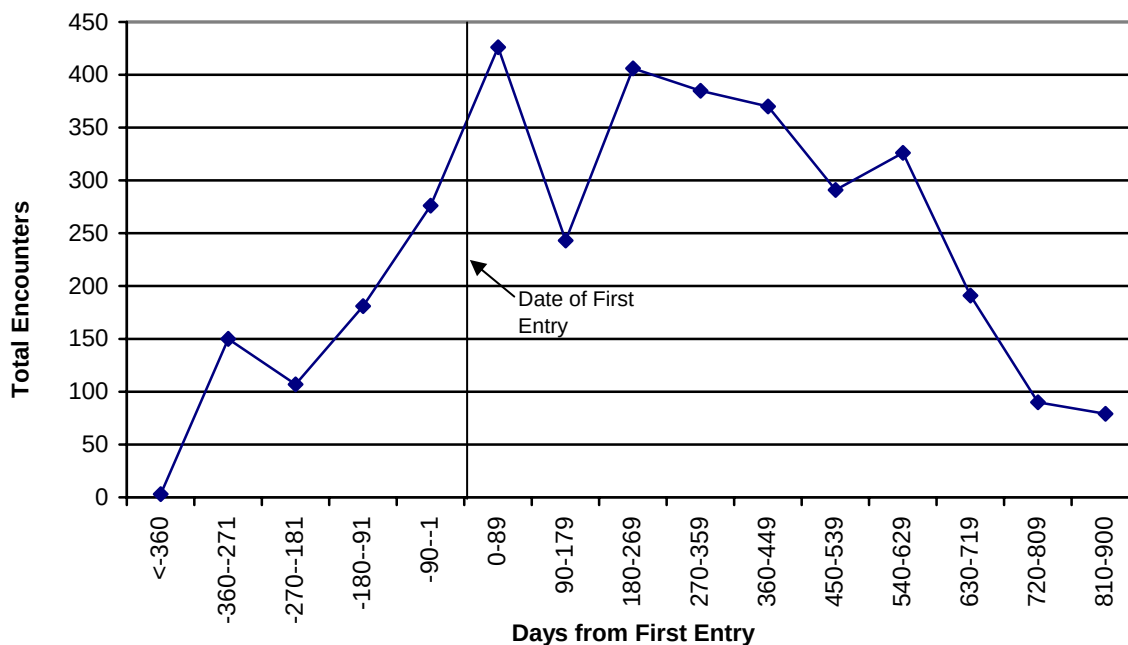
While the high rate of arrests for family members in Kalamazoo and Upstate South Carolina is troubling, the relatively brief interactions with criminal justice and low costs for this domain do not seem to provide major opportunities for cost offsets for first-time homeless families. Criminal justice costs, adjusted for differences in time periods, dropped during the period of homelessness in Houston and Kalamazoo and then rose to higher levels following homelessness (Exhibit 5.20). In Upstate South Carolina, after adjusting for differences in the lengths of time periods, the number of arrests of members of the study cohort was very similar before, during, and following homelessness. Neither homelessness nor stable housing seems to have reduced the likelihood of criminal justice encounters. That said, criminal justice costs are incomplete at each study site. For Kalamazoo, we have arrest and jail costs, but not court costs. For Upstate South Carolina, we have only arrest records, and we imputed a cost of \$200 per arrest, based on arrest costs for other study sites. For no community do we have costs to state or federal criminal justice systems. It is possible that more complete data would identify additional cost saving opportunities.

Exhibit 5.20: Mainstream Costs Per Family Per Month Before, During, and Following Homelessness						
	Mental Health	Medicaid	Criminal Justice	Financial Assistance	Food Stamps	State Hospital
Kalamazoo						
Pre-Homelessness		\$657.58	\$13.33	\$5.18		
During Homelessness		\$929.59	\$12.99	\$22.05		
Post-Homelessness		\$471.90	\$19.36	\$21.55		
South Carolina						
Pre-Homelessness		\$319.66	\$4.65		\$187.30	
During Homelessness		\$433.70	\$4.70		\$229.34	
Post-Homelessness		\$493.28	\$4.86		\$190.78	
Houston						
Pre-Homelessness	\$13.01		\$6.55			\$0.00
During Homelessness	\$32.87		\$1.57			\$0.00
Post-Homelessness	\$20.67		\$16.36			\$3.02

²² The period following homelessness depends on when during the tracking period the family's homelessness ended and also may be different from the period preceding homelessness, which is one year for all families.

Mental health costs in Houston averaged only \$409 per family but were much higher, \$4594, for the 16 percent of families that received at least one mental health service. The use of mental health services by first-time homeless families in Houston rose during the period just before first entry into a residential homeless program, peaked in the first 90 days after the start of homelessness, remained high for 18 months and then began to decline, as shown in Exhibit 5.21. This suggests that homelessness, or the crisis leading to it, exacerbates mental health issues or, alternatively, that a mental health crisis leads to housing instability and homelessness. The higher mental health costs following entry into a homeless residential program may reflect needed engagement in ongoing mental health care and, therefore, may not represent an opportunity for cost saving. However, it is also possible that alternative housing and mental health interventions could provide more cost-effective assistance.

Exhibit 5.21: Mental Health Encounters of First-Time Homeless Families in Houston Compared to Date of First Homeless Entry



Monthly costs per family of the state-funded financial assistance used by many families in the study cohort in Kalamazoo were very low in the period before homelessness (Exhibit 5.20), as were the number of families using financial assistance during the pre-homelessness period (not shown on the exhibit).²³ This pattern suggests that most families receiving prevention funds prior to becoming homelessness did not in fact become homeless and provides evidence for the success of efforts to prevent homelessness through short-term financial assistance.

²³ For more detail, see the separate case study on Kalamazoo (Sokol, B., Spellman, B., Khadduri, J., & Leopold, J., 2009a).

5.4.3 Mainstream Costs for First-Time Homeless Families by Path Group

The costs and patterns just described for the entire study cohorts of first-time homeless in each community do not suggest opportunities for cost savings, with the possible exception of Medicaid costs in Kalamazoo and mental health in Houston. The literature on individual homeless people has focused on potential cost offsets among subsets of the homeless population—for example, individuals with chronic patterns of homelessness or homeless individuals with mental illness.²⁴ We examined patterns of use of mainstream services for homeless families following particular paths when using the homeless services system to determine if one of these path groups has patterns of use of mainstream services that could provide opportunities for cost savings or offsets.

In Kalamazoo, the “long gapper” groups had the highest Medicaid costs. The average Medicaid cost for families in these groups was \$31,177 compared to the cohort average of \$21,770. In Upstate South Carolina, Medicaid costs were fairly consistent across the path groups, but twenty percent of families whose composition changed during homelessness had a family member with an in-patient hospitalization during the period of homelessness. These findings suggest that further study of patterns of homelessness and medical costs for families with unstable membership might reveal opportunities for savings in medical costs.

Heavy users of transitional housing in Kalamazoo had similarly high Medicaid costs before and during the period of homelessness, but costs dropped following homelessness. Possibly, families in this group addressed pre-existing health issues during their stays in the homeless system. Or, they may have learned to sustain their ongoing healthcare needs after homelessness by using relatively lower-cost medical services.

Criminal justice costs were highest for the “long-gapper” groups in Kalamazoo, \$1,153 per household, nearly twice the overall average for the study cohort of \$597. As noted, this does not include court costs. Similarly, in Upstate South Carolina, criminal justice costs were particularly high for the “long-gapper” groups. In Houston, however, the highest criminal justice costs were for a group of heavy users of transitional housing, possibly incurred by one member of multi-adult households while others are in transitional housing.

Overall, families who have repeat episodes of homelessness, difficulty maintaining stable housing, and frequent changes in family composition probably incur, over time, substantial costs to public systems that could be reduced by appropriate interventions. This might be more obvious if we had been able to obtain consistent mainstream system data across all four sites or cost information from the child welfare system at one or more of our study communities. However, the appropriate interventions for these families are not as obvious as placing chronically homeless, mentally ill individuals in permanent supportive housing. A long-term rent subsidy to stabilize the family in mainstream permanent housing might help, but it likely is not sufficient to address the problems associated with unstable household composition, which may include domestic violence, other family conflict, problems with substance abuse, or chronic health problems.

²⁴ See Chapter 4 for a discussion of this literature.

5.5. Policy Implications and Recommendations for Further Research

This study of the patterns and costs associated with first-time homeless families in four communities:

- Confirms earlier research that long stays in the homeless services system are very expensive and makes explicit that most families with long periods of sheltered homelessness use transitional housing, either exclusively or in combination with emergency shelter. Groups of families that we identified as heavy users of transitional housing typically cost the homeless services system at least \$15,000 dollars. In some communities, these costs were in the \$30,000-40,000 range, which was similar to the costs for “long-stayer” families found by Dennis Culhane and his colleagues in other communities. Unlike Culhane’s research, this study found some indication that families used transitional housing for extended periods had high needs, based on their heavy involvement with mainstream behavioral health systems.
- Shows that housing vouchers typically are less expensive than transitional housing per day or per month. This is most pronounced in Houston, where the monthly cost of a two-bedroom voucher during our study period was \$743, while the average monthly cost of transitional housing was over \$4,000. The voucher cost in the high-cost DC housing market was much higher, \$1,225 per month for a two-bedroom Fair Market Rent, but the cost of transitional housing was still higher. In Upstate South Carolina, cost of transitional housing was about double the cost of a voucher. Whether the cost of transitional housing is ultimately lower than the cost of a permanent voucher—because transitional housing is temporary—is an open question.
- Identifies a group of highly troubled families that cycle in and out of the homeless services system and have very unstable household composition, often including men for part of the total period of homelessness. Their rates of involvement with the criminal justice system are high. Their repeat episodes of homelessness are comprised of relatively short stays in the residential homeless system separated by “gaps” of several months during which they evidently are unable to become stably housed in their own or someone else’s housing unit. These families are not particularly costly to the homeless services system because of their relatively small number of days in the system. The public system costs of their housing instability may be high, and over time savings in mainstream costs might offset the cost of stabilizing these families in permanent housing. We do not have enough mainstream system data over a long enough period of time to determine this. Unlike heavy users of transitional housing, the outcomes of “long-gapper” families’ use of the homeless services system as it currently is constituted are unambiguously negative. An alternative treatment model for these families that focuses on their family instability rather than their housing instability may be needed.
- Shows that African-American families, shown by other research to be homeless at higher rates than other poor families, have generally brief stays in the homeless service system and, because they use less expensive programs within each program type, they have relatively low costs to the homeless services system. In some communities African American families are less likely than other families to follow the “long gapper” pattern of homelessness. All of these factors suggest that they may become homeless mainly because of extreme poverty and limited social supports, and that more complex

interventions—beyond income and housing supports—may not be needed to prevent or end homelessness for many of these families. However, the use of less expensive programs could also be the result of fewer referrals or admissions to higher-cost programs, which may warrant follow-up to ensure that informal discrimination is not preventing access to important homeless system resources.

- Shows that, among the domains for which we were able to collect data, homeless families are well-connected to Medicaid and Food Stamps prior to homelessness and that the highest rates of mainstream utilization and costs for homeless families are the medical costs reimbursed by Medicaid. Our data do not permit us to determine whether homeless families use the health care system in inefficient ways or whether Medicaid costs might be reduced by preventing or ending homelessness. The limited information we have from Kalamazoo suggests this might be the case.
- Concludes that short-term costs to the criminal justice system, while troubling, do not appear high enough to suggest opportunities for offsets. We were not able to collect cost data for the use of the child welfare and foster care systems by homeless families in any of the study communities. This is an area in which additional research might find opportunities for cost offsets.
- Suggests that local policies designed to prevent families from becoming homeless and divert those on the brink of homelessness can succeed. Very few families using the Community Care Grants program in DC subsequently became homeless during a 30 month tracking period. Because the program screens for lease-holding history, employment history, and active substance abuse, it is likely that families diverted from homelessness would have used the emergency shelter system for short periods only. On the other hand, they might have been out-placed from emergency shelter into transitional housing. Similarly in Kalamazoo, financial assistance intended to prevent homelessness seems to have been largely successful, as few families in the study cohort received such assistance before becoming homeless. To confirm the success of this type of program would require tracking the results of prevention efforts directly—and ideally randomly assigning families to receive or not receive the limited funds available for such programs.

Because the daily cost of emergency shelter typically is just as high as the cost of transitional housing and sometimes is higher, moving families out of emergency shelter and into transitional housing quickly makes sense for families who are not placed immediately into permanent housing. In some communities, emergency shelters for families may operate more like transitional housing, but are being *used* like emergency shelters—that is, by many households for relatively short periods. Careful program evaluation may be required to determine whether the services rendered are appropriate to the needs for which they are allocated and whether there are opportunities for cost savings by cutting costs of individual programs.

As for transitional housing itself, analysis of cost effectiveness is needed to determine if long stays in transitional housing are justified either by improved outcomes for adults and children²⁵ or by reductions in costs to mainstream services system. The data we collected on the use of Medicaid by homeless families in Kalamazoo permits us to speculate that families who have used transitional

²⁵ HUD is now conducting an experimental design evaluation that will compare the outcomes of transitional housing with those of other approaches for serving homeless families.

housing subsequently use the health care system in a more cost-effective way, but we do not really know if health costs would have tapered off naturally or with an alternative less expensive housing intervention. More detailed analyses of use of health care by homeless families, and its costs, would be valuable.

Since the cost of permanent supportive housing to the homeless services system is low and families typically are well-connected to mainstream systems before they become homeless, quickly moving families who qualify out of emergency shelter and into this type of housing makes sense. More data collection and analysis is needed to determine the total costs to public systems of permanent supportive housing and whether providing services through mainstream systems is more cost-effective than services provided directly by residential programs for homeless people and paid for by their budgets. The services model used for permanent supportive housing, with housing and services managed and funded separately, may be more efficient than the services model used for transitional housing because it is better able to scale services to individual family needs.

Furthermore, it matters who pays for the services, even if they are ultimately paid for by public programs. Using funds appropriated to homeless programs for services can divert resources from providing for immediate shelter needs of homeless families and from programs that place them into long-term, stable housing.

Overall, exiting the homeless system did not yield a reduction in costs to mainstream services systems for first-time homeless families. From the limited data we have, costs to the criminal justice system went up following homelessness. Much more data are needed about other systems that may be affected by homelessness, in particular the child welfare system.

First-time homeless families who appear in the residential system for homeless people, leave, and then come back after long “gaps” and often with changes in family composition are expensive to the homeless services system when their costs are considered on a daily basis, as they appear to use relatively expensive programs. However, their relatively short lengths of stay mean that they do not create high total costs per family. Among homeless families, this is the group with the greatest potential for savings to mainstream systems. More research is needed on the complete costs over time of these “long gappers” to both homeless and mainstream systems. Also needed is the development of knowledge on how best to stabilize these families, based on interventions that are coordinated across mainstream sectors, including the child welfare and criminal justice systems.

6. Implications for Policy and Future Research

Around the country, communities are grappling with how to use their limited resources to efficiently and effectively respond to homelessness. In these uncertain economic times, many more individuals and families may experience first-time homelessness; thus, it is even more critical for communities to act prudently to use resources to meet the changing demand. This study presents findings that help to improve our understanding of homelessness and its associated costs; it presents ideas about opportunities for cost savings; and it develops an approach for measuring costs that, coupled with other evaluation methods, can help communities understand the cost-effectiveness of different homelessness interventions.

Throughout this report, we identified two types of findings with associated policy implications. One, different populations use homelessness programs differently and some populations are associated with greater costs. Communities may want to consider adjusting current interventions or developing new strategies to target people more efficiently. Second, we found that the structure of homeless programs and the roles they fill within the broader homeless assistance system present opportunities for cost savings.

We identified certain demographic characteristics and patterns of first-time homelessness that were associated with greater mainstream system involvement, but the analysis did not identify clear opportunities for overall mainstream system cost savings through the implementation of alternative responses to homelessness. However, the results also do not eliminate the possibility of mainstream system cost savings. Analysis of more comprehensive client-level data may yield more conclusive findings in this area.¹

This chapter summarizes our recommendations and reiterates ideas for future research that will continue to help policymakers and practitioners improve systems that respond to homelessness. While all communities can benefit from these findings, the results are not intended to be representative of the entire nation or every community. Regression analysis showed that the community in which individuals and families received services frequently had a strong effect on both length of stay and cost. Thus, local factors and particular Continuum and program-level decisions can have a large intervening effect on patterns of homelessness and associated homeless system costs. Policymakers should not assume that the findings here, despite spanning multiple different types of communities, will necessarily hold true everywhere. They should instead discuss whether the patterns of homelessness within their own communities are appropriate, whether their homelessness systems are efficient in achieving outcomes for people who become homeless, and whether there are opportunities for cost savings through alternative program models.

¹ We found it very challenging to obtain comprehensive mainstream data from the many federal, state, and local public agencies, in addition to private providers, that collect them. Future research that relies on analysis of mainstream administrative data will need to devote significant effort to the task of identifying and securing these data.

6.1. Policy Implications Related to Different Patterns of Homeless System Use

The study clearly demonstrates that the experience of homelessness and the costs associated with it are diverse and wide-ranging across different groups of homeless people. Most first-time individuals and families experience homelessness only once or twice and, in response, use emergency shelter for a limited period of time at fairly low cost. But some experience much longer stays and some have very high associated costs. And others use the system sporadically, moving in and out of homeless programs multiple times during long periods. Our analysis suggests that communities should consider specific responses to homelessness that target the needs of those who use the system in different ways.

6.1.1. Households that Use Only Emergency Shelters for Brief Periods

The majority of individuals we studied, 57 to 66 percent of the first-time homeless single adults in each of the three communities, used only emergency shelter and only stayed briefly. On average, “short-stayer” individuals used emergency shelter programs for only one week (Des Moines) to three weeks (Jacksonville) at an average cost per household of \$321 to \$686. Many first-time families, ranging from 42 percent in DC to 66 percent in Houston, also had only a few brief stays in emergency shelter. The stays for families were on average longer than those of the individuals in our cohorts. One group of short-stayer families in South Carolina remained in shelter only 10 days, but other short-stayer families in all four communities stayed an average of one to three months. The average costs per short-stayer family ranged from less than \$1,000 to almost \$9,000, depending on the average number of days spent in programs and the relative cost of the programs used.

These short-stayers all had much lower costs than other groups of first-time homeless individuals and families. We surmise that the short-stayers in emergency shelter are those households that may be most likely able to avoid homelessness with appropriate prevention assistance. However, the findings may suggest different responses for individuals versus families from a cost-perspective, recognizing that costs alone should not guide homelessness policy.

The homeless systems that have been established in the communities in which we studied individuals offer emergency shelter with low daily costs. For the majority of individuals, the emergency shelters seem to provide an immediate, low-cost response to their homelessness. It would be very difficult to fund a prevention response at such low cost, particularly since it may be challenging to identify up front which of the individuals’ homelessness could be prevented with minimal assistance. Perhaps the emergency shelter system is an “adequate” response to an immediate housing crisis for most individuals, and a place in which individuals who are not able to quickly resolve their housing crisis can be assisted or referred to more intensive interventions.

In contrast, emergency shelters for families are as expensive on average, if not more expensive, than transitional housing and permanent supportive housing offered in the four communities in which we had information on homeless families. The average cost per short-stayer family, even for the group in South Carolina that used shelter for only 10 days, exceeds a one-month rental subsidy based on local Fair Market Rents. The short-stayer families that stayed one to three months had associated costs per family of \$2,508 to \$8,890, significantly higher than several months of rental assistance. If families truly only need one to three months of assistance, communities may want to consider shelter

diversion or rapid-rehousing interventions that optimize the use of resources to get families back into housing. Alternatively, communities could look at the cost structure of current emergency shelter programs to determine if the environment and services offered are appropriate to the needs of those who are using them. If families stay in shelter for brief periods of time, they may not be taking full advantage of the non-crisis-related services provided to them; thus it may be possible to reduce costs by scaling back on the resources offered to families on-site in shelters. For those with greater needs who need longer stays or more intensive services, it may be more cost effective to quickly move them into transitional housing (facility-based or scattered site) or permanent supportive housing.

6.1.2. Households Who Remain in Homeless Programs for Extended Periods

The greatest opportunities for homeless system cost savings lie with the individuals and families who remain in homeless programs for extended periods. Without an assessment of the outcomes associated with the longer lengths of stay, we cannot determine whether the long stays are cost-effective. The extremely high costs associated with most of these groups suggest that communities should assess whether there are ways to reduce costs of existing programs without diminishing client outcomes, whether communities are appropriately targeting the high-cost interventions to those who benefit from them most, and whether alternative, lower-cost interventions could be developed that might be equally or more effective.

Transitional housing programs provide a starting place for this discussion. Not surprisingly since most transitional housing programs are designed for lengths of stay up to two years, those who used transitional housing alone or in combination with emergency shelter had lengths of stay in homeless programs three times that of households who only used emergency shelter. Even when controlling for lengths of stay, these households also had costs higher than those who only used emergency shelter, two times higher for individuals and one-third higher for families. The difference reflects the fact that emergency shelters for families are generally similar in cost and sometimes even more expensive than transitional housing programs, whereas transitional housing for individuals is generally more expensive than shelter.

For individuals, extended use of transitional housing costs an average of \$9,000 to \$14,000 per person, with the exception of those who used a low-cost form of shared transitional housing in Des Moines. For families, heavy users of transitional housing averaged between \$15,500 and \$38,800 per family, with the exception of families in Kalamazoo whose costs were \$6,574 on average. The environment in which transitional housing is provided, a centralized facility versus scattered site apartments, does not appear to make a consistent difference in program costs, although the distribution of costs between housing operations and services does vary somewhat from one model to another. Therefore, a program's housing model is not primarily a cost question, but rather a programmatic or philosophical one depending on the subpopulation being served.

In all cases, the costs to house individuals and families in transitional housing for extended periods are significantly higher than rental subsidies based on Fair Market Rents for an equivalent period. Transitional housing programs generally provide intensive supportive services along with housing assistance, so a direct comparison of rental assistance to transitional housing is not appropriate. However, communities may want to consider whether alternative interventions or combinations of rent subsidies and standalone supportive services could achieve similar outcomes at lower costs. To the extent that transitional housing is being used by individuals and families as a form of subsidized

permanent housing, actual rent subsidies without extensive services may be much more cost-effective.

Permanent supportive housing is generally less expensive from the perspective of the homeless system than other types of residential homeless programs for families, often similar in cost to a deep rental subsidy. This is not to suggest that the services come at no cost, but rather that permanent supportive housing programs appear to have been successful at helping residents obtain services for which they were already eligible through mainstream systems. To the extent that individuals or families have disabilities that qualify them for permanent supportive housing, communities should expedite their placement into permanent supportive housing programs. This may involve improved assessment and triage processes and may also require development of additional permanent supportive housing resources to accommodate increased referrals.

While some mainstream costs are substantial for these groups of heavy users of transitional housing, ending their homelessness does not appear to offer clear opportunities to achieve cost offsets. Our analysis identified fairly high rates of families who had received some form of mental health or substance abuse treatment in the year prior to homelessness among those who used transitional housing. So, unlike conclusions from past research, family transitional housing in our study communities appears to serve those with behavioral health and medical needs. To the extent that individuals and families are eligible for assistance in mainstream systems but do not have disabilities that qualify them for permanent supportive housing, there may be opportunities to create systematic linkages between transitional housing programs and mainstream system to promote appropriate use of mainstream systems (e.g., using primary healthcare systems for routine medical care rather than emergency or acute healthcare systems) and more efficient mechanisms for delivering these services. For instance, communities should consider creating transitional housing that is modeled like permanent supportive housing. This model would provide housing and limited housing-focused services through the homeless (or other housing) system and non-housing services through mainstream systems.

6.1.3. Households Who Use Homeless Programs Multiple Times with Long Gaps Between Stays

Our analysis also identified a small group of first-time homeless individuals and families who return multiple times for homeless assistance but have long gaps between stays. Their patterns suggest that the assistance they receive from the homeless system the first and even second or third time is not sufficient to help them regain stable housing. These households sometimes only use emergency shelter and other times use a combination of program types. Across the individual sites, costs for individuals who repeatedly used homeless programs with long gaps between stays averaged approximately \$1,000 for groups that only used emergency shelter to as high as \$10,705 for a group of individuals in Houston who used a range of program types. Costs for families averaged from \$3,295 in Kalamazoo for a group that used only emergency shelter for a total of 38 days across all stays to \$17,314 for a group in DC that spent an average of 9 months in range of programs. The homeless system costs are lower on average for groups with long gaps than those incurred by groups with extended stays because the homeless system does not incur costs between program stays.

Beyond the high levels of housing instability, this group is also of interest because of the nature of its involvement with mainstream systems. In Jacksonville, 62 percent of individuals with repeated use of emergency shelters and long gaps were arrested or spent time in jail and 26 percent of the comparable group in Houston had arrests or jail stays during the period in which we studied

mainstream use. In Kalamazoo, 61 percent of families with long gaps had a family member who was arrested or spent time in jail during the study period, as did 23 percent in Houston. In South Carolina, 71 percent of families with long gaps had a family member arrested. For both first-time homeless individuals and families, households with long gaps have much higher involvement with the criminal justice system than other groups. Since these criminal justice system rates represent a time period spanning approximately 3 years, starting 12 months before each household's first stay in a homeless program and generally going through the end of 2006, not all of the involvement occurred during homelessness or the gaps between homeless program stays. However, communities may be able to use patterns of homelessness to identify individuals and families who would benefit from interventions designed to reduce repeat offenses and achieve long-term housing stability. Local criminal justice agencies may be interested in supporting a joint intervention to assist homeless individuals and families with a history of criminal involvement.

A significant percentage of families with long gaps also had changes in household composition from one program stay to the next. Half to two-thirds of families with this pattern in Kalamazoo, Upstate South Carolina, and Houston had a household composition change, and 92 percent of families with long gaps in DC had such a change. These high rates of household change are evidence of household instability and may also suggest high involvement in child welfare systems. In DC, the only site in which we obtained rates of child welfare involvement, 55 percent of the group with long gaps had child welfare involvement at some point during the study period. Unfortunately the nature and timing of child welfare involvement were not available for DC, and data on child welfare involvement were not available for any of the other family sites. However, costs of out-of-home placement by the child welfare system can be substantial. The significant housing and family instability experienced by this group suggests that neither homeless nor mainstream systems are addressing sufficiently the needs of these families.

Although homeless costs associated with households with long gaps are not nearly as large as those for individuals and families with extended stays in homeless programs, the homeless system resources used by this population are sizable enough to support alternative interventions. Moreover, if costs associated with child welfare were captured, the costs for families in this group might be substantially higher. Communities should consider systems to identify individuals and families who leave homeless programs after a relatively brief stay and then return for a second or third time within the next few months. They could be targeted with a specific intervention to address the challenges they face in retaining permanent housing. For families, it may be possible to identify those who are likely to cycle in and out of the homeless system by assessing family stability as part of initial intake. Communities should consider partnering with the child welfare system to develop interventions to promote long-term family and housing stability for these families.

6.2. Policy Implications Related to Individuals and Families with Different Demographic Characteristics

Homelessness impacts first-time individuals and families with different demographic characteristics in different ways, and we found that different demographic groups use homeless programs differently. Cutting across the patterns of homelessness described in the last section, we identified several demographic characteristics that were associated with higher costs: gender for single adults, race for single adults, age for all populations, and household change for families. Recommendations for each of these demographic groups are discussed in this section.

6.2.1. Homeless Costs for Single Women

Among individuals, single women had fewer stays but used homeless programs 74 percent longer than single men. And women dominate groups with certain patterns of homelessness, such as those who use more expensive types of programs.² Even when controlling for length of stay, program type and other demographic characteristics, multivariate regression analysis shows that single women have 97 percent higher costs than men. We speculate that there are several reasons for the higher costs. Women's needs may be greater, and they may use higher-cost programs that can respond to these needs. In some sites, single women are served in small programs together with families, usually with higher daily costs, whereas single men often are served in large programs with lower daily costs. Like single women, most families have fewer but longer stays than single men. Thus, the similar patterns of use for both single women and families also may be influenced by the expectations of program goals and staff.

Regardless of the reasons, communities may want to reevaluate their systems for serving single women. Programs designed to accommodate families require a different physical environment, generally with more privacy than that needed for single women. If a community has sufficient numbers of single women experiencing homelessness, programs or living spaces designed specifically to meet the physical and programmatic needs of single women may be able to be delivered at lower costs per day without affecting quality. To the extent that women are staying in transitional housing for extended periods due to severe mental illness or other long-term disabilities, it may be more appropriate and less costly to quickly place these women in permanent supportive housing programs. As with all long-stayers in transitional housing (Section 6.1.2), communities should also consider whether alternative interventions such as rapid rehousing with community-based assistance could achieve equivalent or better outcomes at lower costs.

6.2.2. Homeless Costs for Older Individuals and Families Headed by Older Adults

Relatively older adults, homeless as individuals or as part of families, also had longer lengths of stay and higher homeless costs than younger adults. Even controlling for length of stay, type of program used, and other demographic characteristics, costs for individuals older than 40 were 10 percent higher for adults than those between 31 and 40 years. Among homeless families, costs for families headed by people between 18 and 24 were one-third less than those headed by 31 to 40 year olds. For individuals, the reasons for relatively older people using higher cost programs are not clear and may be due to individual needs and program eligibility. For families, the differences in costs can almost entirely be explained by the types of program used and lengths of stay.

Single women are older on average than women in families with children. This is not surprising as women who are older may have grown children and therefore be less likely to be accompanied by them. Since both age and gender are associated with higher costs for first-time homeless individuals, communities may want to consider using age and gender in combination with other indicators to identify older women with greater needs immediately at intake. Quickly diverting this group to alternative interventions specifically designed to meet their physical and programmatic needs may be more cost-effective.

² Data from victim service providers, such as domestic violence shelters, were not available for this study, so these findings are for other type of homeless residential services.

6.2.3. Homeless Costs of African-Americans

African-Americans are over-represented among first-time homeless individuals and families in comparison to the general population of individuals and families in poverty in each of the communities we studied, with the exception of Jacksonville. The multivariate analysis of lengths of homelessness and costs reveals contrasting results for African-American individuals and families. Among the individuals we studied, African-Americans are more likely to spend longer cumulative periods of time homeless, have a greater number of stays, and to incur higher homeless system costs than individuals of other races. However among the families we studied, African-Americans are likely to spend shorter periods of time in homeless programs and to be associated with lower costs. In some communities, African-Americans are associated with higher mainstream system costs and in some, lower. The conclusions suggest different strategies for African-American individuals than for families.

For individuals, African-Americans are likely to have longer lengths of stay due to their repeated episodes of homelessness. The greater costs are somewhat surprising, since African-Americans are found at lower rates in the path groups that primarily use transitional housing, the program type generally associated with higher costs. However, in Jacksonville these patterns of use—using emergency shelters rather than transitional housing—may in part drive the higher homeless system costs for African-American individuals. African-Americans comprise 73 percent of the emergency shelter long-stayer group, but only 47 percent of the Jacksonville study cohort. The Jacksonville emergency shelter that accommodates long stays is one of the most expensive homeless programs offered in the community. In Des Moines, the group of individuals that uses the lower cost, shared room model of transitional housing has a low rate of African-Americans compared with the Des Moines study cohort as a whole. To the extent that African-Americans individuals are using emergency shelter for extended periods, communities should explore strategies to alert programs to these patterns of extended stays, so more appropriate interventions can be deployed. If individuals are identified with issues that suggest need for more intensive interventions, they should be placed quickly in appropriate permanent supportive housing, transitional housing, or a newly created homeless program type that is focused on addressing their specific needs.

Among families, patterns of homelessness and involvement in healthcare systems suggest that African-American families are homeless due to extreme poverty, rather than issues related to mental illness or substance abuse. If so, communities should explore prioritizing African-American families for prevention and rapid rehousing interventions that address housing and income issues with less focus on services for non-economic issues. It may be particularly appropriate to provide a prevention or rapid rehousing intervention for families who have several characteristics associated with shorter episodes of homelessness and lower costs, for instance when African-American families headed by younger adults with younger children request shelter assistance. While communities may feel uncomfortable discussing methods of directing assistance based on race, this finding could be translated into strategies that identify ways other than race to uncover indicators for families who become homeless primarily due to poverty rather than psycho-social issues.

Alternatively, the low involvement in healthcare systems may also reflect an informal or clinical bias that results in lower access by African-American families to mainstream systems or fewer referrals or admissions to homeless programs that offer higher-intensity assistance. Therefore, communities

should also consider whether informal discrimination at the community level and as part of the case management process needs to be addressed.

6.2.4. Potential for Achieving Mainstream Cost Savings

The question of whether mainstream system costs can be offset by appropriate housing interventions is left open by this study. Our analysis suggests that there are few opportunities for mainstream cost savings when targeting groups based on their patterns of homelessness; however, consistent with past research, significant mainstream system costs may be achievable when targeting individuals or families with high levels of inappropriate involvement in mainstream systems prior to homelessness. For example, for individuals in Houston we identified patterns of mental health inpatient involvement immediately prior to homelessness, which imply that homeless programs may be currently used to house some individuals when they leave inpatient facilities. Mainstream systems and homeless systems (or ideally mainstream housing systems) may be able to design more appropriate, lower cost post-care housing responses that can offset future mainstream and homeless system costs for individuals being discharged from inpatient facilities.

Several demographic groups of first-time homeless individuals in Jacksonville and Houston, the only sites in which we had data to accommodate regression analysis, are associated with higher mainstream costs over the full period in which we studied these individuals when controlling for patterns of homelessness.³ First-time homeless single women had higher mainstream costs when compared to men for mental health treatment costs (as well as physical healthcare costs and income supports in Jacksonville) and lower criminal justice costs. Relatively older adults in both communities also had lower criminal justice costs. However, age had different effects on costs for health care across communities. First-time homeless adults over 40 had higher mental health and physical health costs in Jacksonville and lower mental health care costs in Houston. Results for race provided a mixed picture. Communities may want to explore whether certain demographic groups should be targeted with alternative interventions to ensure appropriate use of mainstream systems.

The key point is that communities must recognize that mainstream cost savings are most likely not readily achievable when targeting homeless individuals or families defined by their use of the homeless system, even those who are homeless for extended periods. Instead, communities interested in mainstream cost savings should be intentional about identifying and targeting those with high mainstream system use as they enter the system.

6.3. Ideas for Future Research

This study does not show which homelessness interventions are cost-effective or indicate whether mainstream systems are appropriately used during periods of homelessness. But it does illuminate the diverse patterns and costs of homeless and mainstream system use that are essential to answer the critical policy question of whether instances of higher costs are appropriate as a response to homelessness for specific subgroups, or whether there are more efficient and effective ways of meeting people's needs.

³ The mainstream costs were incurred throughout the periods before, during and after homelessness in which we studied these individuals.

This research raises a number of additional questions that should be the focus of new research.

1. Are there specific features of homeless programs, such as program structure or size that are consistently associated with higher costs? Understanding specific cost drivers more clearly may help communities understand how to design lower-cost interventions.
2. Do some program models have outcomes that justify greater investment?
3. Are needs and patterns of homelessness for single women distinct enough to warrant systems designed specifically for them, such that future homeless system planning would focus on three broad populations: single men, single women, and families with children?
4. Are there individual and family characteristics beyond those identified in this study that can be used to predict who is likely to experience extended or high-cost homeless system use? This study identifies many patterns of homelessness associated with high costs, but changing those costs requires directing people to alternative interventions before the costs have been incurred and communities will need a basis for setting new referral policies.
5. Are the tentative conclusions drawn here about the relationship of homelessness for African-American families and extreme poverty warranted? Are there other factors that are important for identifying African-American and other families who are likely candidates for prevention or rehousing interventions?
6. How are costs of the child welfare system related to periods of homelessness? Do the conclusions regarding limited opportunities for mainstream cost offsets change when analyzing a broader range of mainstream domains within the same community?
7. Although mainstream costs appear to be related to homelessness, does desirable and undesirable mainstream involvement vary when homeless individuals or families are accessing transitional housing as opposed to a shelter, permanent housing or rapid rehousing program? For instance, this study did not attempt to understand whether individuals had greater inpatient use while in shelter and more routine mental health care when placed in transitional housing. Understanding the nature of mainstream costs, how they change in relation to different types of homeless programs, would help communities implement homeless programs that encourage cost-effective use of mainstream systems.
8. How do mainstream costs vary for the periods in-between homeless program stays as compared with during homeless program stays and the periods before and after homelessness? This study aggregated the homeless program stays and the gaps between them in a single “during homelessness” period. More granular analysis might help explain important trends in mainstream use preceding homelessness, during stays in different types of homeless program, during times of housing instability between homeless program stays, and following homelessness

While there are many research avenues still to explore, this study contributes substantially to the effort to quantify the costs associated with homelessness. Understanding these costs is a critical step in ensuring that the resources invested in serving those who are homeless are directed in a manner that best meets the diverse needs of homeless individuals and families.

Appendix A: Costs Associated with First-time Homelessness: Individuals in Jacksonville, FL

A.1. Overview

This study aims to understand the financial costs associated with 1,972 single adults in Jacksonville, Florida who became homeless for the first-time between July 1, 2004 and June 30, 2005. This study describes how people who become homeless use homeless and mainstream services and the total costs associated with those services. The mainstream services included in this report are arrests and jail stays, Medicaid-funded healthcare costs, mental health services, substance abuse treatment, food stamps, and TANF benefits. Mainstream services were tracked for the periods before, during, and following homelessness.¹

Of the seven sites included in this study on the costs of first-time homelessness, we were able to develop the most comprehensive dataset for Jacksonville: data on utilization and costs for more mainstream systems, data for costs of residential homeless programs that include capital costs, and data on patterns of homelessness that include people who were contacted by homeless street outreach programs but never entered homeless residential programs.

Eighty percent of the first-time homeless individuals in the study cohort for Jacksonville were men. The average age was 41 years, and the study cohort was evenly split between whites and African-Americans (Exhibit 1). Half of the cohort had only one stay in a homeless program, and more than three-quarters used only emergency shelters. A small subset of the cohort had extended stays in homeless residential programs, and they were responsible for the majority of homeless costs. Three-fourths of the study cohort used mainstream systems before, during, or following the period of homelessness (Exhibit 1), and the costs of the study cohort to mainstream systems increased during homelessness.

Exhibit 1: The Jacksonville Cohort	
Basic Cohort Information	
Total Persons	1,972
Average Age	41
Percent Male	80%
Percent White	48%
Homeless Program Utilization	
Length of Homeless Tracking Period	18 months
Average Number of Stays	3.3 stays
Average Total Length of Stay	57 days
Median Length of Stay	10 days
Mainstream System Utilization	
Incurred costs in at least one mainstream system	74%
Incurred costs in two or more mainstream systems	49%

A.1.1 Highlights of Cost Findings

On average, individuals in the study cohort spent 132 days homeless during the 18-month homeless tracking period.² During this period, the study cohort incurred a per person total cost of \$2,652 for homeless and mainstream systems combined. Sixty-two percent of costs were incurred by the

¹ For the purposes of this study, mainstream systems are those that do not exclusively target people who are homeless.

² The period of homelessness extends from the first entry into a program for homeless people through the last exit from such a program. It may include “gap days” during which a person is not in a homeless program. Thus the 132 day average period of homelessness is longer than the 57 day average total length of stay shown on Exhibit 1.

homeless system (\$1,634), and the remaining 38 percent was spread across mainstream domains. Criminal justice was by far the most expensive mainstream domain during homelessness (Exhibit 2).

Homeless System Costs

- **Distribution of Costs:** The distribution of homeless costs was highly skewed. Fifty percent of the study cohort had total homeless system costs of less than \$225 and accounted for only 2 percent of total homeless costs. Ten percent of the study cohort had homeless costs of \$5,300 or more. These individuals accounted for 62 percent of total homeless costs.

Exhibit 2: Costs While Homeless	
Domain	Average Costs per Person
Homeless System Costs	\$1,634
Mainstream System Costs (all domains)	\$1,018
Income support (Food Stamps and TANF)	\$138
Physical Health	\$219
Criminal Justice	\$397
Substance Abuse	\$158
Mental Health	\$106
Total Costs While Homeless	\$2,652

Homeless System
Costs Included • <i>Operational costs of homeless residential programs, including facility rents</i> • <i>Services provided by homeless residential and homeless outreach programs</i> • <i>Capital Costs of facilities owned by the program or donated</i>
Costs Not Included • <i>Programs not covered by HMIS:</i> Probably not major costs; over 90 percent of beds are covered in the HMIS either directly or through data merges. However, the costs of one large health program that targeted the homeless are not included in this study.

- **Costs by Program Type:** Emergency shelters with 24-hour staffing and on-site supportive services had the highest daily cost of homeless residential programs. Overnight shelters and permanent supportive housing programs with low-intensity services had the lowest daily cost.³
- **Costs by Demographics:** The average homeless system cost for women (\$2,754) was more than

double the average cost for men (\$1,337). Women tended to stay in more extensive programs than men and have longer program stays.

- **Costs by Homeless System Utilization:** Not surprisingly, there was a strong correlation between length of time spent in homeless programs and homeless costs. Users with long term stays (six months or more) in transitional housing had the highest average homeless costs.

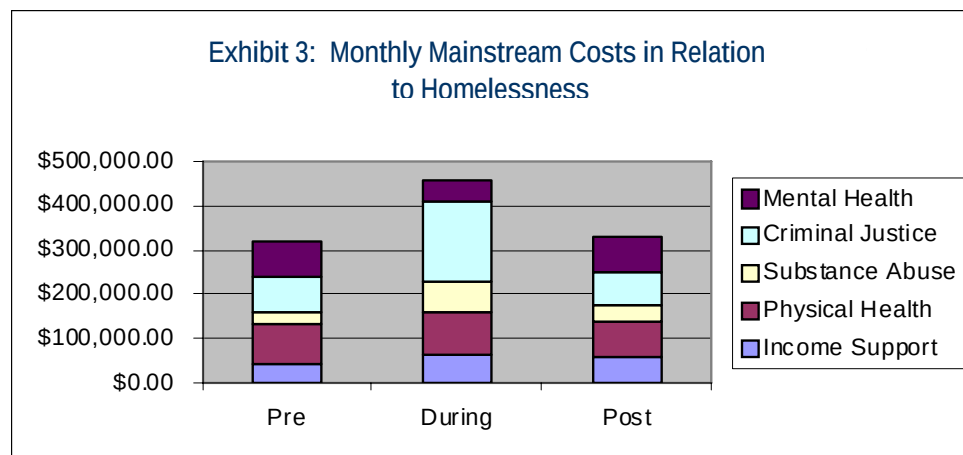
Cost of Mainstream Systems

More than \$12.4 million, \$6,294 per person, in mainstream costs were incurred over the entire study period, which extended from one year before each person became homeless to December 2006. Like costs to the homeless services system, the distribution of mainstream costs across the study cohort was highly skewed, with more than a quarter of the study cohort using no mainstream systems and another quarter using more than \$7,000 in mainstream services during the entire study period.

³ The term Permanent Supportive Housing is used here because these programs were considered part of Jacksonville's homeless service system. However, some of these programs were funded with HUD Section 8 SRO Moderate Rehabilitation grants and do not offer intensive supportive services.

Mainstream Systems	
Costs Included	
•	Physical Health (Medicaid Managed Care and Fee For Service)
•	Income support (TANF and Food Stamps)
•	Criminal Justice (county and city)
•	Mental Health and Substance Abuse: Medicaid and IDS funded
Costs Not Included	
•	Non-Medicaid Primary Health Care: Likely to be high; as participation in Medicaid was low.
•	Veterans Administration Funded Services: May be high, we do not know what percent of the study cohort were veterans.
•	Other benefits (SSI/SSDI)

- The event of becoming homeless for the first time was associated with a sharp increase in costs to mainstream systems (Exhibit 3).⁴ This increase was most pronounced in the criminal justice domain, where average monthly costs more than doubled during homelessness.
- Persons in the study cohort were frequently arrested for crimes such as trespassing that appeared to be directly related to their homelessness.
- Mental health was the only domain for which average monthly costs were lower during homelessness, and persons receiving mental health services had lower homeless costs than the rest of the study cohort.



- In regression analysis, demographic characteristics and involvement in mainstream domains were stronger predictors of mainstream costs than the path a person takes through the homeless service system. In particular, whether or not a person received physical healthcare was a very strong predictor of mainstream costs. Age was also a strong predictor, with the youngest and the oldest age groups in the study cohort having the highest mainstream costs.
- Overall mainstream costs were far lower than estimates from previous studies, suggesting that the experience of becoming homeless does not necessarily lead to long-term, costly involvement in mainstream service systems.

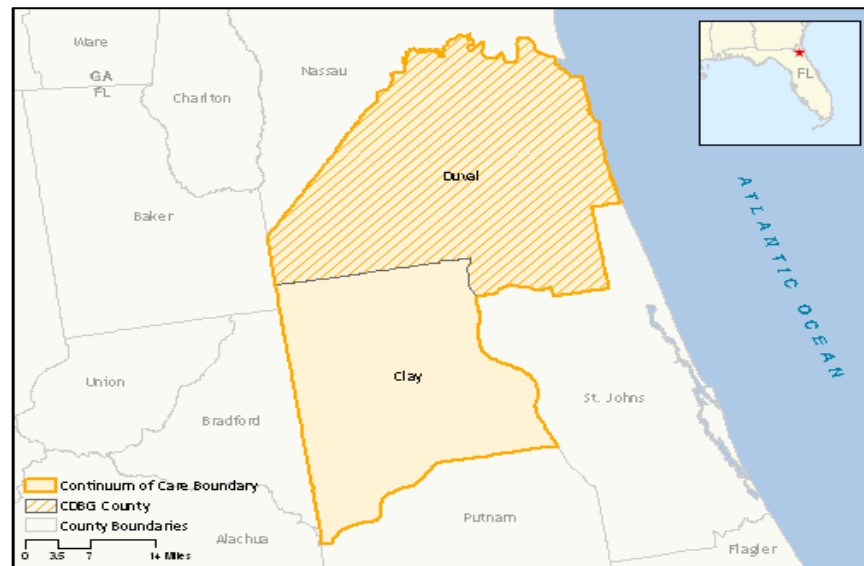
⁴ Average monthly costs are used here to adjust for the wide variance in the length of the homeless period for the study cohort.

A.2. The Homeless Services System for Single Adults in Jacksonville-Duval, Clay Counties

The Jacksonville-Duval/Clay Counties Continuum of Care (CoC) covers approximately 1,350 square miles along the northeastern Florida coastline. The CoC includes a significant portion of the metropolitan Jacksonville area, including its downtown hub, and has a population of 980,226. Exhibit 4 is a map showing the Jacksonville-Duval/Clay Counties CoC.

Exhibit 4: The Jacksonville-Duval/Clay Counties CoC

In January 2005, the CoC reported a point in time census of 2,930 homeless persons, 86 percent of whom (2,521) were single adults. Of those, 721 were without shelter. Nearly one in every 335 people in Jacksonville-Duval/Clay Counties was homeless on that single night in January.⁵



Fifteen primary agencies within the CoC provide shelter, transitional

housing and permanent housing to homeless people. They are clustered primarily within downtown Jacksonville. Several additional agencies do not provide shelter but provide supportive services to homeless persons in Jacksonville. Nearly all of the homeless service agencies, including large faith-based organizations that do not receive any public funding, participate actively in the CoC planning process. The CoC, led by the non-profit Emergency Services and Homeless Coalition (ESHC), establishes priorities for program development and funding. In 2004, ESHC published a 10-Year Strategic Plan entitled *Ending Homelessness in Jacksonville: A Blueprint for the Future* (ESHC, 2004). The plan encourages the CoC to adopt a “Housing First” approach of moving clients as quickly as possible into permanent housing. However, as is true for many jurisdictions that have announced intentions to place clients rapidly into permanent housing, Jacksonville’s service system still reflects, for the most part, a more traditional staged housing framework, wherein clients are assumed to move from emergency shelter to transitional housing and from there to independent or permanent supportive housing.

A.2.1 Homeless Program Types

Homeless programs in Jacksonville were assigned a program-type based on their role in the homeless service system, the level of supportive services they provided, and their expected cost structure.

⁵ This estimate is based on the Continuum of Care’s 2005 *Homeless Population and Subpopulations* chart from its annual funding application to HUD (HUD, 2006) and 2005 ACS population estimates for Duval and Clay Counties (U.S. Census Bureau, n.d.).

Exhibit 5 shows the program types identified in this analysis, the number of programs in each category, the number of available beds for each program type, and information on the costs collected for these programs.

Exhibit 5: Jacksonville CoC Program Typology				
Program Type	Description	Number of Programs	Number of Beds	Notes on Cost Estimates
Supportive Services Only	This category includes a service center that provides food, clothing and job training; a health clinic; and a case management program for persons with psychiatric disabilities.	3	N/A	These programs were not included in the case study due to lack of standardized data on utilization.
Street Outreach	Street-based outreach and service center, offering low demand, engagement-focused services. Clients are engaged on the streets and come into the center for more extensive assistance. Clients typically receive services for 6-12 months.	2	N/A	No data available on level of services received so a standard "engagement" cost was applied to each stay.
Congregate Overnight Shelter	Overnight shelters for homeless individuals. Programs were all faith-based and offered minimal services.	3	180	One overnight shelter was not included in this study due to lack of HMIS data. Costs were collected directly from one of the two other programs.
Congregate 24-hour Emergency Shelter	Emergency Shelter with 24-hour supervision, permitting longer lengths of stay and offering more extensive services.	1	300	Costs collected directly.
Facility-based Transitional Housing	Congregate facilities offering longer lengths of stay (up to 2 years) and intensive services, typically focused on substance abuse recovery.	8	450	Two programs were not included in study because they did not participate in HMIS. Cost data was collected directly from three of the six remaining programs.
Scattered Site Transitional Housing	Market-rate housing. Agency holds the lease, but clients may take over the lease if/when they become self-sufficient. Rent subsidies are typically provided for up to two years. Clients receive case management and other services.	2	60	Costs were collected directly from both programs.
Facility-based PH: Minimal Services	Section 8 Moderate Rehabilitation Single Room Occupancies (SROs). Clients served were not necessarily disabled. Minimal services offered in conjunction with program.	4	450	Costs were collected directly for three of the four programs.
Facility-based PSH: Moderate to Intensive Services	Permanent Supportive Housing, either SROs or group housing. Exclusively serve persons with disabilities and offer more intensive services.	5	175	Two programs were excluded due to lack of HMIS data. Costs were collected directly from two of three remaining programs.
Scattered Site PSH: Moderate to Intensive Services	Market-rate housing. Either the agency or the client holds the lease. Clients receive permanent, deep rental subsidy, case management, and other services.	4	165	One program was excluded due to lack of HMIS data. For Shelter + Care programs, case match included as service cost.

Jacksonville has two homeless outreach programs that provide a variety of services to persons living on the streets. In most cases these services are limited to brief interactions such as distributing blankets or bus tokens. However, some clients engaged for longer periods of time are placed into residential homeless programs.

Jacksonville has three overnight emergency shelters. These facilities offer minimal services and often limit the total number of nights clients can stay there. One overnight shelter allows three free nights per month and then charges \$5 per night. Although overnight shelters are not very large, they serve more people than other programs because they have the highest turnover rates. The largest emergency shelter in the area was placed in a separate category because, unlike the overnight emergency shelters, it has 24-hour staffing, on-site supportive services, and no explicit limits on length of stay.

Most transitional housing units in Jacksonville are facility-based, meaning that clients are housed in a single building or a campus of buildings owned or leased by the program. There are a few scattered-site transitional programs that rent individual apartments in larger complexes where most of the buildings' tenants are not homeless. Most transitional housing programs offer supportive services, including case management, benefits assistance, and job training. These programs screen out persons who are actively using drugs or alcohol and cite employment, sobriety and obtaining permanent housing as their primary program goals.

The majority of permanent supportive housing units in Jacksonville are Section 8 Moderate Rehabilitation Single Room Occupancies (SROs). Unlike permanent supportive housing, these programs do not exclusively serve persons with disabilities. Aside from meals, these permanent housing SROs do not include on-site supportive services. Services are provided through referral. Jacksonville also has several permanent supportive housing programs that offer more intensive on-site supportive services. Most individuals using permanent housing programs are not included in this study because their initial homeless program entry date was prior to July 1, 2004.

Annual operating budgets were collected for a sample of homeless programs of each type. The annual operating costs include the costs of housing operations, program administration and supportive services such as food and case management. For programs that own their own facilities, an estimate of the capital costs of those facilities was factored into the daily cost. Annual costs were divided by the annual number of total shelter days provided to derive a daily cost.

The daily costs were merged with homeless service utilization data to derive the total costs for each program stay. The primary source of data used to measure homeless program utilization was HMIS data. However, three of Jacksonville's largest providers did not consistently enter data into the HMIS during the study period. These providers had their own separate databases to track the number of clients they served, their characteristics, and their lengths of stay. For the study, data extracts from the HMIS and each of the three provider databases were merged to create a single dataset that captured the majority of homeless programs in the Jacksonville CoC.

Some programs did not participate in HMIS or provide a separate dataset. Those programs are missing from the analysis, and, therefore, this study does not provide a complete account of how many single adults became homeless during the study period, their service patterns, or their total costs. For instance, no data was available for Circle of Love, a medium-size faith-based organization

that operates an overnight shelter and a transitional housing program, or for Volunteers of America's permanent supportive housing programs. Despite these limitations, data was available for over 95 percent of the total emergency, transitional and permanent supportive housing beds within the CoC.

Jacksonville has several homeless supportive services only programs whose costs are not included in this case study, including a health clinic; a service center that provides meals, clothing and employment services; and a case management program for homeless persons with psychiatric disabilities. These programs were excluded from the case study because of their lack of consistent and standardized HMIS data.

A.2.2 Homeless Costs by Program Type

It cost the homeless service system more than \$3.2 million to provide shelter and services to the 1,972 persons in the homeless study cohort during the 18-month homeless tracking period. Exhibit 6 presents the homeless system costs for each homeless program-type used by the study cohort of first-time homeless individuals in Jacksonville. Service intensity is the biggest determinant of cost per day. Programs that offer an array of on-site services such as healthcare and employment assistance have higher daily costs. Facility-based residential programs, where clients are all served in a single building or campus, have daily costs similar to those of scattered-site programs that lease market-rate apartment units.

Exhibit 6: Homeless Costs by Program Type								
Type	Total Cost	Total Days	Average Cost Per Day	Total Program Stays	Distinct Persons Served	Average # of Stays per Person	Average # of Days per Stay	Average Cost Per Person
Outreach and Engagement ^a	\$15,868	177	\$89.65	177	168	1.1	1	\$94
Congregate Overnight Shelter	\$134,183	9,862	\$13.61	4,909	1,210	4.1	2	\$111
Congregate 24-hour Emergency Shelter	\$1,733,325	54,046	\$32.07	884	700	1.3	61	\$2,476
Facility-based Transitional Housing: Moderate to Low Intensity Services	\$773,714	24,680	\$31.35	434	348	1.2	57	\$2,223
Scattered Site Transitional Housing: Moderate to Low Intensity services	\$19,002	686	\$27.70	6	6	1.0	114	\$3,167
Facility-based PSH: Moderate to Intensive Services	\$157,231	5,457	\$28.81	33	31	1.1	165	\$5,072
Scattered Site PSH: Moderate to Intensive Services	\$82,250	2,650	\$31.04	13	12	1.1	204	\$6,854
Facility-based PSH: Minimal Services	\$305,696	14,758	\$20.71	59	58	1.0	250	\$5,271
^a Each outreach engagement was treated as a one-day stay								

Homeless outreach programs were responsible for less than one percent of total homeless system costs. Only nine percent of the study cohort had contact with a homeless outreach worker. The HMIS data did not offer information on the types of services clients received, so an average cost per “engagement” was estimated and applied to each member of the study cohort reported to have received outreach services.

Although congregate overnight emergency shelters served 61 percent of the homeless study cohort, they accounted for only 9 percent of homeless days and only 4 percent of homeless system costs. On average, a night in an overnight congregate shelter cost \$13.61, a significantly lower unit cost than any other residential homeless program. Overnight shelters also had the lowest total costs per person served because they had much shorter lengths of stay than other residential homeless programs.

Jacksonville’s congregate 24-hour emergency shelter served 35 percent of the study cohort at sometime during the tracking period and accounted for 48 percent of total shelter days and 54 percent of homeless costs. This shelter had a daily cost of \$32.07, the highest of any residential program, or \$962 for a one-month stay. By comparison, the 2007 fair market rent for a 1-bedroom apartment in Jacksonville was \$669. The twenty-four hour emergency shelter had a longer average length of stay than facility-based transitional housing programs. This could be because the 24-hour shelter has fewer program requirements such as maintaining sobriety or paying program rent. Because of the slightly higher daily cost and the slightly longer average stay, the total cost per individual of a stay in 24-hour emergency shelter was higher than the total cost of a stay in a transitional-housing facility.

Transitional housing programs accounted for 25 percent of total homeless system costs. Facility-based transitional housing programs had a slightly higher daily unit cost (\$31.35) than scattered site transitional housing (\$27.70). However, scattered-site transitional housing programs had a higher total per-person cost because their average stay was twice as long. The median stay in facility-based transitional housing lasted less than 30 days, possibly because persons in the study cohort had difficulty complying with their sobriety requirements or other program rules.

Although only 5 percent of the study cohort used permanent supportive housing, these programs accounted for 17 percent of total homeless costs.⁶ The daily costs of permanent supportive housing programs varied greatly depending on the level of services provided. Facility based SRO programs with minimal services had a daily cost per person of \$20.71, while scattered site permanent supportive housing programs with more intensive services had a daily cost per person of \$31.04. Permanent supportive housing programs with more intensive services had significantly shorter average lengths of stay than permanent supportive housing programs with services provided through referrals. Overall, permanent supportive housing programs had the highest total costs per person because their average lengths of stay were greater than other residential programs.

⁶ Several permanent supportive housing programs for people with mental illness did not have data in the HMIS, including these program might have increased the number of clients using permanent housing programs and their associated costs. However, most of those clients would not have been likely to fall into our cohort of first-time homeless between July 1, 2004 and June 30, 2005.

A.3. Homeless System Costs

A.3.1 Utilization of the Homeless System

The study cohort's homeless service utilization was tracked for 18 months from the initial program entry date for each member of the study cohort. Seventy-eight percent of the study cohort used only emergency shelter or street outreach programs, and fifty percent of the study cohort had only one program stay.

The median total length of stay in residential homeless programs was only ten days. A small subset of the study cohort stayed in homeless residential programs for six months or more. As a result, the average length of stay (57 days) was more than five times the median length of stay. Similarly, a small subset of persons had five or more program stays. Although fifty percent of the study cohort had only one program stay, the average number of program stays was 3.3 (Exhibit 7).

It was rare for people in the study cohort to use the homeless service system as a continuum, moving from emergency shelter to transitional or permanent housing. Only 22 percent of the study cohort used transitional or permanent supportive housing at all. The majority of persons who used transitional or permanent housing also had an emergency shelter stay (59%). However, of those who used both emergency shelter and transitional or permanent housing, 37 percent accessed transitional or permanent housing directly, had a program exit, and then had a subsequent stay at an emergency shelter. When people moved from emergency shelter into transitional or permanent supportive housing, there was often a lag between their exit from emergency shelter and their entry into transitional or permanent supportive housing, suggesting that their entry into transitional or permanent supportive housing was not the result of a referral.

Exhibit 7. Homeless Program Utilization	
Average number of Homeless Program Stays	3.3
Percent of study cohort with only one program stay	50%
Percent of study cohort that used only emergency shelter or outreach programs	78%
Percent of study cohort that used transitional and/or permanent supportive housing	22%
Average (mean) number of days spent in homeless programs	57
Median number of days spent in homeless programs	10

A.3.2 Homeless System Costs per Person

Exhibit 8 shows the distribution of costs to the homeless services system for individuals in the study cohort. The average cost per person was \$1,634, while the median was \$225. The minimum cost for a person represents one night in an emergency shelter, and the maximum is for a person who stayed in a range of homeless programs for the entire 18-month period.

Exhibit 8. Summary of Per Person Homeless System Costs	
Average Homeless System Cost Per Person	\$1,634
Median Homeless Cost	\$225
Minimum Homeless Cost	\$13.61
25 th Percentile of Homeless Costs	\$40.82
75 th Percentile of Homeless Costs	\$1,578
Maximum Homeless Costs	\$23,069

As shown in Exhibit 8, half the study cohort had a total homeless cost of less than \$225. Almost all of these individuals either used just emergency shelter or had a street outreach contact followed by an

emergency shelter stay and spent only a few days total in shelter. These individuals accounted for only 2 percent of total homeless costs. Ten percent of the study cohort had a total homeless cost of \$5,300 or more. These individuals accounted for 62 percent of total homeless costs.

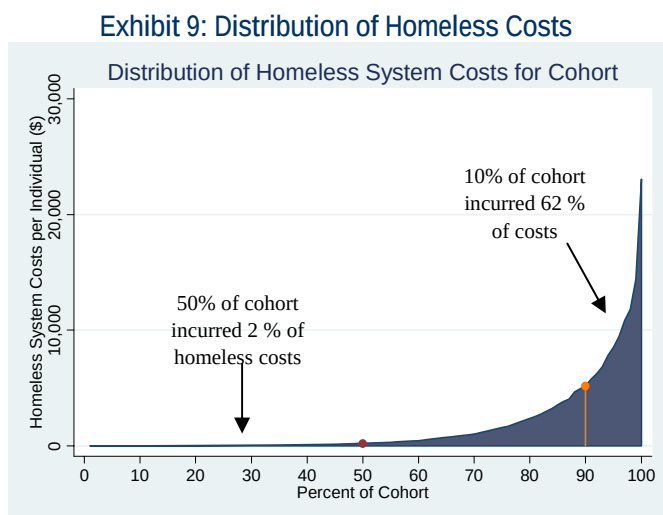


Exhibit 9 shows the cumulative distribution of homeless system costs for the individuals in the study cohort. The distribution of homeless system costs is heavily skewed by a small percentage of users responsible for the majority of total costs.

A.3.3 Homeless Costs by Demographic Characteristics

The average total homeless cost of women in the study cohort was more than double the average costs of men, as shown in Exhibit 10. Women were more likely to have long stays in emergency shelter. Fifty-five percent of persons who spent 6 months or more in emergency shelter were women, even though women made up only 20 percent of the homeless study cohort. This finding is consistent with other studies that have found that women typically have longer lengths of stay in residential homeless programs (HUD, 2008).

Exhibit 10: Homeless Costs by Gender, Race and Age	
	Average Homeless Cost
Gender	
Men	\$1,337
Women	\$2,754
Race	
White	\$1,348
African-American	\$1,928
Age	
18 to 24	\$1,197
25 to 30	\$1,327
31 to 40	\$1,466
41 to 50	\$1,689
51 and older	\$2,152

Not only did women have longer homeless program stays, they also typically used more expensive programs. Multivariate regression analysis, shown in Appendix B.3.1, measures the effect each independent variable has on homeless costs, holding other variables constant. The outcome variable is in log form, and these coefficients can be understood as percentage differences from the reference category for each categorical variable. Model 4 in Appendix B.3.1 shows the effect of gender on homeless costs, controlling for the length of stay spent in homeless programs, number of program stays, gaps between homeless stays, race, and age. The female variable has a co-efficient of 1.21, meaning that women had 121 percent higher homeless costs after controlling for other variables. The relationship between gender and homeless costs was statistically significant at the .01 level.

The average total homeless cost for African-Americans (\$1,928) was nearly \$600 higher than the average homeless cost for whites (\$1,348) (Exhibit 10).⁷ African-Americans had longer average lengths of stay than whites. However, even after controlling for length of stay and other variables, African-Americans still had 39.4 percent higher costs than whites (Appendix B.3.1). This finding was statistically significant at the .01 level.

Exhibit 10 also shows that costs per individual increase with age, with those over 50 having the highest cost per person. Older persons were more likely to progress from emergency shelter to transitional or permanent supportive housing or to be placed directly in permanent supportive housing, possibly because they were more likely to have a documented disability. However, multivariate regression analysis found that the effect of age on total homeless cost per person was not statistically significant after controlling for homeless program utilization, suggesting that the greater cost per person for older individuals is associated only with longer stays (Appendix B.3.1, Model 4).

A.3.4 Costs by Homeless Path Group

First-time homeless individuals followed eight distinct “paths” through the homeless services system in Jacksonville. These paths were assigned based on a multivariate cluster analysis that included as variables the number of nights spent in homeless programs, number of homeless stays, length of gaps (in days) between homeless stays, and the types and sequences of programs used while homeless. Exhibit 11 presents the Jacksonville path groups, the percentage of the study cohort in each path, the path groups’ demographic characteristics, their lengths of stay, and the average cost to the homeless system for each person in the path group. Appendix B.1 provides more information on the demographic characteristics of each path group, and Appendix B.2 shows their utilization of homeless programs.

Two-thirds of the study cohort, 1,302 people, fell into either the “ES Short Stayer” or the “Street/ES Short Stayer” path group. These people had brief stays in emergency shelter or a brief engagement with a homeless outreach program followed by a stay in emergency shelter. The majority of people in these path groups spent three days or less in homeless programs and typically used only overnight emergency shelter rather than the more costly 24-hour emergency shelter. Therefore, the total homeless cost per person for these path groups were very low compared to the rest of the study cohort. The individuals in these path groups were overwhelmingly male and somewhat more likely to be white than individuals in other path groups.

Two percent of the study cohort had a single stay in emergency shelter that lasted more than six months. “Emergency Shelter Long Stayers” was the only path group with more women than men. This path group also had the highest percentage of African-Americans. “Emergency Shelter Long Stayers” had the second highest total homeless system cost per person of any path group, \$9,756. The forty-four persons in this path group had a higher total homeless cost (\$429,274) than the 746 “Emergency Shelter Short Stayers” (\$419,768).

⁷ Information on ethnicity was not available from the Homeless Management Information System (HMIS).

Exhibit 11: Jacksonville Homeless Path Groups								
Path Name	Description	% of Study Cohort	Average Age	Percent Male	Percent White	Average Length of Stay	Average Homeless Cost	Total Homeless Cost
Single ES Short Stayers	A single stay in emergency shelter lasting less than 6 months	38%	40	80%	51%	18	\$563	\$419,768
Street/ES Short Stayers	This pattern includes outreach engagements followed by short emergency shelter stays, as well as multiple, brief shelter stays	28%	41	85%	52%	29	\$853	\$474,039
Single ES Long Stayers	A single stay in emergency shelter lasting 6 months or more	2%	41	46%	25%	304	\$9,756	\$429,274
Multiple ES Long Gappers	Multiple emergency shelter stays with significant gaps in time between stays	10%	42	95%	37%	40	\$910	\$179,249
Sequential Short Stayers	Brief use of transitional housing, sometimes following emergency shelter. A few members of this path ended the sequence with a short stay in PSH following emergency shelter or transitional housing. Total length of stay less than 6 months.	10%	41	65%	50%	54	\$1,585	\$310,652
Sequential Long Stayers	Long stays in transitional housing, sometimes following a stay in emergency shelter. A few members of this path ended the sequence with a short stay in PSH. Total length of stay greater than 6 months.	2%	47	67%	50%	364	\$10,416	\$374,961
Circlers	Use of emergency shelter following transitional or permanent supportive housing.	7%	43	79%	38%	135	\$3,987	\$566,200
Permanent Supportive Housing Long Stayers	Long stays in permanent supportive housing, sometimes preceded by a stay in emergency shelter	3%	46	67%	42%	338	\$8,493	\$467,126

Ten percent of the study cohort had a high number of stays in emergency shelter spread out over a long period of time. Ninety-five percent of “Emergency Shelter Long Gappers” were male and two thirds were African-Americans. “Long Gappers” had an average of 11 distinct program stays during the study period, and most of these stays lasted only a few days (Appendix B.2). On average, 398 days elapsed between the first shelter entry for “Emergency Shelter Long Gappers” and their last shelter exit during the study period. However, “ES Long Gappers” spent an average of only forty days in emergency shelter. Some “ES Long Gappers” may be chronically homeless persons alternating among spending the night in emergency shelters, living on the streets or in other tenuously housed situations, and staying in other institutions. The average homeless cost for this path group was \$910, lower than the overall study cohort average.

Ten percent of persons in the study cohort were “Sequential Short Stayers”. This path group ended the homeless “path” in transitional or permanent housing and had a total length of stay of less than six months. Two percent of persons in the study cohort were “Sequential Long Stayers”. This path group ended the homeless “path” in transitional or permanent housing and had a total length of stay of six months or more. Although people in these two path groups are characterized as “sequential” users of the homeless service system, the majority (56 percent) used only transitional housing.

“Sequential Long Stayers” had a total homeless cost per person of \$10,416, the highest of any path group. Together the 36 “Sequential Long Stayers” incurred \$374,961 in total homeless costs, \$64,000 more than the total homeless costs of the 196 “Sequential Short Stayers” (\$310,652). “Sequential Long Stayers” and “Sequential Short Stayers” both were somewhat more likely to be women than the study cohort as a whole. Long Stayers were older on average than other path groups, with an average age of 47, compared to 41 for the overall study cohort (Appendix B.1).

Seven percent of the study cohort, 142 people, were “Circlers”, meaning that they exited transitional or permanent supportive housing only to have a subsequent homeless program stay in emergency shelter or transitional housing. Compared to other path groups using transitional or permanent housing, “Circlers” were more likely to be male and more likely to be African-American. Because of their relatively short lengths of stay, their average costs were lower than costs for the “long-stayer” path groups.

Three percent of the study cohort, 55 persons, had long stays in permanent housing. “Permanent Supportive Housing Long Stayers” had a higher average age than the study cohort as a whole. Although this group had an average length of stay of 338 days and the highest median length of stay of any path group (384 days, compared with 371 for sequential long-stayers), they typically stayed in SRO units with minimal services and low daily costs (Appendix B.2). Thus, their total cost per person was considerably less than the costs per person of the long-term stayer groups that spent most of their time in transitional housing or emergency shelter.

A.4. Mainstream System Costs

Of the six sites in the Cost of Homelessness study, Jacksonville provides the most complete picture of mainstream service costs associated with first-time homelessness.

Administrative data on mainstream service systems were collected through the University of South Florida (USF), which acted as an intermediary. USF manages behavioral health data for the State and was able to link our homeless study data with mainstream datasets to produce the analysis needed for this case study. The study includes data for: Medicaid-funded physical

healthcare; state and Medicaid funded mental health and substance abuse services; Temporary Assistance to Needy Families (TANF); food stamps; and jail and arrest data from the Duval County Sheriff. The data on physical healthcare cover both capitation plans (Medicaid managed care) and fee for service encounters. The capitation plan costs reported in the study represent the costs incurred by the medical providers for the visits and services provided, rather than the amount of the premiums paid by the State for the managed care.

Exhibit 12. Percent of Study Cohort Utilizing Mainstream Systems During the Study Period	
One or more mainstream domains	74%
Two or more mainstream domains	49%
Income support	52%
Criminal Justice	38%
Mental Health	25%
Substance Abuse	22%
Physical Health (Medicaid funded)	20%

Not included in the study are physical healthcare costs not covered by Medicaid, such as emergency room visits for the uninsured, and medical and other services provided through the Veterans Administration. We also did not collect data on SSI/SSDI income support or on service encounters and costs that members of the study cohort might have had with the child welfare system.⁸

Mainstream service costs were analyzed for the periods before, during and after homelessness. The pre-homelessness period was defined as the 12 months prior to the first homeless program entry for an individual in the study cohort. During homelessness was defined as the period between a cohort member's initial entry into a homeless program and his or her final exit from a homeless program.⁹ The after homelessness period was defined as the period between a person's final program exit date and the end of the study period December 31, 2006. The entire study period lasted between 2.5 and

⁸ Members of the study cohort were served only as single individuals during the study period. However, some of them may have been parents of minor children with encounters with the child welfare system, just as some received TANF income.

⁹ If clients were still in a homeless program 18 months after their initial program entry, they were given an exit date of 18 months (548 days) after their initial entry. For persons who had more than one homeless program stay, the during-homelessness period includes time when those persons were not actually residing in homeless programs and many not have actually been homeless. For example, a person in the study cohort might go to an overnight shelter for one night on July 3, 2004, exit the shelter to live in his own apartment, and then have a subsequent one night stay in an overnight shelter on December 21, 2005. Although this person's total length of stay in homeless programs was two nights, his total period "during homelessness" was 536 days.

3.5 years, depending on a client's initial homeless program entry date.¹⁰ Exhibit 12 shows the percentage of the study cohort using each mainstream system at some point during the entire study period.

Exhibit 13 summarizes the mainstream system costs of the Jacksonville study cohort of first-time homeless individuals. The average total mainstream system cost per person in the study cohort was \$6,294. Some mainstream costs are positive, as persons in the study cohort received necessary benefits or services. Other mainstream costs were less positive, for example, incarceration or involuntary psychiatric hospitalizations.

Like homeless costs, the distribution of mainstream costs was heavily skewed, with a majority of the study cohort with relatively low costs and a small subset with very high costs. The skew is reflected in the large gap between the mean mainstream cost (\$7,136) and the median mainstream cost (\$1,602). More than a quarter (26 percent) of the study cohort made no use of mainstream services during the study period, so the 25th percentile cost per person is zero.

Exhibit 13. Summary of Total Mainstream System Costs	
Total Mainstream Costs	\$12,410,933
Percent of study cohort that incurred mainstream costs	74%
Average mainstream costs per person	\$6,294
Average mainstream costs per person incurred during homelessness	\$1,018
25 th percentile of mainstream cost	\$0
Median mainstream cost	\$1,602
75 th percentile of mainstream cost	\$7,136
Maximum mainstream cost	\$180,814

Exhibit 14 shows the total monthly mainstream costs for the entire study cohort for each major domain in the periods before, during and after homelessness. Monthly averages are used to control for the difference in length between the before, during and after homelessness time-periods. Total monthly mainstream costs for almost all domains were highest during homelessness. The biggest reason for the increase was a 125 percent spike in criminal justice costs during homelessness. The Duval County Department of Corrections spent an average of \$178,072 per month on the homeless study cohort during this period.

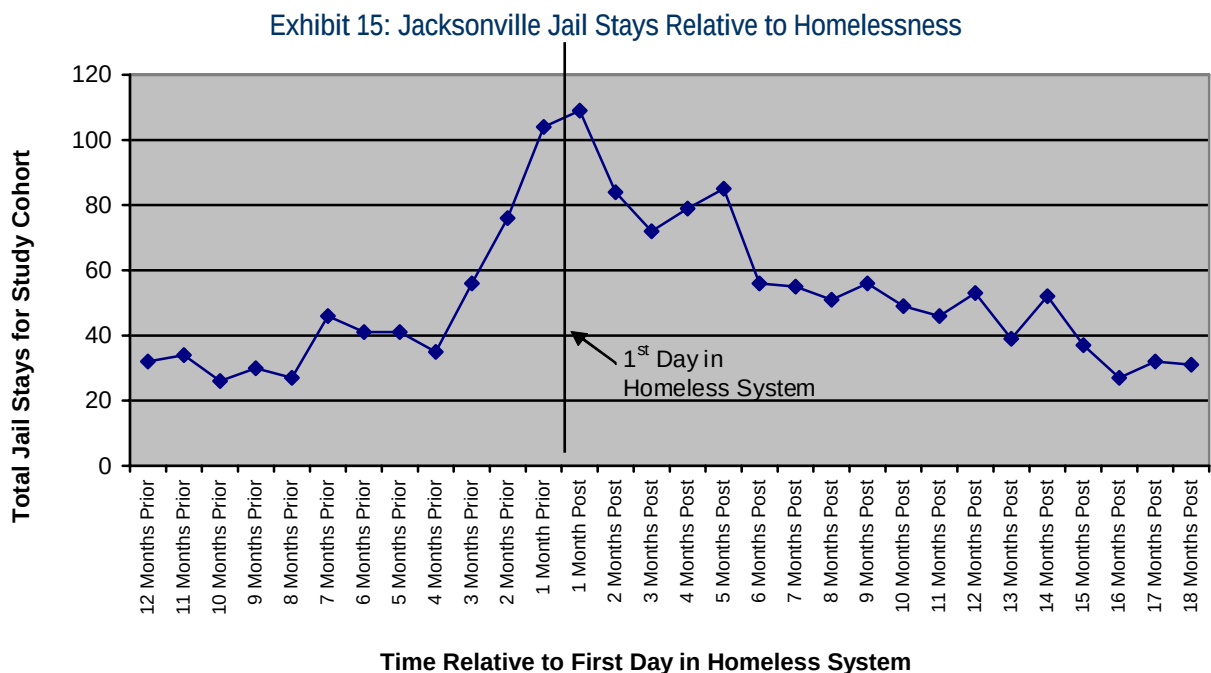
Exhibit 14: Total Monthly Mainstream Costs for the Study Cohort Before, During, and After Homelessness						
	Criminal Justice	Physical Health	Mental Health	Income Support	Substance Abuse	All Domains
Average Monthly Costs by Time Period						
Prior	\$79,274	\$89,923	\$78,091	\$42,595	\$26,622	\$317,198
During	\$178,072	\$98,206	\$47,328	\$61,526	\$70,992	\$456,124
Post	\$73,950	\$81,049	\$76,908	\$58,568	\$37,862	\$327,746
Percent of Costs Incurred by Time Period						
Prior	25%	28%	25%	13%	8%	-
During	39%	22%	10%	13%	16%	-
Post	23%	25%	23%	18%	12%	-
Overall	26%	25%	22%	16%	11%	-

¹⁰ The total length of the mainstream tracking period varied based on when persons in the study cohort first entered the homeless service system. Persons with a program entry date of July 1, 2004 had a total study period of 3.5 years (July 1, 2003 – December 31, 2006). Persons with a program entry date of June 30, 2005 had a total study period of 2.5 years (June 30, 2004–December 31, 2006). The average mainstream study period was 1,090 days.

Criminal justice was the most expensive mainstream domain for the study cohort, accounting for 26 percent of overall mainstream costs and 39 percent of mainstream costs incurred while the study cohort was homeless (Exhibit 14). Criminal justice costs include the costs of making an arrest (\$244.50/arrest) and putting someone in jail (a \$165 processing fee plus \$60 for each night spent in jail). Criminal justice costs do not include court costs or prison costs. Thirty-eight percent of the study cohort had at least one encounter with the criminal justice system (Exhibit 12).

Exhibit 14 shows a 125 percent increase in monthly criminal justice costs for the study cohort during homelessness, suggesting that persons are more likely to incur criminal justice costs while they are homeless. Trespassing was the most commonly cited cause for arrest, followed by possession of a controlled substance, petty theft, public intoxication, and driving with a suspended license – all non-violent offenses.

The monthly costs by time period show a sharp spike in criminal justice costs during homelessness. However, a more granular analysis of the criminal justice data shows that jail stays increase dramatically directly before and after first contact with a homeless program (Exhibit 15). The dramatic increase in jail stays (and jail costs) is obscured in Exhibit 14 because monthly costs are averaged out over the entire 12-month “pre-homelessness” period. Exhibit 15 suggests a connection between the event of becoming homeless and the likelihood a person goes to jail. In some cases a jail stay may have disrupted a person’s housing arrangement and precipitated his homelessness; in other cases, being homeless might have made people more likely to be arrested for vagrancy crimes such as trespassing or loitering.¹¹



¹¹ Other research analyzing rates of homelessness among ex-offenders found that individuals released from state prisons or jails have a greater risk of homelessness than individuals with similar characteristics who have not been recently incarcerated. The same research also found that certain demographic characteristics and longer periods of incarceration were associated with greater risks of homelessness after release. (Graham, D., Locke, G., Bass Rubenstein, D. & Carlson, K., unpublished)

Unfortunately, the administrative data used in this study is insufficient to investigate these relationships more thoroughly. This level of analysis requires client-level utilization data, which we did not receive for the other mainstream systems in Jacksonville.

Exhibit 16 shows the results of multivariate analysis we conducted to understand which characteristics of the study cohort and its patterns of homelessness are related to criminal justice costs.¹² In these models, the regression coefficients represent the differences in dollar costs between individuals with and without a particular characteristic. The first model in Exhibit 16 includes the number of homeless stays, length of stay in homeless programs, the number of gap days spent between homeless program stays, age, gender, and race. The coefficients in these models should be interpreted as the effect (in dollars) having a particular characteristic has on a person's criminal justice costs, controlling for all other characteristics included in the model. According to this model, there is not a strong association between the number of homeless program stays and criminal justice costs or between length of stay in homeless programs and criminal justice costs. However, there is a strongly significant relationship between sporadic use of the homeless service system and criminal justice costs. People who had long gaps between homeless program stays had higher criminal justice costs. The gap days variable has a coefficient of 149.9, meaning that for every 30 days spent between homeless program stays, criminal justice costs increased by almost \$150. The first model in Exhibit 16 also shows a strong relationship between gender and criminal justice costs, with women having almost \$1,000 lower criminal justice

Exhibit 16. Multivariate Regression Models for Criminal Justice Costs		
	Model without mainstream involvement	Model with mainstream involvement
Patterns of Homelessness		
Total Number of Stays	-34.855 (21.201)	-16.612 (18.684)
Total length of stay (in days), divided by 30	11.861 (27.582)	-40.961* (24.685)
Total gaps between stays (in days), divided by 30	149.972*** (25.196)	46.678** (22.557)
Demographics+		
Females	-992.334*** (249.377)	-699.162*** (239.654)
African-Americans	380.364* (195.320)	391.015** (173.505)
Other Races	814.333 (535.575)	1,037.067** (470.540)
Ages 18-24	91.847 (380.230)	20.461 (335.731)
Ages 25-30	-59.916 (341.461)	30.047 (300.492)
Ages 41-50	-639.606*** (240.925)	-442.451** (212.209)
Ages 51 and above	-1,094.955*** (291.206)	-451.928* (257.551)
Mainstream Involvement		
Income Support (TANF and food stamps)	N/A	162.643 (180.981)
Physical Healthcare	N/A	-522.385** (247.343)
Mental Health	N/A	133.297 (211.859)
Substance Abuse	N/A	1,003.905*** (211.772)
Criminal Justice	N/A	3,973.550*** (178.374)
Constant	1,820.685*** (220.352)	61.876 (214.513)
Observations	1972	1972
R-Squared	.04	.26
+ Reference categories are males, whites, and ages 31-40. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%		

¹² Appendix B.4 provides a complete set of regression models, which include controls for missing variables. Appendices B.5 and B.6 provide alternate regression models that control for homeless path group and homeless cost respectively, rather than homeless service utilization.

costs than men. Age was also strongly associated with criminal justice costs, as persons over 40 had lower criminal justice costs than persons between 31 and 40.

The second regression model shown in Exhibit 16 controls for both patterns of use of the homeless services system and for use of the mainstream domains, including criminal justice, with which the study cohort had encounters.¹³ Thus, individuals with criminal justice encounters had criminal justice costs almost \$4,000 greater (the coefficient is 3973.55) than those without such encounters (whose criminal justice costs would be zero). Because this model controls for whether or not a person becomes involved in the criminal justice system, the coefficients indicate the extent of a person's involvement and not the likelihood of his involvement.

Thus, individuals who received substance abuse services as well as criminal justice services incurred an additional \$1,004 in criminal justice costs, while those who used Medicaid reimbursed health care had criminal justice costs \$522 lower. Even after controlling for the differential use of mainstream services, across the entire study cohort women had criminal justice costs about \$700 lower than men. The model shows that African American individuals have higher criminal justice costs than whites, as do those identifying themselves as belonging to "other" races. Not surprisingly, relatively older members of the study cohort have lower criminal justice costs than younger people.

After controlling for involvement in mainstream domains, there is still a significant relation between gap days and criminal justice costs. However the relationship is much weaker, as the coefficient decreases from 149.9 to 46.7. After controlling for involvement in mainstream domains, there is a negative correlation between length of stay in homeless programs and criminal justice costs. However, the effect is slight and only significant at the 10 percent level. Apparently, peoples' characteristics that are not directly related to homelessness—whether they are arrested, whether they have needs that bring them into contact with substance abuse services, whether they lack routine medical care—are much more powerful determinants of their criminal justice costs than their patterns of use of homeless programs. Gender and race also are more powerful predictors of criminal justice encounters than are patterns of use of the homeless services system.

Income support was used by just over half of the study cohort. Fifty-two percent of the study cohort received food stamps during the study period, while only three percent of persons in the cohort received TANF. The low utilization of TANF benefits was expected because most persons in the study cohort were single men, and many of the women may not have qualified for TANF because they did not have children living with them. Income support costs increased 44 percent while persons in the study cohort were homeless and decreased only slightly after clients exited homeless programs (Exhibit 14). It is unclear how persons living in residential homeless programs, who in many cases were provided free meals, used their food stamp benefits.

Multivariate analysis results indicate that income support costs were positively associated with longer homeless lengths of stay. The first regression model shown in Exhibit 17 shows that each additional 30 days in homeless residential programs is associated with an additional \$80 in income support across the study cohort. An alternate model that controls for homeless path groups (Appendix B.5.1, Model 2) shows that those with long stays in emergency shelter had a \$2,327 higher income support cost per person. The models control for the gender of the individual and also show that women have

¹³ Both models are shown in their entirety in Appendices B.4.1 and B.4.2 respectively.

much higher income support amounts than men. The second model in Exhibit 17 shows that people who also receive physical health care have higher income support amounts than those who do not.

Overall, the pattern seems to identify a group better connected to programs that alleviate poverty than other first-time homeless individuals.

Substance Abuse

services were used by 22 percent of the study cohort (Exhibit 12). The monthly cost of substance abuse treatment for the study cohort spiked 167 percent during homelessness, from \$26,622 to \$70,992 and decreased to \$37,862 after persons in the study cohort exited homeless programs (Exhibit 14). Substance abuse treatment was the least expensive mainstream service domain during the study period, having the lowest costs in the periods before and after homelessness. However, it was the third most expensive domain while people in the study cohort were homeless.

Exhibit 17. Multivariate Regression Models for Income Support Costs		
	Model without mainstream involvement	Model with mainstream involvement
Patterns of Homelessness		
Total number of stays	-5.599 (10.013)	-2.596 (8.964)
Total length of stay (in days), divided by 30	80.128*** (13.027)	40.700*** (11.843)
Total gaps between stays (in days), divided by 30	0.982 (11.900)	-12.295 (10.822)
Demographics+		
Females	1,770.719*** (117.779)	833.108*** (114.976)
African-Americans	280.946*** (92.248)	135.253 (83.241)
Other Races	-174.340 (252.948)	-115.260 (225.746)
Ages 18-24	416.656** (179.580)	185.669 (161.070)
Ages 25-30	248.953 (161.269)	92.079 (144.164)
Ages 41-50	-152.958 (113.787)	-242.203** (101.810)
Ages 51 and above	-104.207 (137.534)	-210.229* (123.563)
Mainstream Involvement		
Income Support (TANF and food stamps)	N/A	1,445.796*** (86.828)
Physical Healthcare	N/A	1,423.293*** (118.666)
Mental Health	N/A	-255.665** (101.641)
Substance Abuse	N/A	-123.407 (101.600)
Criminal Justice	N/A	7.975 (85.577)
Constant	394.947*** (104.071)	-112.587 (102.915)
Observations	1972	1972
R-Squared	0.16	0.34
+ Reference categories are males, whites, and ages 31-40. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%		

Path groups that involved the use of transitional housing programs (“Sequential” Stayers and “Circlers”) had higher substance abuse costs than path groups associated with only the use of emergency shelter.¹⁴ The relationship between use of transitional housing programs and substance abuse costs holds both when the use of mainstream systems is controlled for in the model and when it is not (Exhibit 18). Most

transitional housing programs cited achieving sobriety as a principal program goal, and these programs may have referred their clients to mainstream drug treatment programs. An alternative specification of the model shows that each 30-day increase in the length of stay in a homeless program is associated with a \$61 increase in substance abuse costs (Appendix B.4.1). The first regression model in Exhibit 18, which does not control for the use of mainstream services, shows that heavy users of permanent supportive housing also have high substance abuse costs, but the coefficient is no longer significant in the second model, which does control for mainstream involvement. A possible explanation is that, while users of permanent supportive housing are more likely to incur substance abuse costs than other path groups, their substance abuse costs are not higher than other people who receive substance abuse treatment. Receiving mental health treatment was associated with a \$451 increase in substance abuse costs, for persons who received substance abuse treatment (Exhibit 18). Gender appears to have no effect on substance abuse costs.

Mental health services were the third most expensive mainstream service domain across the entire study period but the least expensive domain during the homelessness

Exhibit 18. Multivariate Regression Models for Substance Abuse Costs		
	Model without mainstream involvement - controlling for homeless path group	Model with mainstream involvement – controlling for homeless
Homeless Path Group+		
Single ES Long Stayers	-12.359 (448.596)	-267.271 (400.888)
Multiple ES Long Gappers	349.426 (231.315)	29.563 (209.701)
Street/ES Short Stayers	312.461* (160.581)	126.469 (143.937)
PSH Long Stayers	1,174.122*** (402.976)	583.988 (362.491)
Sequential Short Stayers	883.603*** (231.450)	414.067** (207.256)
Sequential Long Stayers	1,345.077*** (494.468)	862.500* (440.936)
Circlers	491.023* (263.855)	130.110 (238.325)
Mainstream Involvement		
Income Support (TANF and food stamps)	N/A	146.196 (125.848)
Physical Healthcare	N/A	239.911 (172.276)
Mental Health	N/A	451.142*** (147.491)
Substance Abuse	N/A	2,951.154*** (147.036)
Criminal Justice	N/A	-9.928 (123.700)
Constant	587.542*** (164.758)	-179.410 (158.159)
Observations	1972	1972
R-Squared	0.02	0.23
+ Reference categories are Single Emergency Shelter Short Stayers, males, whites, and ages 31-40. Both models also controlled for age, gender, and race. The full models are shown in Appendix B.4.1 and B.4.2. Standard errors in parentheses. *significant at 10%, **significant at 5%; ***significant at 1%		

¹⁴ Appendix B.7 shows mainstream involvement and per person costs by time period and homeless path group.

period, as shown on Exhibit 14. The exhibit shows that during homelessness, total mental health costs went down for the study cohort, even as substance abuse costs rose. This may reflect a substitution effect between similar services during the period of homelessness. However, regression models that look for determinants of mental health costs across the entire study period show no statistically significant differences in cost between persons who have and have not received substance abuse treatment (Exhibit 19). This means that, persons in the study cohort that received substance abuse treatment and also received mental health services had higher substance abuse costs than those who only received substance abuse treatment. However, persons who received mental health services and also received substance abuse treatment did not have higher mental health costs than persons that only received mental health services.

Both before and after controlling for involvement in mainstream systems, African-Americans have significantly lower mental health costs than white individuals (Exhibit 19). “Sequential Short Stayers”, those with short stays in transitional or permanent supportive housing, have higher mental health costs in both regression models (Appendix B.5.1, Appendix B.5.2). Aside from this, the path group regression analysis showed no significant relationship between homeless service use and mental health costs. Among those persons who had mental health treatment, people who received Medicaid funded physical health care incurred an additional \$3,204 in mental health costs (Exhibit 19).

Physical health care was the least likely mainstream domain to be utilized by the Jacksonville cohort.

Exhibit 19. Multivariate Regression Models for Mental Health Services Costs ¹⁵		
	Model without mainstream involvement	Model with mainstream involvement
Demographics		
Female	1,663.730*** (441.617)	34.806 (454.595)
African-American	-907.569*** (345.888)	-745.157** (329.119)
Other Race	575.892 (948.438)	358.007 (892.559)
Ages 18-24	1,237.724* (673.342)	286.685 (636.842)
Ages 25-30	636.365 (604.686)	334.982 (569.998)
Ages 41-50	237.133 (426.649)	244.497 (402.536)
Ages 51 and older	1,065.059** (515.691)	1,003.213** (488.545)
Mainstream Involvement		
Income Support (TANF and food stamps)	N/A	-623.605* (343.301)
Physical Healthcare	N/A	3,203.957*** (469.182)
Mental Health	N/A	4,531.870*** (401.871)
Substance Abuse	N/A	131.791 (401.706)
Criminal Justice	N/A	-7.631 (338.355)
Constant	1,183.239*** (390.217)	92.949 (406.907)
Observations	1972	1972
R-Squared	0.02	0.13
+ Reference categories are Single Emergency Shelter Short Stayers, males, whites, and ages 31-40. Both models also controlled for number of homeless program stays, homeless length of stay, and gaps between homeless stays. The full models are shown in Appendix B.4.1 and B.4.2 Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%		

While used by only 20 percent of the study cohort, it had the second highest total cost (Exhibit 14). Physical health care costs did not change significantly in the periods before, during and after persons in the study cohort were homeless (Exhibit 14).¹⁶ Long-stayers in permanent supportive housing had by far the highest physical health care costs of any path group. Their average physical health care cost was \$9,300, 239 percent higher than the per person physical health care costs of the next highest path group (Appendix B.7). Most permanent supportive housing programs serve exclusively people with disabilities, and these individuals may have physical as well as mental health conditions. No other path group had a significant association with physical health care costs after controlling for

¹⁶ Appendix B.7 shows the per person costs and involvement rates in physical health care by time period and homeless path group.

demographic characteristics. However, there was a significant association between physical health care costs and the length of time spent in homeless programs. The first model in Exhibit 20 shows that, for every thirty days spent in homeless programs, physical health care costs increase \$199. In the second model, which controls for mainstream involvement, each 30-day increase in homeless length of stay is associated with a \$157 increase in physical health care costs (Exhibit 20). This indicates that not only are persons with long stays in homeless programs more likely to receive Medicaid funded physical health care, they also are likely to receive it more frequently and/or receive more expensive services. The models that include involvement in other mainstream systems show that people who receive mental health services also have substantially higher physical health care costs than other members of the study cohort (Exhibit 20). The models that do not control for receipt of mainstream services show that women have much higher physical health care costs than men. However, once receipt of physical health care and other mainstream services is controlled for, women have lower costs than men (Exhibit 20). Apparently, individual homeless men are less likely than individual homeless women to receive Medicaid-reimbursed physical health care services, but when they do, their treatment is more expensive.

Exhibit 20. Multivariate Regression Models for Physical Health Care Costs		
	Model without mainstream involvement	Model with mainstream involvement
Patterns of Homelessness		
Total number of stays	-74.742** (36.628)	-34.522 (33.302)
Total length of stay (in days), divided by 30	198.681*** (47.651)	157.377*** (44.000)
Total gaps between stays (in days), divided by 30	13.062 (43.528)	4.806 (40.207)
Demographics+		
Females	2,170.849*** (430.825)	-951.443** (427.168)
African-Americans	560.360* (337.435)	284.895 (309.262)
Other Races	209.352 (925.260)	163.165 (838.707)
Ages 18-24	646.639 (656.886)	-508.376 (598.418)
Ages 25-30	128.096 (589.908)	-476.145 (535.607)
Ages 41-50	47.339 (416.223)	63.805 (378.249)
Ages 51 and above	912.642* (503.089)	421.008 (459.069)
Mainstream Involvement		
Income Support (TANF and food stamps)	N/A	-312.324 (322.588)
Physical Healthcare	N/A	7,847.323*** (440.874)
Mental Health	N/A	1,159.145*** (377.624)
Substance Abuse	N/A	878.769** (377.469)
Criminal Justice	N/A	-571.797* (317.940)
Constant	477.218 (380.681)	-219.240 (382.356)
Observations	1972	1972
R-Squared	0.04	0.21
+ Reference categories are males, whites, and ages 31-40. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%		

A.5. Total Homeless and Mainstream Costs

The average total homeless and mainstream cost for each individual in the study cohort was \$7,927. The median total system cost for persons in the study cohort was \$3,057 (Exhibit 21). The average cost was inflated by a small subset of persons with overall homeless and mainstream system costs of more than \$20,000.

Exhibit 22 shows the distribution of overall costs during the homeless period across the homeless services system and mainstream domains.

Exhibit 21. Summary of Total Costs	
Total Costs (mainstream and homeless)	\$15,632,202
Average (mean) total cost per Person	\$7,927
Median total cost	\$3,057
Average Costs incurred while homeless	\$2,651

Sixty-two percent of overall costs incurred during homelessness were borne by homeless programs and 38 percent was borne by mainstream systems. The average monthly costs for all mainstream domains except for mental health were highest during homelessness. Criminal justice was the most expensive mainstream domain during homelessness, accounting for 15 percent of total costs in this period.

Exhibit 22: Distribution of Costs During Homelessness

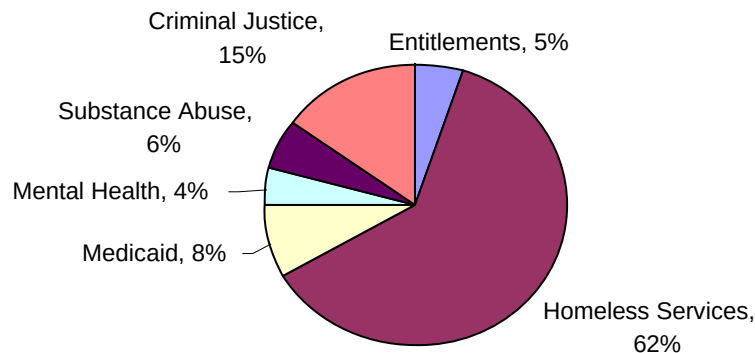


Exhibit 23 shows the average total costs of the study cohort by path group and time period. More detail about the differences in mainstream utilization and costs by path group is provided in Appendix B.7. The three path groups associated with long homeless residential stays (“Single ES Long Stayers”, “Transitional Housing Long Stayers”, and “Permanent Housing Long Stayers”) had the highest overall costs. PSH Long Stayers had a total average cost of \$23,930, the highest of any path group, primarily because their physical healthcare costs were much higher than any other path group.

Exhibit 23: Average Homeless and Mainstream Costs by Time Period and Path Group								
	ES Short Stayers	Street/ES Short Stayers	ES Long Stayers	ES Long Gappers	Sequential Short Stayers	Sequential Long Stayers	Circlers	PSH Long Stayers
Mainstream Costs Before Homelessness	\$1,822	\$1,571	\$3,314	\$1,260	\$3,313	\$2,439	\$1,624	\$4,808
Homeless Costs	\$563	\$853	\$9,756	\$910	\$1,585	\$10,416	\$3,987	\$8,493
Mainstream Costs During Homelessness	\$259	\$711	\$2,953	\$1,841	\$1,054	\$2,385	\$2,057	\$6,198
Mainstream Costs After Homelessness	\$3,288	\$3,456	\$3,384	\$2,563	\$4,533	\$846	\$2,499	\$4,432
Total	\$5,932	\$6,771	\$19,407	\$6,574	\$10,485	\$16,086	\$10,167	\$23,931

The high healthcare costs for users of permanent supportive housing were expected because many of Jacksonville's permanent supportive housing programs exclusively served people with disabilities, and these individuals are older than the study cohort as a whole and may have chronic physical conditions as well as mental health problems. More than half of PSH Long Stayers also had some involvement with the criminal justice system during the study period. Compared to other path groups, mainstream costs for PSH Long Stayers remained fairly consistent before and after becoming homeless.

"Sequential Long Stayers", persons who had long stays in transitional housing, had the highest homeless costs of any path group, but only average mainstream costs. Their average total costs (\$16,086), were well below the overall costs of long-term stayers in emergency shelter or permanent supportive housing. The mainstream costs of "Sequential Long Stayers" dropped dramatically after homelessness, a possible indication that their lives were more stable as a result of their homeless stay or stays. Another interpretation is that this group of users was higher functioning than other path groups and thus had less frequent and less expensive involvement with mainstream systems after exiting homeless programs.

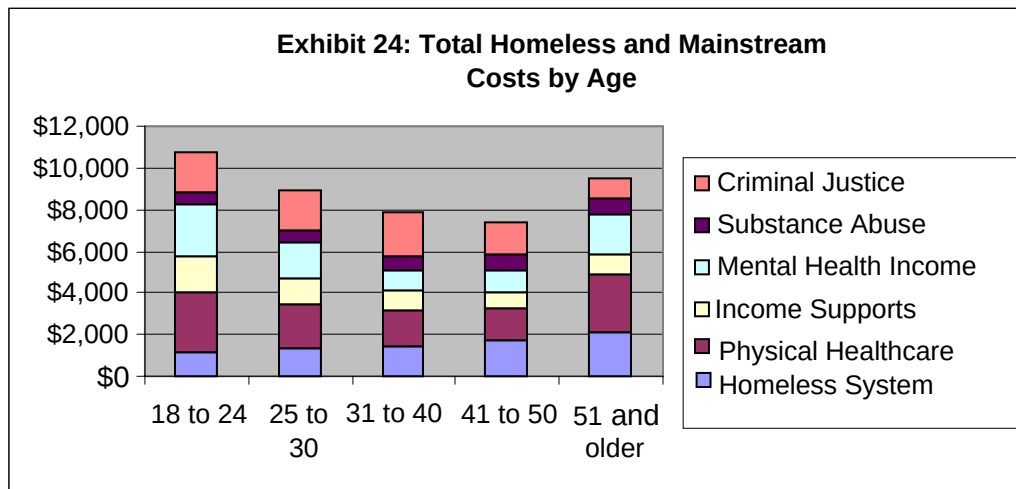
People with a single long stay in emergency shelter had an average total cost of \$19,407. This small path group, only two percent of the study cohort, had the second highest homeless (\$9,756) and mainstream (\$9,651) costs per person of any path group. This group appeared to be more connected to mainstream supports than other path groups. They were the most likely to receive both income supports (86 percent) and physical healthcare (39 percent).

"Sequential Short Stayers" and "Circlers" had nearly identical total costs per person, \$10,485 and \$10,167 respectively. Sequential Short Stayers had much higher mental health costs before becoming homeless than any other path group (Appendix B.7). Unlike Sequential Long Stayers, the average mainstream costs of Sequential Short Stayers remained high after exiting homeless programs. "Circlers" had high average criminal justice costs during homelessness; suggesting that in some cases a jail stay helped trigger homeless recidivism and entry into emergency shelter. However, both of these path groups had lower overall costs than long term users of transitional or permanent housing because they spent less time in residential homeless programs.

Surprisingly, "Multiple Emergency Shelter Long Gappers" the group that most closely resembles the chronically homeless in their patterns of homelessness, had the lowest average mainstream costs before becoming homeless of any path group (Exhibit 23). Although Long Gappers had high criminal justice costs during homelessness, their overall mainstream costs were significantly lower than users of transitional or permanent housing or long-term stayers in emergency shelter because they were less connected to mainstream services like food stamps and healthcare. Long Gappers also had low homeless costs because, despite their many homeless program stays, their cumulative number of nights in shelter was low and they used inexpensive overnight shelters. "Single ES Short Stayers", the most common path group representing 38 percent of the study cohort, had the lowest total cost per person. "Street ES Short Stayers" also had overall costs significantly lower than the cohort average.

There was a U-shaped relationship between age and total cost, as demonstrated in Exhibit 24. The 18-24 year old age group had the highest total costs per person. Although their homeless costs were low, their income support costs were significantly higher than other age groups, and they also had high Medicaid and mental health costs. Persons over 50 also had significantly higher total costs than

other age groups. Older persons had significantly higher homeless and Medicaid costs compared with persons between the ages of 25 and 49.



Multivariate regression analysis shows that homeless service patterns, gender, race, and mainstream system involvement all had significant effects on overall costs. Holding constant demographic and mainstream system variables, long term stayers in transitional housing (“Sequential Long Stayers”) had the highest overall costs, 438 percent higher than short-term stayers in emergency shelter (Exhibit 25). After controlling for homeless path groups, mainstream involvement, and other demographic characteristics, women had 93 percent higher overall costs than men (Exhibit 25).

Similarly, African-Americans had 41-percent higher overall costs than whites (Exhibit 25). The entire difference in overall costs for African Americans was because of higher homeless costs. There was no significant difference in mainstream costs between African-Americans and those who are white (Appendix B.3.1, Models 5 and 6; Appendix B.3.2, Models 5 and 6.)

Involvement in mainstream systems was highly correlated with total costs for the homeless and mainstream systems combined. In most cases, persons involved in mainstream systems had higher overall costs. For instance, controlling

Exhibit 25. Multivariate Regression Models for Overall Homeless and Mainstream Costs

	Model with mainstream involvement -controlling for homeless path group
Homeless Path Group+	
Single ES Long Stayers	3.890*** (0.240)
Multiple ES Long Gappers	1.519*** (0.126)
Street/ES Short Stayers	0.721*** (0.086)
PSH Long Stayers	3.892*** (0.217)
Sequential Short Stayers	1.800*** (0.124)
Sequential Long Stayers	4.378*** (0.264)
Circlers	2.902*** (0.143)
Demographics+	
Females	0.931*** (0.100)
African-Americans	0.408*** (0.072)
Other Races	0.348*** (0.196)
Mainstream Involvement	
Income Support (TANF and food stamps)	0.542*** (0.075)
Physical Healthcare	0.405*** (0.103)
Mental Health	-0.203** (0.088)
Substance Abuse	0.429*** (0.088)
Criminal Justice	0.192*** (0.074)
Constant	3.620*** (0.095)
Observations	1972
R-Squared	0.49
+ Reference categories are Single Emergency Shelter Short Stayers, males, and whites. Both models also controlled for age. The full models are shown in Appendix B.3.2, which also includes models for homeless costs and overall mainstream costs. Standard errors in parentheses. ^a significant at 10%; ^b significant at 5%; ^c significant at 1%	

for other factors, persons receiving income supports had 54 percent higher costs than persons that did not receive income supports (Exhibit 25). The only exception to this was mental health. Controlling for homeless path group, demographics, and receipt of other mainstream services, people who used the mental health system had 20 percent lower overall costs than people who did not receive mental health services (Exhibit 25). The most likely explanation for this is that persons who received mental health services spent less time in homeless programs and had lower homeless costs.

A.6. Implications

This case study is consistent with past research showing great diversity in the ways people use the homeless service system. It also finds a similar diversity in the effects of becoming homeless on use of mainstream services. Particularly for homeless costs, but also for mainstream costs, a small subset of the study cohort was responsible for the majority of costs. Homeless interventions that target intensive users of homeless and mainstream services have the greatest potential for cost savings. More research is needed to understand what separates the majority of first-time homeless persons having brief and relatively inexpensive involvement with homeless and mainstream systems from the small subset with long periods of homelessness and costly involvement in homeless and mainstream systems. However, this case study did have several findings with direct implications for homeless policymakers.

A.6.1. Findings Associated with Homeless Paths

The small subset of the study cohort with long stays in emergency shelter, transitional, or permanent supportive housing had by far the highest costs over the entire period. People with longer homeless stays and higher homeless costs across program types also incurred higher costs for physical healthcare, income supports, and substance abuse treatment. Additionally, in many cases placement into service- rich, long-term homeless residential programs tends to increase costs to mainstream service systems rather than offset them. The current expenditures may also be justified by client needs and outcomes. However, homeless prevention and housing-based assistance targeting the most intense users of the homeless system may be able to equally meet needs and yield cost savings for both homeless and mainstream systems.

Short-term users of transitional housing had much higher mental health costs before becoming homeless than long-term users of emergency shelter or transitional housing. This could be an indication that people with the greatest barriers to independent living may have more difficulty successfully using homeless programs. It also suggests that people with long stays, and therefore those who incur the highest homeless costs, may not be the people with the greatest barriers to housing.

People with the most glaring need for assistance, those with long episodes of homelessness characterized by sporadic short stays in overnight shelters, actually had very low overall costs because they were not well connected to homeless or mainstream services. However, many people in this path group appeared to be stuck in a cycle of homelessness and incarceration. Criminal justice was the most expensive mainstream system for this group across the entire study period, and criminal justice costs spiked considerably around the time of initial entry into a homeless program, suggesting that people exiting jails are at increased risk of homelessness and persons with multiple homeless program stays are at increased risk of incarceration. In many cases, persons in the study cohort were arrested for public nuisance crimes like loitering or trespassing on public property, that were directly

related to their homelessness. This reflects a need for better discharge planning and greater coordination between law enforcement, homeless service providers, and mental health and substance abuse service providers to prevent repeated homelessness and criminal justice involvement.

A.6.2. Findings Associated with Gender, Age and Race

There were substantial differences in the experiences of men and women. Women had longer stays in homeless programs, used programs with higher daily costs, and thus had significantly higher homeless costs. In part this could be because women chose to stay in residential programs until they had secured stable housing while men often alternated between shelter and other tenuous living arrangements. However, the pattern also reflects the design of the homeless system itself. Overnight emergency shelters tend to only serve single men while transitional housing programs are more likely to serve single women and families. Therefore, it is possible that single women are more likely to use transitional housing even to address short-term housing needs. Both transitional housing for individuals and programs serving families are generally more expensive than emergency shelter for individuals. Emergency shelter programs that are geared to the specific short-term needs of single women might yield cost savings, reducing the percentage of women who need the more intensive assistance provided in transitional housing.

The youngest and oldest members of the Jacksonville study cohort had the highest overall costs. People between 18 and 25 incurred significantly higher costs in mainstream systems, particularly income supports and mental health services, than the rest of the study cohort. People over 50 had higher homeless and physical healthcare costs.

First-time homeless African-American individuals also had higher overall costs and homeless costs, though not necessarily higher mainstream costs. This is related to their disproportionate use of a single long-term emergency shelter, one of the most expensive homeless programs in the community. To the extent that African-Americans individuals are using emergency shelter for extended periods as a form of permanent housing, communities should explore alternative, lower-cost housing strategies. Alternatively, for those who remain in shelter due to intensive needs that prevent them from resolving their homelessness, they should be referred to lower-cost transitional or permanent supportive housing programs that can more appropriately address their needs. In either case, systems should be implemented to alert programs to these patterns of extended stays, so more appropriate interventions can be deployed.

Targeting prevention or rapid rehousing interventions to individuals who have several of the demographic characteristics associated with higher costs, or even raising awareness among program staff on the different ways in which various demographic groups tend to use the homeless system, may help ensure that individuals are directed to providers that best match their particular needs and also provide additional opportunities for cost savings.

A.6.3. Concluding Findings on the Cost of Homeless Programs

Except for overnight shelters with minimal services, the monthly costs of a stay in a homeless residential program were substantially higher than the fair market rent for a one-bedroom apartment in Jacksonville. It is worth exploring whether the cost of issuing a permanent housing voucher, even with accompanying additional services administered by the homeless system or through mainstream

systems (as is the case with permanent supportive housing programs), might be comparable to long-term placement in transitional housing.

This study provides an outline of the different ways that people who become homeless use homeless and mainstream services and the associated costs. However, this study did not collect data on clients' outcomes after exiting homeless residential programs or their long-term use of mainstream services after homelessness. This type of data would be necessary to compare the cost-effectiveness of various homeless interventions. Absent detailed health records for the study cohort, it is not possible to determine whether the low rates of involvement in healthcare and substance abuse treatment indicate a lack of need or a failure to connect persons in the study cohort to needed services. Finally, this case study is one piece of a larger study of the costs of homelessness, encompassing six communities. One of the key findings of the overall study is that the costs of homelessness vary greatly based on location and the characteristics of the study population. Policymakers should be wary of using cost estimates from this or other communities as a proxy for their own population and are encouraged to use their own administrative data to determine the costs of homelessness in their own communities.

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Appendix B: Jacksonville Tables

B.1. Demographic Characteristics of Homeless Path Groups

Characteristic	Single ES Short Stayers	Street/ES Short Stayers	Single ES Long Stayers	Multiple ES Long Gappers	Sequential Short Stayers	Sequential Long Stayers	Relapsers	PSH Long Stayers	All Paths
Total Individuals	746	556	44	197	196	36	142	55	1972
% of Study Population	38%	28%	2%	10%	10%	2%	7%	3%	100%
Gender									
Males	80%	85%	46%	95%	65%	67%	79%	67%	80%
Females	20%	15%	55%	5%	33%	28%	20%	29%	19%
Gender not reported	0%	0%	0%	0%	1%	5%	1%	4%	0%
Ages (at Client Start Date)									
18 to 24	10%	8%	2%	6%	11%	3%	4%	.	8%
25 to 30	13%	10%	14%	10%	8%	3%	5%	9%	11%
31 to 40	28%	28%	32%	24%	27%	14%	25%	15%	27%
41 to 50	31%	36%	32%	43%	34%	42%	47%	42%	36%
51 to 61	14%	13%	18%	16%	17%	22%	16%	31%	15%
62 and older	0%	0%	0%	0%	0%	0%	0%	0%	0%
Age not reported	4%	4%	2%	2%	4%	17%	3%	4%	4%
Average Age at Client Start Date	40	41	41	42	41	47	43	46	41
Race									
White	51%	52%	25%	37%	50%	50%	38%	42%	48%
Black or African-American	45%	42%	73%	58%	46%	39%	54%	53%	47%
Asian	1%	1%	2%	1%	0%	0%	1%	0%	1%
American Indian or Alaska Native	1%	1%	0%	1%	1%	0%	1%	2%	1%
Other	2%	2%	0%	2%	1%	0%	1%	2%	2%
Race not reported	1%	3%	0%	1%	3%	11%	5%	2%	2%

B.2. Homeless Service Utilization by Homeless Path Group

	Single ES Short Stayers	Street/ES Short Stayers	Single ES Long Stayers	Multiple ES Long Gappers	Sequential Short Stayers	Sequential Long Stayers	Relapsers	PSH Long Stayers	All Paths
Number of Clients	746	556	44	197	196	36	142	55	1,972
Percent of Clients	38%	28%	2%	10%	10%	2%	7%	3%	100%
Total Number of Stays									
Average	1	3.1	1	10.9	2.4	5.6	7.6	2.7	3.3
25th Percentile	1	2	1	4	1	2	3	1	1
50th Percentile (Median)	1	2	1	8	2	2	5	2	2
75th Percentile	1	4	1	14	3	3	9	3	3
Percent of Individuals with Only One Stay	100.0%	12.4%	100.0%	0.0%	50.0%	22.2%	0.0%	36.4%	49.9%
Total Length of Stays (in Days)									
Average	18	29	304	40	54	364	135	338	57
25th Percentile	1	3	215	12	11	266	38	172	2
50th Percentile (Median)	2	6	269	24	33	371	83	384	10
75th Percentile	17	20	372	47	84	469	199	505	56
Total Gap Between Stays (in Days)									
Average	0	58	0	358	71	49	182	68	75
50th Percentile (Median)	0	17	0	363	0	0	159	2	0
Total Homeless Period (in Days)									
Average	18	87	304	398	125	413	317	406	132

B.3. Multivariate Analysis of Total Costs, Homeless Costs, and Total Mainstream Costs

B.3.1 Models Excluding Usage of Each Domain as Covariates

Outcome variables: The outcome variable for model 1 and model 2 is total costs (homeless and mainstream) in log scale. The outcome variable for model 3 and model 4 is homeless costs in log scale. The outcome variable for model 5 and model 6 is total mainstream costs in log scale.

Description: All models control for gender, race and age. Models 1, 3, 5 are with control based on path groups; models 2, 4, and 6, are with control based on underlying utilization data. These models do not include utilization of each particular mainstream domain as covariates.

	Model (1) Total Costs – Homeless Path Group Model	Model (2) Total Costs - Homeless Service Utilization Model	Model (3) Homeless Costs – Homeless Path Group Model	Model (4) Homeless Costs - Homeless Service Utilization Model	Model (5) Mainstream Costs – Homeless Path Group Model	Model (6) Mainstream Costs – Homeless Service Utilization Model
Single ES Long Stayers+	4.109***		4.119***		0.376	
	(0.247)		(0.257)		(0.242)	
Multiple ES Long Gappers	1.678***		1.707***		0.190	
	(0.127)		(0.133)		(0.135)	
Street/ES Short Stayers	0.789***		0.874***		0.108	
	(0.088)		(0.096)		(0.100)	
PSH Long Stayers	4.229***		4.077***		0.595***	
	(0.222)		(0.231)		(0.222)	
Sequential Short Stayers	1.899***		1.848***		0.274**	
	(0.127)		(0.133)		(0.139)	
Sequential Short Stayers	4.555***		4.473***		0.406	
	(0.272)		(0.284)		(0.284)	
Circlers	3.076***		3.054***		0.210	
	(0.145)		(0.151)		(0.153)	
Total Number of Stays		0.023***		0.023***		-0.033***
		(0.007)		(0.007)		(0.008)
Total length of stay (in days), divided by 30		0.410***		0.409***		0.034***
		(0.009)		(0.009)		(0.010)
Total gaps between stays (in days), divided by 30		0.086***		0.086***		0.034***
		(0.008)		(0.008)		(0.010)

	Model (1) Total Costs – Homeless Path Group Model	Model (2) Total Costs - Homeless Service Utilization Model	Model (3) Homeless Costs – Homeless Path Group Model	Model (4) Homeless Costs - Homeless Service Utilization Model	Model (5) Mainstream Costs – Homeless Path Group Model	Model (6) Mainstream Costs – Homeless Service Utilization Model
Female+	1.235***	1.073***	1.460***	1.208***	0.672***	0.625***
	(0.094)	(0.078)	(0.102)	(0.086)	(0.097)	(0.097)
Black+	0.437**	0.360**	0.457**	0.394**	-0.048	-0.032
	(0.074)	(0.061)	(0.078)	(0.065)	(0.081)	(0.080)
Other race	0.302	0.307*	0.352	0.351*	-0.007	-0.041
	(0.202)	(0.167)	(0.217)	(0.182)	(0.225)	(0.224)
Age: 18-24+	0.118	0.165	0.093	0.155	0.598***	0.590***
	(0.143)	(0.118)	(0.153)	(0.128)	(0.154)	(0.153)
Age: 25-30	0.102	0.114	0.062	0.108	0.228	0.215
	(0.129)	(0.106)	(0.136)	(0.113)	(0.141)	(0.140)
Age: 41-50	0.053	0.113	0.034	0.089	-0.083	-0.058
	(0.091)	(0.075)	(0.097)	(0.081)	(0.100)	(0.099)
Age: 51 or above	0.206*	0.096	0.198*	0.090	0.140	0.160
	(0.110)	(0.091)	(0.116)	(0.097)	(0.123)	(0.122)
Gender missing	0.706	0.343	0.935	0.427	0.399	0.411
	(0.526)	(0.434)	(0.574)	(0.479)	(0.562)	(0.557)
Race missing	0.581**	0.775***	0.634**	0.834***	-0.005	0.020
	(0.263)	(0.217)	(0.279)	(0.233)	(0.289)	(0.287)
Age missing	-0.656**	-0.448**	-0.715**	-0.532**	0.032	0.066
	(0.270)	(0.222)	(0.294)	(0.245)	(0.316)	(0.312)
Constant	3.944***	4.030***	3.810***	3.893***	7.731***	7.810***
	(0.091)	(0.069)	(0.095)	(0.074)	(0.103)	(0.093)
Observations	1972	1972	1901	1901	1465	1465
R-squared	0.46	0.63	0.45	0.61	0.07	0.08
Notes: + Reference categories are: Single Emergency Shelter Short Stayers, Men, Whites, Age 31 to 40. Standard errors in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%						

B.3.2 Models Including Usage of Each Domain as Covariates

Outcome variables: The outcome variable for model 1 and model 2 is total costs (homeless and mainstream) in log scale. The outcome variable for model 3 and model 4 is homeless costs in log scale. The outcome variable for model 5 and model 6 is total mainstream costs in log scale.

Description: All models control for gender, race and age. Models 1, 3, 5 are with control based on path groups; models 2, 4, and 6, are with control based on underlying utilization data. These models include utilization of each particular mainstream domain as covariates.

	Model (1) Total Costs – Homeless Path Group Model	Model (2) Total Costs - Homeless Service Utilization Model	Model (3) Homeless Costs – Homeless Path Group Model	Model (4) Homeless Costs - Homeless Service Utilization Model	Model (5) Mainstream Costs – Homeless Path Group Model	Model (6) Mainstream Costs – Homeless Service Utilization Model
Single ES Long Stayers	3.890*** (0.240)		3.905*** (0.251)		0.450** (0.184)	
Multiple ES Long Gappers	1.519*** (0.126)		1.532*** (0.131)		0.067 (0.104)	
Street/ES Short Stayers	0.721*** (0.086)		0.801*** (0.094)		0.038 (0.076)	
PSH Long Stayers	3.892*** (0.217)		3.727*** (0.227)		0.247 (0.170)	
Sequential Short Stayers	1.800*** (0.124)		1.753*** (0.130)		0.177* (0.106)	
Sequential Short Stayers	4.378*** (0.264)		4.296*** (0.276)		0.353 (0.216)	
Circlers	2.902*** (0.143)		2.878*** (0.149)		0.142 (0.117)	
Total Number of Stays		0.026*** (0.006)		0.025*** (0.007)		-0.018*** (0.006)
Total length of stay (in days), divided by 30		0.393*** (0.009)		0.391*** (0.009)		0.020** (0.008)
Total gaps between stays (in days), divided by 30		0.075*** (0.008)		0.074*** (0.008)		0.014* (0.008)
Female+	0.931*** (0.100)	0.869*** (0.083)	1.117*** (0.110)	0.981*** (0.092)	0.044 (0.081)	0.034 (0.081)
Black+	0.408*** (0.072)	0.346*** (0.060)	0.424*** (0.077)	0.377*** (0.064)	-0.011 (0.062)	0.004 (0.062)
Other race	0.348* (0.196)	0.342** (0.162)	0.390* (0.211)	0.382** (0.177)	0.060 (0.171)	0.034 (0.170)
Age: 18-24+	0.058 (0.140)	0.125 (0.116)	0.034 (0.149)	0.114 (0.125)	0.238** (0.118)	0.225* (0.117)
Age: 25-30	0.072 (0.125)	0.093 (0.104)	0.037 (0.132)	0.088 (0.111)	0.105 (0.107)	0.093 (0.107)
Age: 41-50	0.037	0.093	0.027	0.076	-0.045	-0.036

	Model (1) Total Costs – Homeless Path Group Model	Model (2) Total Costs - Homeless Service Utilization Model	Model (3) Homeless Costs – Homeless Path Group Model	Model (4) Homeless Costs - Homeless Service Utilization Model	Model (5) Mainstream Costs – Homeless Path Group Model	Model (6) Mainstream Costs – Homeless Service Utilization Model
	(0.088)	(0.073)	(0.094)	(0.079)	(0.076)	(0.075)
Age: 51 or above	0.218**	0.109	0.211*	0.102	0.158*	0.166*
	(0.107)	(0.089)	(0.114)	(0.095)	(0.094)	(0.094)
Any Food Stamp or TANF Costs	0.542***	0.430***	0.541***	0.423***	0.577***	0.587***
	(0.075)	(0.062)	(0.080)	(0.068)	(0.068)	(0.068)
Any Physical Healthcare Costs	0.405***	0.239***	0.458***	0.285***	1.433***	1.413***
	(0.103)	(0.085)	(0.111)	(0.093)	(0.078)	(0.078)
Any Mental Health Costs	-0.203**	-0.126*	-0.213**	-0.145*	0.832***	0.831***
	(0.088)	(0.073)	(0.094)	(0.079)	(0.068)	(0.067)
Any Substance Abuse Costs	0.429***	0.357***	0.419***	0.372***	0.644***	0.637***
	(0.088)	(0.073)	(0.093)	(0.078)	(0.066)	(0.066)
Any Criminal Justice Costs	0.192***	0.127**	0.248***	0.160**	1.104***	1.094***
	(0.074)	(0.062)	(0.079)	(0.067)	(0.063)	(0.063)
Gender Missing	0.665	0.328	0.921*	0.433	0.110	0.108
	(0.510)	(0.423)	(0.557)	(0.468)	(0.427)	(0.425)
Race Missing	0.579**	0.772***	0.622**	0.830***	0.006	0.035
	(0.256)	(0.212)	(0.271)	(0.227)	(0.220)	(0.219)
Age Missing	-0.582**	-0.404*	-0.624**	-0.479**	0.235	0.246
	(0.263)	(0.218)	(0.287)	(0.240)	(0.242)	(0.240)
Constant	3.620***	3.766***	3.468***	3.619***	6.117***	6.172***
	(0.095)	(0.074)	(0.100)	(0.080)	(0.101)	(0.096)
Observations	1972	1972	1901	1901	1465	1465
R-squared	0.49	0.65	0.49	0.64	0.47	0.47
Notes: + Reference categories are: Single Emergency Shelter Short Stayers, Men, Whites, Age 31 to 40. Standard errors in parentheses. *significant at 10%; ***significant at 5%; ****significant at 1%.						

B.4. Multivariate Analysis of Costs by Domain, with Homeless Utilization as Covariates

B.4.1 Models Excluding Usage of Each Domain as Covariates

Outcome variables: The outcome variable for these models is total costs associated with each domain in their original metric (dollar amounts).

Description: All models control for homeless utilization data, gender, race, and age homeless utilization. These models do not include utilization of each particular mainstream domain as covariates.

	Criminal Justice	Income Supports	Physical Healthcare	Mental Health	Substance abuse
Total Number of Stays	-34.855 (21.201)	-5.599 (10.013)	-74.742** (36.628)	-15.781 (37.545)	-15.465 (14.559)
Total length of stay (in days), divided by 30	11.861 (27.582)	80.128*** (13.027)	198.681*** (47.651)	-47.273 (48.844)	60.639*** (18.941)
Total gaps between stays (in days), divided by 30	149.972*** (25.196)	0.982 (11.900)	13.062 (43.528)	-18.746 (44.618)	40.846** (17.302)
Female+	-992.334*** (249.377)	1,770.719*** (117.779)	2,170.849*** (430.825)	1,663.730*** (441.617)	257.364 (171.251)
Black+	380.364* (195.320)	280.946*** (92.248)	560.360* (337.435)	-907.569*** (345.888)	-378.032*** (134.129)
Other race	814.333 (535.575)	-174.340 (252.948)	209.352 (925.260)	575.892 (948.438)	-745.892** (367.788)
Age: 18-24+	91.847 (380.230)	416.656** (179.580)	646.639 (656.886)	1,237.724* (673.342)	-192.726 (261.110)
Age: 25-30	-59.916 (341.461)	248.953 (161.269)	128.096 (589.908)	636.365 (604.686)	-196.469 (234.486)
Age: 41-50	-639.606*** (240.925)	-152.958 (113.787)	47.339 (416.223)	237.133 (426.649)	15.568 (165.447)
Age: 51 or above	-1,094.955*** (291.206)	-104.207 (137.534)	912.642* (503.089)	1,065.059** (515.691)	-43.218 (199.976)
Gender missing	-690.350 (1,392.916)	90.055 (657.863)	1,894.993 (2,406.404)	-953.652 (2,466.687)	702.451 (956.538)
Race missing	-575.680 (696.237)	287.534 (328.827)	-673.060 (1,202.820)	1,133.490 (1,232.952)	-422.936 (478.117)
Age missing	-1,842.868*** (713.407)	-7.848 (336.937)	1,816.595 (1,232.484)	9.502 (1,263.359)	636.696 (489.908)
Constant	1,820.685*** (220.352)	394.947*** (104.071)	477.218 (380.681)	1,183.239*** (390.217)	727.681*** (151.319)
Observations	1972	1972	1972	1972	1972
R-squared	0.04	0.16	0.04	0.02	0.02
Notes: + Reference categories are: Men, Whites, Age 31 to 40. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.					

B.4.2 Models Including Usage of Each Domain as Covariates

Outcome variables: The outcome variables for these models are total homeless costs, total mainstream costs, and costs associated with each domain, all in log scale.

Description: All models control for homeless utilization data, gender, race, and age homeless utilization. These models include utilization of each particular mainstream domain as covariates.

Total Costs (log scale)	Homeless Costs	Mainstream Costs	Medicaid Costs	Mental Health Costs	Substance Abuse Costs	Entitlement Costs	Criminal Justice Costs
Number of Homeless Program Stays	0.025*** (0.007)	-0.018*** (0.006)	-0.057 (0.039)	-0.025 (0.025)	-0.007 (0.027)	-0.012* (0.007)	-0.005 (0.011)
Homeless Length of Stay (cost per additional 30 days)	0.391*** (0.009)	0.020** (0.008)	0.034 (0.022)	-0.020 (0.022)	0.045** (0.022)	0.027*** (0.008)	-0.041*** (0.014)
Homeless Gap Days (cost per 30 additional days between stays)	0.074*** (0.008)	0.014* (0.008)	0.021 (0.025)	-0.004 (0.022)	0.024 (0.022)	-0.008 (0.008)	0.025** (0.011)
Females	0.981*** (0.092)	0.034 (0.081)	0.128 (0.188)	-0.021 (0.196)	-0.237 (0.226)	0.470*** (0.083)	-0.557*** (0.141)
African-Americans	0.377*** (0.064)	0.004 (0.062)	-0.023 (0.177)	-0.316* (0.166)	-0.280 (0.175)	0.123* (0.068)	0.158 (0.100)
Other Races	0.382** (0.177)	0.034 (0.170)	-0.387 (0.516)	0.234 (0.389)	-1.263*** (0.457)	-0.121 (0.196)	0.462 (0.298)
Ages 18 – 24	0.114 (0.125)	0.225* (0.117)	0.569** (0.281)	0.188 (0.269)	-0.090 (0.331)	0.164 (0.129)	0.070 (0.185)
Ages 25 – 30	0.088 (0.111)	0.093 (0.107)	0.226 (0.28)	0.443 (0.279)	-0.536* (0.309)	0.160 (0.120)	-0.059 (0.169)
Ages 41 – 50	0.076 (0.079)	-0.036 (0.075)	0.349 (0.246)	0.183 (0.202)	-0.104 (0.207)	-0.047 (0.084)	-0.163 (0.119)
Age 51 and Above	0.102 (0.095)	0.166* (0.094)	0.260 (0.266)	0.207 (0.256)	-0.050 (0.265)	0.221** (0.103)	-0.244 (0.160)
Received Food Stamps or TANF	0.423*** (0.068)	0.587*** (0.068)	-0.015 (0.211)	0.012 (0.174)	0.468** (0.185)		0.240** (0.103)
Received Medicaid Services	0.285*** (0.093)	1.413*** (0.078)		0.749*** (0.174)	-0.501** (0.214)	0.614*** (0.082)	-0.269* (0.14)
Received Mental Healthcare	-0.145* (0.079)	0.831*** (0.067)	0.299* (0.176)		0.441** (0.176)	0.029 (0.075)	0.150 (0.116)
Received Substance Abuse	0.372*** (0.078)	0.637*** (0.066)	0.254 (0.184)	0.137 (0.158)		0.018 (0.074)	0.361*** (0.108)
Involved with Criminal Justice	0.160** (0.067)	1.094*** (0.063)	0.031 (0.177)	0.045 (0.162)	0.304* (0.17)	0.071 (0.067)	
Missing Gender	0.433 (0.468)	0.108 (0.425)	0.960 (1.125)	-0.411 (0.954)	0.147 (1.289)	-0.015 (0.454)	-0.812 (0.957)
Missing Race	0.830*** (0.227)	0.035 (0.219)	-1.107 (1.015)	0.321 (0.513)	0.630 (0.749)	0.190 (0.226)	-0.435 (0.363)
Missing Age	-0.479** (0.240)	0.246 (0.24)	0.573 (0.591)	-0.658 (0.524)	0.954 (0.679)	0.206 (0.256)	-2.011 (1.371)
Constant	3.619*** (0.080)	6.172*** (0.096)	7.432*** (0.328)	6.917*** (0.229)	6.389*** (0.248)	6.435*** (0.094)	7.374*** (0.127)
Observations	1901	1465	390	492	437	1024	755
R-squared	0.64	0.47	0.04	0.07	0.11	0.2	0.09

Reference categories are: Males, Whites, Ages 31 – 40

Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%

B.5. Multivariate Analysis of Costs by Domain, with Path Groups as Covariates

B.5.1 Models Excluding Usage of Each Domain as Covariates

Outcome variables: The outcome variable for these models is total costs associated with each domain in their original metric (dollar amounts).

Description: All models control for homeless path groups, gender, race, and age homeless utilization. These models do not include utilization of each particular mainstream domain as covariates.

	Model (1) Criminal Justice	Model (2) Income Supports	Model (3) Physical Healthcare	Model (4) Mental Health	Model (5) Substance Abuse
Single ES Long Stayers+	47.142 (656.299)	2,326.988*** (306.924)	1,629.965 (1,118.827)	-1,238.011 (1,158.049)	-12.359 (448.596)
Multiple ES Long Gappers	1,677.589*** (338.415)	-93.135 (158.263)	-540.835 (576.914)	-163.468 (597.138)	349.426 (231.315)
Street/ES Short Stayers	541.743** (234.931)	-4.741 (109.867)	-134.925 (400.498)	-2.881 (414.539)	312.461* (160.581)
PSH Long Stayers	839.736 (589.556)	439.888 (275.711)	7,562.911*** (1,005.047)	-177.606 (1,040.280)	1,174.122*** (402.976)
Sequential Short Stayers	43.786 (338.613)	-247.596 (158.355)	910.630 (577.251)	1,306.901** (597.487)	883.603*** (231.450)
Sequential Long Stayers	42.512 (723.410)	43.305 (338.309)	-634.893 (1,233.235)	-716.680 (1,276.468)	1,345.077*** (494.468)
Circling/ Relapsers	1,099.228*** (386.022)	325.064* (180.526)	-342.969 (658.072)	-501.256 (681.141)	491.023* (263.855)
Female+	-920.635*** (249.170)	1,793.028*** (116.526)	2,252.018*** (424.773)	1,590.685*** (439.664)	264.270 (170.314)
African American+	356.920* (196.010)	254.646*** (91.666)	524.382 (334.149)	-901.187*** (345.863)	-346.331*** (133.978)
Other Race	839.945 (537.436)	-215.937 (251.336)	176.758 (916.195)	659.964 (948.314)	-681.944* (367.350)
Age: 18-24+	90.056 (381.693)	455.442** (178.502)	715.421 (650.692)	1,209.422* (673.503)	-211.340 (260.896)
Age: 25-30	-82.979 (342.779)	231.148 (160.303)	63.796 (584.352)	684.489 (604.838)	-179.945 (234.297)
Age: 41-50	-692.992*** (242.255)	-135.882 (113.293)	-19.914 (412.985)	236.254 (427.463)	-14.492 (165.587)
Age: 51 or above	-1,132.213*** (292.185)	-52.109 (136.643)	748.102 (498.102)	1,013.491** (515.564)	-74.962 (199.715)
Gender missing	-895.875 (1,398.425)	495.061 (653.985)	1,427.608 (2,383.968)	-1,309.097 (2,467.542)	426.853 (955.857)
Race missing	-508.396 (700.858)	290.689 (327.762)	-426.163 (1,194.788)	1,139.488 (1,236.674)	-484.723 (479.053)
Age missing	-1,967.192*** (718.321)	28.630 (335.929)	1,998.803 (1,224.558)	176.788 (1,267.487)	550.893 (490.989)
Constant	1,682.568*** (241.042)	467.889*** (112.726)	476.466 (410.918)	978.383** (425.323)	587.542*** (164.758)
Observations	1972	1972	1972	1972	1972
R-squared	0.04	0.18	0.06	0.02	0.02

Notes: + Reference categories are: Single ES Short Stayers, Men, Whites, Age 31 to 40.
Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

B.5.2 Model Including Usage of Each Domain as Covariates

Outcome variables: The outcome variable for these models is total costs associated with each domain in log scale.

Description: All models control for homeless path groups, gender, race, and age homeless utilization. These models include utilization of each particular mainstream domain as covariates.

Total Costs (log scale)	Homeless Costs	Mainstream Costs	Medicaid Costs	Mental Health Costs	Substance Abuse Costs	Entitlement Costs	Criminal Justice Costs
Single ES Long Stayers	3.905*** (0.251)	0.450** (0.184)	1.011** (0.416)	-1.088** (0.535)	-0.356 (0.562)	0.784*** (0.179)	-0.084 (0.356)
Multiple ES Long Gappers	1.532*** (0.131)	0.067 (0.104)	-0.302 (0.37)	-0.13 (0.309)	0.245 (0.288)	-0.254** (0.12)	0.256* (0.151)
Street/ES Short Stayers	0.801*** (0.094)	0.038 (0.076)	0.119 (0.216)	-0.320* (0.194)	0.096 (0.216)	-0.015 (0.086)	0.143 (0.128)
PSH Long Stayers	3.727*** (0.227)	0.247 (0.17)	0.789* (0.421)	-0.247 (0.475)	1.155** (0.45)	0.228 (0.167)	-0.403 (0.271)
Sequential Short Stayers	1.753*** (0.13)	0.177* (0.106)	0.841*** (0.275)	-0.233 (0.263)	0.772*** (0.268)	-0.087 (0.115)	-0.192 (0.184)
Sequential Long Stayers	4.296*** (0.276)	0.353 (0.216)	-0.73 (0.604)	-0.537 (0.562)	1.437*** (0.536)	-0.009 (0.225)	-0.407 (0.38)
Circling/Relapsers	2.878*** (0.149)	0.142 (0.117)	0.421 (0.379)	-0.926*** (0.303)	0.198 (0.326)	0.089 (0.121)	0.181 (0.195)
Females	1.117*** (0.11)	0.044 (0.081)	0.134 (0.184)	0.08 (0.197)	-0.256 (0.223)	0.478*** (0.082)	-0.564*** (0.141)
African-Americans	0.424*** (0.077)	-0.011 (0.062)	-0.031 (0.176)	-0.352** (0.166)	-0.203 (0.176)	0.096 (0.069)	0.144 (0.101)
Other Races	0.390* (0.211)	0.06 (0.171)	-0.334 (0.511)	0.296 (0.388)	-1.276*** (0.452)	-0.12 (0.196)	0.506* (0.299)
Ages 18 – 24	0.034 (0.149)	0.238** (0.118)	0.563** (0.275)	0.197 (0.267)	-0.151 (0.328)	0.201 (0.129)	0.08 (0.186)
Ages 25 – 30	0.037 (0.132)	0.105 (0.107)	0.226 (0.276)	0.42 (0.277)	-0.498 (0.305)	0.161 (0.119)	-0.066 (0.17)
Ages 41 – 50	0.027 (0.094)	-0.045 (0.076)	0.339 (0.244)	0.219 (0.201)	-0.095 (0.207)	-0.037 (0.084)	-0.174 (0.121)
Age 51 and Above	0.211* (0.114)	0.158* (0.094)	0.307 (0.265)	0.197 (0.256)	0.015 (0.261)	0.249** (0.103)	-0.281* (0.16)
Received Food Stamps or TANF	0.541*** (0.08)	0.577*** (0.068)	0.096 (0.209)	0.065 (0.173)	0.438** (0.184)		0.222** (0.105)
Received Medicaid Services	0.458*** (0.111)	1.433*** (0.078)		0.714*** (0.173)	-0.484** (0.212)	0.626*** (0.083)	-0.264* (0.141)
Received Mental Healthcare	-0.213** (0.094)	0.832*** (0.068)	0.267 (0.175)		0.416** (0.175)	0.033 (0.075)	0.137 (0.117)
Received Substance Abuse	0.419*** (0.093)	0.644*** (0.066)	0.255 (0.182)	0.116 (0.158)		0.034 (0.074)	0.363*** (0.109)
Involved with Criminal Justice	0.248*** (0.079)	1.104*** (0.063)	0.055 (0.176)	0.04 (0.163)	0.317* (0.169)	0.072 (0.067)	

Total Costs (log scale)	Homeless Costs	Mainstream Costs	Medicaid Costs	Mental Health Costs	Substance Abuse Costs	Entitlement Costs	Criminal Justice Costs
Missing Gender	0.921* (0.557)	0.11 (0.427)	0.754 (1.117)	-0.501 (0.955)	-0.227 (1.274)	0.171 (0.455)	-1.016 (0.973)
Missing Race	0.622** (0.271)	0.006 (0.22)	-0.846 (0.998)	0.44 (0.511)	0.758 (0.742)	0.144 (0.226)	-0.452 (0.366)
Missing Age	-0.624** (0.287)	0.235 (0.242)	0.791 (0.583)	-0.598 (0.523)	1.07 (0.672)	0.254 (0.257)	-2.226 (1.384)
Constant	3.468*** (0.1)	6.117*** (0.101)	7.144*** (0.327)	7.012*** (-0.237)	6.272*** (0.27)	6.420*** (-0.101)	7.329*** (-0.139)
Observations	1901	1465	390	492	437	1024	755
R-squared	0.49	0.47	0.09	0.09	0.14	0.21	0.09

Reference categories are: Males, Whites, Ages 31 – 40

Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%

B.6. Multivariate Analysis of Costs by Domain, with Total Homeless Costs as a Covariate

Outcome variables: The outcome variable for these models is total costs associated with each domain in log scale.

Description: All models control for homeless costs, gender, race, and age homeless utilization. These models include utilization of each particular mainstream domain as covariates.

Total Costs By Domain (log scale)	Medicaid Costs	Mental Health Costs	Substance Abuse Costs	Entitlement Costs	Criminal Justice Costs
Total Homeless System Costs	0.102** (0.046)	-0.077* (0.041)	0.058 (0.042)	0.029* (0.017)	-0.005 (0.026)
Females	0.107 (0.199)	0.101 (0.209)	-0.309 (0.233)	0.510*** (0.087)	-0.649*** (0.15)
African-Americans	-0.103 (0.183)	-0.341** (0.168)	-0.275 (0.176)	0.141** (0.07)	0.137 (0.1030)
Other Races	-0.155 (0.541)	0.42 (0.424)	-1.268*** (0.473)	-0.104 (0.199)	0.426 (0.314)
Ages 18 – 24	0.494* (0.295)	0.278 (0.273)	-0.118 (0.34)	0.151 (0.132)	0.117 (0.19)
Ages 25 – 30	0.134 (0.288)	0.383 (0.277)	-0.577* (0.31)	0.163 (0.121)	-0.065 (0.172)
Ages 41 – 50	0.271 (0.256)	0.15 (0.205)	-0.086 (0.209)	-0.059 (0.086)	-0.171 (0.123)
Age 51 and Above	0.135 (0.273)	0.126 (0.258)	-0.066 (0.268)	0.258** (0.104)	-0.327** (0.162)
Received Food Stamps or TANF	-0.032 (0.222)	0.019 (0.181)	0.514*** (0.189)		0.242** (0.109)
Received Medicaid Services		0.850*** (0.176)	-0.510** (0.216)	0.645*** (0.084)	-0.329** (0.146)
Received Mental Healthcare	0.403** (0.181)		0.449** (0.18)	0.032 (0.077)	0.168 (0.12)
Received Substance Abuse	0.238 (0.19)	0.134 (0.16)		0.004 (0.076)	0.339*** (0.111)
Involved with Criminal Justice	0.036 (0.182)	0.145 (0.163)	0.332* (0.171)	0.052 (0.069)	
Missing Gender	0.92 (1.184)	0.098 (1.054)	0.364 (1.277)	0.769 (0.485)	-1.493 (0.946)
Missing Race	-1.467 (1.043)	0.755 (0.525)	0.583 (0.748)	0.231 (0.227)	-0.486 (0.379)
Missing Age	0.813 (0.686)	-0.609 (0.569)	0.943 (0.681)	0.13 (-0.271)	-2.059 (1.381)
Constant	6.878*** (0.424)	7.144*** (0.275)	6.169*** (0.324)	6.233*** (0.127)	7.422*** (0.169)
Observations	369	465	429	980	719
R-squared	0.05	0.09	0.1	0.2	0.08

Reference categories are: Males, Whites, Ages 31 – 40

Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%

B.7. Mainstream Involvement and Per Person Mainstream Costs by Homeless Path Group and Time Period

Path Groups	ES Short Stayers	Street/ES Short Stayers	ES Long Stayers	ES Long Gappers	Sequential Short Stayers	Sequential Long Stayers	Circlers	PSH Long Stayers
Number of Individuals	746	556	44	197	196	36	142	55
% of Cohort	38%	28%	2%	10%	10%	2%	7%	3%
Criminal Justice								
Percent Involved	31%	38%	34%	62%	35%	36%	44%	55%
Average Costs Pre	\$461	\$573	\$376	\$527	\$356	\$488	\$454	\$539
Average Costs During	\$12	\$307	\$57	\$1,636	\$215	\$178	\$1,400	\$561
Average Costs Post	\$777	\$902	\$612	\$885	\$529	\$14	\$366	\$628
Average Costs Total	\$1,251	\$1,783	\$1,045	\$3,048	\$1,100	\$680	\$2,219	\$1,728
Income Supports (TANF and food stamps)								
Percent Involved	42%	51%	86%	53%	57%	67%	71%	84%
Average Costs Pre	\$298	\$194	\$706	\$182	\$227	\$432	\$328	\$332
Average Costs During	\$57	\$84	\$1,777	\$45	\$57	\$366	\$243	\$667
Average Costs Post	\$598	\$561	\$1,458	\$367	\$670	\$321	\$697	\$528
Average Costs Total	\$953	\$839	\$3,941	\$593	\$955	\$1,119	\$1,267	\$1,527
Physical Healthcare								
Percent Involved	22%	17%	39%	12%	25%	22%	15%	31%
Average Costs Pre	\$499	\$319	\$1,865	\$213	\$957	\$167	\$375	\$3,197
Average Costs During	\$86	\$56	\$808	\$19	\$302	\$528	\$201	\$3,452
Average Costs Post	\$804	\$733	\$1,218	\$303	\$1,367	\$451	\$489	\$2,651
Average Costs Total	\$1,389	\$1,108	\$3,892	\$535	\$2,626	\$1,146	\$1,064	\$9,300
Mental Healthcare								
Percent Involved	21%	28%	25%	21%	30%	28%	30%	27%
Average Costs Pre	\$474	\$427	\$131	\$267	\$1,230	\$470	\$147	\$429
Average Costs During	\$59	\$117	\$147	\$50	\$116	\$336	\$121	\$568
Average Costs Post	\$839	\$746	\$92	\$498	\$1,545	\$53	\$483	\$284
Average Costs Total	\$1,372	\$1,290	\$371	\$816	\$2,891	\$859	\$750	\$1,281
Substance Abuse								
Percent Involved	17%	22%	23%	26%	32%	31%	26%	33%
Average Costs Pre	\$90	\$57	\$235	\$71	\$542	\$881	\$321	\$310
Average Costs During	\$45	\$147	\$164	\$91	\$365	\$977	\$93	\$950
Average Costs Post	\$269	\$514	\$4	\$511	\$422	\$7	\$465	\$341
Average Costs Total	\$404	\$718	\$403	\$673	\$1,329	\$1,865	\$879	\$1,601
All Mainstream Domains								
Average Costs Pre	\$1,822	\$1,571	\$3,314	\$1,260	\$3,313	\$2,439	\$1,624	\$4,808
Average Costs During	\$259	\$711	\$2,953	\$1,841	\$1,054	\$2,385	\$2,057	\$6,198
Average Costs Post	\$3,288	\$3,456	\$3,384	\$2,563	\$4,533	\$846	\$2,499	\$4,432
Average Costs Total	\$5,369	\$5,737	\$9,651	\$5,664	\$8,901	\$5,670	\$6,180	\$15,438

Note: Jacksonville's ES Short Stayers and Street/ES Short Stayers are combined in the ES Short Stayers common path group. Sequential Short Stayers and Sequential Long Stayers are combined in the Sequential Program Users common path group.

Appendix C: Individual Data

C.1. Cohort Summaries

C.1.1 Jacksonville, Florida Study Cohort

Path Groups	ES Short Stayers	Street/ES Short Stayers	ES Long Stayers	ES Long Gappers	Sequential Short Stayers	Sequential Long Stayers	Circlers	PSH Long Stayers	Total Cohort
Number of Individuals	746	556	44	197	196	36	142	55	1,972
% of Cohort	38%	28%	2%	10%	10%	2%	7%	3%	100%
Demographics^a									
Male	80%	85%	45%	95%	66%	71%	79%	70%	81%
African-American	45%	43%	73%	59%	47%	44%	57%	54%	48%
51 and older	17%	16%	20%	17%	21%	31%	17%	33%	18%
Average Age at First Entry	40 yrs	41 yrs	41 yrs	42 yrs	41 yrs	47 yrs	43 yrs	46 yrs	41 yrs
Homeless Experience									
Average Number of Stays	1 stay	3 stays	1 stay	11 stays	2 stays	6 stays	8 stays	3 stays	3 stays
Average Total Length of Stay	18 days	29 days	304 days	40 days	54 days	364 days	135 days	338 days	57 days
Average Total Gap	0 days	58 days	0 days	358 days	71 days	49 days	182 days	68 days	75 days
Median Total Length of Stay	2 days	6 days	269 days	24 days	33 days	371 days	83 days	384 days	10 days
Mainstream System Involvement (% of study cohort with involvement at any point during the study)									
Medicaid Managed Care and Primary Health Claims	22%	17%	39%	12%	24%	22%	15%	31%	20%
Mental Health - Medicaid and State	21%	28%	25%	21%	30%	28%	30%	27%	25%
Substance Abuse Treatment - Medicaid and State	17%	22%	23%	26%	32%	31%	26%	33%	22%
Criminal Justice - Arrests and Jail	31%	38%	34%	62%	35%	36%	44%	55%	38%
TANF	5%	2%	18%	1%	3%	0%	1%	2%	3%
Food Stamps	42%	51%	86%	53%	57%	67%	71%	84%	52%
Costs During Homelessness (Average Cost Per Person in Path Group)									
Homeless System	\$563	\$853	\$9,756	\$910	\$1,585	\$10,416	\$3,987	\$8,493	\$1,634
Medicaid Managed Care and Primary Health Care Claims	\$86	\$56	\$808	\$19	\$302	\$528	\$201	\$3,452	\$219
Medicaid and State-funded Mental Health Treatment	\$58	\$117	\$147	\$50	\$116	\$336	\$121	\$568	\$106
Medicaid and State-funded Substance Abuse Treatment	\$45	\$147	\$164	\$91	\$365	\$977	\$93	\$950	\$158
Jail and Arrests	\$12	\$307	\$57	\$1,636	\$214	\$178	\$1,400	\$561	\$397
TANF	\$4	-	\$227	\$1	\$2	-	\$1	\$3	\$7
Food Stamps	\$54	\$84	\$1,551	\$44	\$55	\$366	\$241	\$664	\$131
Mainstream Costs	\$259	\$711	\$2,954	\$1,841	\$1,054	\$2,385	\$2,057	\$6,198	\$1,002
Total Costs	\$822	\$1,564	\$12,710	\$2,751	\$2,639	\$12,801	\$6,044	\$14,691	\$2,636

Note: Jacksonville's ES Short Stayers and Street/ES Short Stayers are combined in the ES Short Stayers common path group. Sequential Short Stayers and Sequential Long Stayers are combined in the Sequential Program Users common path group.

^aNull demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere.

C.1.2 Houston, Texas Individuals Study Cohort

	Street Only	ES Short Stayers	Extended ES Stayers	ES Long Gappers	Frequent ES Long Gappers	Sequential Program Users	Circlers	TH Only or PSH Only	Total Cohort
Number of Individuals	871	2,306	115	263	101	89	85	576	4,406
% of Cohort	20%	52%	3%	6%	2%	2%	2%	13%	100%
% of Cohort excluding Street Only Path Group	-	65%	3%	7%	3%	3%	2%	16%	100%
Demographics^a									
Male	78%	88%	43%	88%	100%	51%	31%	23%	74%
African-American	63%	52%	72%	66%	63%	65%	68%	52%	57%
51 and older	17%	17%	9%	19%	30%	19%	8%	12%	16%
Average Age at First Entry	42 yrs	40 yrs	37 yrs	42 yrs	46 yrs	43 yrs	40 yrs	40 yrs	41 yrs
Homeless Experience									
Average Number of Stays	1 stay	2 stays	1 stay	7 stays	40 stays	3 stays	3 stays	1 stay	3 stays
Average Total Length of Stay	1 day	8 days	158 days	23 days	124 days	182 days	174 days	150 days	39 days
Average Total Gap	0 days	16 days	6 days	376 days	245 days	149 days	150 days	10 days	44 days
Median Total Length of Stay	1 day	2 days	112 days	14 days	95 days	254 days	269 days	205 days	22 days
Mainstream System Involvement (% of study cohort with involvement at any point during the study)									
Mental Health Care	2%	17%	30%	36%	28%	35%	48%	28%	18%
State MH Inpatient	0%	<1%	0%	3%	0%	0%	2%	<1%	<1%
Criminal Justice	1%	14%	14%	26%	23%	19%	27%	19%	13%
Costs During Homelessness (Average Cost Per Person in Path Group)									
Residential Homeless	\$199	\$353	\$10,540	\$880	\$2,494	\$14,418	\$10,705	\$8,799	\$2,257
Mental Health Care	\$2	\$149	\$1,050	\$1,669	\$1,491	\$2,052	\$1,847	\$489	\$380
State MH Inpatient				\$170					\$10
Criminal Justice	-	\$45	\$222	\$1,049	\$782	\$900	\$749	\$109	\$157
Mainstream Costs	\$2	\$194	\$1,272	\$2,888	\$2,274	\$2,952	\$2,596	\$598	\$547
Total Costs	\$201	\$547	\$11,812	\$3,768	\$4,768	\$17,370	\$13,301	\$9,397	\$2,804
Note: ES Long Gappers and Frequent ES Long Gappers are combined in the ES Long Gapper common path group.									
^a Null demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere.									

C.1.3 Des Moines, Iowa Study Cohort

	ES Short Stayers	ES Long Gappers	Sequential Program Users	Circlers	TH Only (Shared Room Model)	TH Only (Ind Room Model)	Total Cohort
Number of Individuals	641	154	42	48	147	92	1,124
% of Cohort	57%	14%	4%	4%	13%	8%	100%
Demographics^a							
Male	73%	72%	88%	90%	58%	85%	73%
African-American	21%	29%	27%	26%	12%	18%	21%
51 and older	16%	14%	31%	19%	3%	13%	15%
Average Age at First Entry	39 yrs	40 yrs	44 yrs	40 yrs	34 yrs	37 yrs	39 yrs
Homeless Experience							
Average Number of Stays	2 stays	8 stays	4 stays	7 stays	1 stay	1 stay	3 stays
Average Total Length of Stay	17 days	63 days	259 days	203 days	133 days	237 days	73 days
Average Total Gap	10 days	308 days	110 days	171 days	9 days	26 days	63 days
Median Total Length of Stay	4 days	44 days	181 days	157 days	92 days	198 days	24 days
Average Per Person Residential Homeless System Costs	\$321	\$1,224	\$8,539	\$6,374	\$3,103	\$11,731	\$2,308
^a Null demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere.							

C.2. Cross-Site Individuals Multivariate Analyses

C.2.1 Analysis of Homeless Costs and Homeless Service Utilization, with Homeless Program Type as Covariates

Outcome variables: The outcome variables for these models are total homeless costs in log scale and total length of stay (in days) in log scale

Description: Both models control for the program types used, site, gender, race and age. The homeless costs model also controls for homeless utilization data.

	Model 1: Total Homeless Costs (log scale)	Model 2: Length of Stay (log scale)
Homeless Programs Used+		
Persons who only Used TH Housing	1.299*** (0.049)	2.029*** (0.063)
Only Used ES and TH Programs	1.114*** (0.067)	2.294*** (0.088)
Used Other Program Types or Combinations	0.793*** (0.051)	1.261*** (0.067)
Site+		
Des Moines, IA	0.068 (0.045)	0.227*** (0.061)
Houston, TX	0.012 (0.033)	-0.465*** (0.046)
Homeless System Utilization+		
Number of stays	0.037*** (0.003)	
Total length of stay (in days), divided by 30	0.351*** (0.005)	
Total gaps between stays (in days), divided by 30	0.073*** (0.004)	
Demographics+		
Female	0.974*** (0.035)	0.735*** (0.047)
Black	0.192*** (0.030)	0.300*** (0.040)
Other Race	0.051 (0.059)	0.100 (0.080)
Age 18 – 24	0.074 (0.055)	-0.232*** (0.075)
Age 25 – 30	0.105** (0.051)	-0.043 (0.070)
Age 41 – 50	0.098*** (0.037)	0.190*** (0.051)
Age 18 – 24	0.098** (0.046)	0.261*** (0.062)
Gender missing	-0.452*** (0.091)	0.439*** (0.123)
Race missing	0.241*** (0.087)	0.930*** (0.119)

	Model 1: Total Homeless Costs (log scale)	Model 2: Length of Stay (log scale)
Age missing	0.134**	-2.345***
	(0.063)	(0.084)
Constant	3.953***	1.685***
	(0.041)	(0.054)
Observations	7502	7502
R-squared	0.68	0.36
<i>Notes: + Reference categories are: Used ES Only, Jacksonville, Age 31 – 40, Male, White.</i> <i>Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%</i>		

C.2.2 Analysis of Homeless Costs and Homeless Service Utilization, without Homeless Program Type as Covariates

Outcome variables: The outcome variables for these models are (1) total homeless cost in log scale, (2) total number of stays in log scale, (3) total length of stay in log scale, and (4) total number of gap days in log scale.

Description: All four models control for site, gender, race and age. The model for homeless costs controls for homeless system utilization data.

Outcome variable	Model 1: Total Homeless Costs (log scale)	Model 2: Number of Stays (log scale)	Model 3: Length of Stay (log scale)	Model 4: Total gap days (log scale)
Site+				
Des Moines, IA	0.180*** (0.049)	0.023 (0.030)	0.293*** (0.067)	-0.179* (0.103)
Houston, TX	0.095*** (0.037)	-0.084*** (0.023)	-0.534*** (0.050)	-0.119 (0.078)
Homeless System Utilization				
Number of stays	0.030*** (0.003)			
Total length of stay (in days), divided by 30	0.385*** (0.004)			
Total gaps between stays (in days), divided by 30	0.076*** (0.004)			
Demographics+				
Female	1.268*** (0.037)	-0.376*** (0.022)	1.307*** (0.049)	0.335*** (0.099)
Black	0.188*** (0.033)	0.137*** (0.020)	0.276*** (0.045)	0.403*** (0.075)
Other Race	-0.032 (0.065)	0.098** (0.040)	-0.060 (0.089)	-0.015 (0.143)
Age 18 – 24	0.061 (0.061)	-0.092** (0.038)	-0.310*** (0.083)	-0.030 (0.141)
Age 25 – 30	0.087 (0.057)	-0.098*** (0.035)	-0.116 (0.078)	-0.237* (0.128)
Age 41 – 50	0.116*** (0.041)	0.098*** (0.025)	0.228*** (0.056)	0.222** (0.088)
Age 18 – 24	0.094* (0.051)	0.153*** (0.031)	0.260*** (0.069)	0.074 (0.106)
Gender missing	-0.655*** (0.098)	-0.241*** (0.061)	0.136 (0.134)	-0.596** (0.272)
Race missing	0.129 (0.095)	0.246*** (0.059)	0.707*** (0.130)	0.256 (0.229)
Age missing	0.582*** (0.055)	-0.501*** (0.034)	-1.645*** (0.074)	0.180 (0.304)
Constant	4.059*** (0.044)	0.657*** (0.027)	2.096*** (0.059)	3.630*** (0.092)
Observations	7502	7502	7502	2870
R-squared	0.62	0.11	0.22	0.03
Notes: + Reference categories are: Used ES Only, Jacksonville, Age 31 – 40, Male, White Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%				

C.3. Multivariate Analysis of Costs by Domain in Houston Individuals

Outcome variables: The outcome variable for these models is total costs associated with each domain in their original metric (dollar amounts).

Description: Models 1, 2, and 3 model Mental Health System Costs. Models 4, 5, and 6 model criminal justice costs. All models control for gender, race, and age. Models 1 and 4 control based on path groups. Models 2 and 5 control for underlying homeless utilization data. Models 3 and 6 control for homeless system costs.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Outcome	Mental Health System Costs (Homeless Path Group Model)	Mental Health System Costs (Homeless Utilization Model)	Mental Health System Costs (Homeless Cost Model)	Criminal Justice Costs (Homeless Path Group Model)	Criminal Justice Costs (Homeless Utilization Model)	Criminal Justice Costs (Homeless Cost Model)
Path Group+						
Street-Only Short Stayers	-648.743			-497.902		
	(472.107)			(389.487)		
Emergency Shelter Long Gappers	2,351.606***			1,179.294***		
	(401.362)			(331.123)		
Emergency Shelter Multiple-Stay Long Gappers	2,317.959***			761.055		
	(627.240)			(517.472)		
Emergency Shelter Extended Stayers	767.744			709.349		
	(598.898)			(494.089)		
Progressive Long Stayers	2,084.817***			604.719		
	(672.278)			(554.628)		
Circling Long Stayers	2,966.777***			1,943.164***		
	(695.542)			(573.821)		
TH-Only and PSH-Only	-94.020			790.651***		
	(331.763)			(273.704)		
Homeless System Utilization						
Number of stays		2.035			-23.043*	
		(15.330)			(12.658)	
Total length of stay (in days), divided by 30		135.568***			-33.204	
		(31.638)			(26.123)	
Total gaps between stays (in days), divided by 30		207.498***			136.029***	
Homeless System Costs						
Total Homeless Costs			244.533***			-25.776
			(54.671)			(44.988)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Outcome	Mental Health System Costs (Homeless Path Group Model)	Mental Health System Costs (Homeless Utilization Model)	Mental Health System Costs (Homeless Cost Model)	Criminal Justice Costs (Homeless Path Group Model)	Criminal Justice Costs (Homeless Utilization Model)	Criminal Justice Costs (Homeless Cost Model)
Demographics+						
Female	568.855** (257.202)	408.504* (233.006)	6.249 (254.764)	-635.795*** (212.191)	-174.216 (192.393)	-227.191 (209.644)
Black	-249.602 (217.731)	-281.174 (216.820)	-170.798 (218.043)	81.006 (179.627)	62.298 (179.028)	125.816 (179.427)
Other Race	-668.275** (309.769)	-671.700** (308.407)	-589.103* (310.447)	-752.921*** (255.559)	-813.770*** (254.652)	-777.166*** (255.465)
Age 18 – 24	-653.342 (416.243)	-625.156 (414.834)	-664.094 (417.714)	-338.548 (343.400)	-388.749 (342.528)	-384.910 (343.734)
Age 25 – 30	-94.633 (370.515)	-28.563 (369.645)	-149.842 (371.953)	-290.677 (305.674)	-321.642 (305.216)	-365.413 (306.077)
Age 41 – 50	-729.987*** (269.043)	-797.297*** (268.755)	-739.953*** (270.714)	-1,242.844*** (221.960)	-1,250.060*** (221.911)	-1,210.904*** (222.769)
Age 51 or greater	-1,454.007*** (334.955)	-1,498.154*** (334.779)	-1,453.801*** (336.496)	-1,634.459*** (276.337)	-1,635.552*** (276.428)	-1,624.431*** (276.901)
Gender missing	174.329 (1,121.838)	-27.085 (1,117.312)	-211.924 (1,127.713)	-227.348 (925.514)	184.237 (922.565)	137.760 (927.988)
Race missing	-1,015.764* (551.384)	-692.421 (448.306)	-330.123 (452.561)	-749.294* (454.890)	-376.993 (370.166)	-341.467 (372.410)
Age missing	-1,393.196*** (498.065)	-1,772.292*** (299.000)	-2,305.343*** (294.904)	-1,745.497*** (410.902)	-2,333.122*** (246.884)	-2,470.592*** (242.675)
Constant	2,161.168*** (265.168)	1,990.985*** (262.855)	1,278.324*** (362.525)	2,420.949*** (218.763)	2,520.263*** (217.039)	2,741.075*** (298.320)
Observations	4404	4404	4404	4404	4404	4404
R-squared	0.04	0.04	0.03	0.04	0.04	0.03

Notes: + Reference categories are ES Short Stayers, Age 31 – 40, Male, White

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix D: Family Data

D.1. Family Cohort Summaries

D.1.1 Houston, Texas Families Study Cohort

Path Groups ^a	ES Short Stayers	ES Repeat Users	ES Long Gappers	Multi-Program Users	Housing Program Users	Total Cohort
Number of Families	262	54	22	44	95	477
% of Cohort	55%	11%	5%	9%	20%	100%
Number of Adults	290	65	29	47	103	534
Number of Children	553	125	50	80	187	995
Avg. Household Size	3.2	3.5	3.6	2.9	3.1	3.2
Household Characteristics						
One Adult	89%	83%	68%	93%	91%	88%
Membership changed during homeless period	7%	52%	68%	70%	26%	25%
Children six and under	53%	35%	45%	56%	49%	50%
Demographics^b						
Male Adults	14%	25%	28%	9%	3%	13%
African-American	65%	67%	78%	62%	61%	65%
Adults 41 and older	15%	16%	28%	21%	15%	16%
Average Age at First Entry	30.4	33.4	34.9	32.5	31.8	31.5
Homeless Experience						
Average Number of Stays	1 stay	2.1 stays	3.4 stays	2.5 stays	1.2 stays	1.4 stays
Average Total Length of Stay	37.1 days	100.6 days	63.0 days	236.3 days	283.6 days	113.0 days
Median Total Length of Stay	24 days	49 days	45 days	191 days	45 days	49 days
Average Total Gap	0.0 days	41.3 days	346.0 days	81.1 days	12.2 days	30.5 days
Mainstream System Involvement (% of study cohort with involvement at any point during the study)						
Criminal Justice	5%	7%	23%	14%	13%	8%
Mental Health	11%	19%	23%	23%	21%	16%
State Hospitals	-	-	-	-	1%	0.2%
Costs During Homelessness (Average Cost Per Person in Path Group)						
Homeless System	\$2,321	\$5,748	\$3,885	\$26,913	\$35,344	\$11,626.77
Criminal Justice	-	-	\$163	-	-	\$7.52
Mental Health	\$48.92	\$210.29	\$72.68	\$331.27	\$364.72	\$157.22
State Hospitals	-	-	-	-	-	-
Mainstream Costs	\$49	\$210	\$236	\$331	\$365	\$164.74
Total Costs	\$2,370	\$5,959	\$4,121	\$27,244	\$35,709	\$11,792
^a The ES Short Stayers and ES Repeat Users are combined to form the Brief Users of Emergency Shelter path in the Family Chapter, Multi-Program Users and Housing Program Users are considered Heavy Users of Transitional Housing, and the Emergency Shelter Long Gappers path is considered Repeat Users with Long Gaps.						
^b Null demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere						

D.1.2 Kalamazoo, Michigan Study Cohort

Path Groups ^a	ES Single Use Short Stayers	ES Repeat Users	ES Long Gappers	Multi- Program Long Gappers	Long Stayers	Total Cohort
Number of Families	161	47	33	19	82	342
% of Cohort	47%	14%	10%	6%	24%	100%
Number of Adults	172	51	38	21	98	380
Number of Children	307	94	92	42	171	706
Avg. Household Size	3.0	3.1	3.9	3.3	3.3	3.2
Household Characteristics						
One Adult	93%	92%	85%	90%	81%	89%
Membership changed during homeless period	1%	17%	61%	53%	5%	13%
Children six and under	48%	54%	56%	51%	44%	49%
Demographics^b						
Male Adults	12%	8%	16%	10%	24%	15%
African-American	59%	53%	71%	67%	60%	60%
Adults 41 and older	11%	10%	11%	19%	15%	12%
Average Age at First Entry	29.6	28.8	29.1	32.7	31.1	30.0
Homeless Experience						
Average Number of Stays	1 stay	2.1 stays	3.1 stays	3.3 stays	1.2 stays	1.5 stays
Average Total Length of Stay	14.6 days	48.1 days	37.8 days	144.1 days	289 days	94 days
Median Total Length of Stay	8 days	31 days	31 days	135 days	308 days	30 days
Average Total Gap	0 days	50.0 days	377.5 days	275.4 days	8.7 days	60.5 days
Mainstream System Involvement (% of study cohort with involvement at any point during the study)						
Criminal Justice	39%	45%	61%	63%	34%	42%
Medicaid	92%	98%	100%	100%	94%	94%
Financial Assistance ^{***}	>=32%	>=36%	>=58%	>=79%	>=40%	>=39%
Costs During Homelessness (Average Cost Per Person in Path Group)						
Homeless System	\$1,172	\$2,977	\$3,295	\$5,925	\$6,574	\$3,184
Criminal Justice	\$1.09	\$45.34	\$125.61	\$383.00	\$112.31	\$67.08
Medicaid	\$340.35	\$1,951.99	\$13,184.15	\$10,283.72	\$10,555.85	\$4,802.88
Financial Assistance	\$3.04	\$51.15	\$204.29	\$268.76	\$295.47	\$113.95
Mainstream Costs	\$344	\$2,048	\$13,514	\$10,935	\$10,964	\$4,984
Total Costs	\$1,516	\$5,026	\$16,809	\$16,860	\$17,537	\$8,168

^a ES Single Use Short Stayers and ES Repeat Users are combined to form the Brief Users of Emergency Shelter path in the Family Chapter, the Long Stayers path is considered Heavy Users of Transitional Housing, and ES Long Gappers and Multi-Program Long Gappers are considered Repeat Users with Long Gaps.

^b Null demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere

^c De-duplicated data across programs within this domain was not provided. Values in this row represent the maximum value received by the path group in any one type of sub-domain. The total de-duplicated value across types is most likely higher assuming that at least some families receiving each type of assistance were different.

D.1.3 Upstate South Carolina Study Cohort

Path Groups ^a	One Week Single Stayers	One Month Returners	Three- Month Single Stayers	Six Month Returners	Long Stay Progressers	TH Only Long Stayers	Total Cohort
Number of Families	35	11	24	14	25	36	145
% of Cohort	24%	8%	17%	10%	17%	25%	100%
Number of Adults	38	12	26	17	28	41	162
Number of Children	57	16	48	26	48	77	272
Avg. Household Size	2.7	2.6	3.1	3.1	3.0	3.3	3.0
Household Characteristics							
One Adult	91%	91%	92%	79%	88%	86%	88%
Membership changed during homeless period	0%	36%	4%	64%	36%	6%	17%
Children six and under	50%	69%	27%	46%	30%	43%	41%
Demographics^b							
Male Adults	3%	17%	8%	18%	11%	15%	10%
African-American	56%	25%	46%	41%	63%	54%	49%
Adults 41 and older	5%	8%	23%	0%	18%	12%	12%
Average Age at First Entry	30.1	29.1	34.6	28.3	32.4	31.3	31.2
Homeless Experience							
Average Number of Stays	1 stay	2.1 stays	1 stay	2.3 stays	2.2 stays	1 stays	1.4 stays
Average Total Length of Stay	9.3 days	31.6 days	87.6 days	176.2 days	328.5 days	375.3 days	186.0 days
Median Total Length of Stay	6 days	33 days	87 days	117 days	298 days	409 days	103 days
Average Total Gap	0 days	92.7 days	0 days	133.8 days	24.9 days	3.4 days	24.9 days
Mainstream System Involvement (% of study cohort with involvement at any point during the study)							
Criminal Justice	31%	45%	38%	71%	32%	19%	34%
Food Stamps	80%	100%	92%	100%	100%	94%	92%
Medicaid ^c	>=69%	100%	>=96%	>=93%	100%	>=94%	>90%***
Costs During Homelessness (Average Cost Per Person in Path Group)							
Homeless System	\$784	\$2,508	\$8,890	\$12,475	\$16,036	\$15,478	\$9,663.12
Criminal Justice	-	\$18.18	\$41.67	\$57.14	\$64.00	\$33.33	\$33.10
Food Stamps	\$64.00	\$866.00	\$630.58	\$2,140.57	\$2,725.92	\$3,030.44	\$1,614.57
Medicaid	\$48.17	\$2,730.73	\$1,712.75	\$4,071.43	\$4,436.76	\$5,608.89	\$3,052.89
Mainstream Costs	\$112	\$3,615	\$2,385	\$6,269	\$7,227	\$8,673	\$4,700.56
Total Costs	\$896	\$6,123	\$11,275	\$18,744	\$23,262	\$24,151	\$14,363.68
^a One-Week Single Stayers, One-Month Returners and Three-Month Returners are combined to form the Brief Users of Emergency Shelter path in the Family Chapter, Long Stay Progressers and TH Only Long Stayers are considered Heavy Users of Transitional Housing, and the Six-Month Returners are considered Repeat Users with Long Gaps. ^b Null demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere ^c De-duplicated data across programs within this domain were not provided. Values in this row represent the maximum value received by the path group in any one type of sub-domain.							

D.1.4 Washington, DC Study Cohort

Path Groups ^a	Congregate ES, Short Stayers	Congregate and Apartment ES	Progressing Long Stayers	Transitional Housing Only	Direct to Permanent Housing	Long Gappers	Total Cohort
Number of Families	135	36	52	45	91	51	410
% of Cohort	33%	9%	13%	11%	22%	12%	100%
Number of Adults	157	47	70	47	108	171	500
Number of Children	303	112	135	90	199	107	946
Avg. Household Size	3.4	4.4	3.9	3.0	3.4	3.5	3.5
Household Characteristics							
One Adult	84%	72%	69%	96%	81%	69%	80%
Membership changed during homeless period	11%	64%	75%	22%	5%	92%	34%
Children six and under	43%	53%	43%	64%	44%	53%	48%
Demographics^b							
Male Adults	15%	25%	16%	4%	21%	25%	18%
African-American	97%	100%	100%	94%	96%	98%	97%
Adults 41 and older	21%	15%	29%	21%	16%	21%	20%
Average Age at First Entry	32.0	30.6	30.8	30.5	30.6	32.4	31.6
Homeless Experience							
Average Number of Stays	1.2 stays	2.6 stays	2.8 stays	1.2 stays	1 stays	7.2 stays	2.2 stays
Average Total Length of Stay	67.2 days	513.2 days	550.5 days	447.1 days	384.4 days	272.6 days	308.6 days
Median Total Length of Stay	39 days	474 days	543 days	472 days	381 days	207 days	258 days
Average Total Gap	5.8 days	20.4 days	42.6 days	0.1 days	0.0 days	514.7 days	73.2 days
Mainstream System Involvement (% of study cohort with involvement between 7/1/2003 and 7/31/2008)							
Medicaid	92%	100%	100%	98%	93%	98%	95%
Substance Abuse	7%	8%	6%	13%	1%	29%	9%
Child Welfare	46%	56%	37%	49%	29%	55%	43%
Mental Health	30%	47%	46%	58%	14%	55%	36%
^a Congregate ES Short Stayers are considered Brief Users of Emergency Shelter in the Family Chapter, Progressing Long Stayers and Transitional Housing Only are combined to form Heavy Users of Transitional Housing and the Long Gappers are considered Repeat Users with Long Gaps. ^b Null demographic values are excluded from percentage calculations and thus may differ from findings presented elsewhere							

D.2. Cross-Site Family Multivariate Analysis

D.2.1 Analysis of Total Homeless Costs: Approach 1

Description: This series of regressions starts with the basic building blocks of costs per family, first adding length of stay (Model 1) to dummy variables controlling for site differences. Model 2 adds program type to site dummy variables and length of stay. Models 3 and 4 add other variables that reflect program use patterns, number of stays, number of “gap days,” and whether the family changed composition during the period of homelessness. The final models (5 and 6) add basic family demographic characteristics: age of adults, age of children, household size, and race.

Outcome Variable: Total Homeless Costs in Log Scale

Total Homeless Cost (log scale)	Model 1 (Length of Stay only)	Model 2 (Model 1 variables plus Program Type)	Model 3 (Model 2 variables plus Number of stays and number of “gap days”)	Model 4 (Model 3 variables plus Change in composition during homeless period)	Model 5 (All variables except household change)	Model 6 (All variables)
Washington, DC ^a	0.734*** (0.097)	0.828*** (0.098)	0.769*** (0.098)	0.727*** (0.098)	0.864*** (0.103)	0.836*** (0.103)
Upstate South Carolina	0.733*** (0.121)	0.700*** (0.120)	0.748*** (0.119)	0.732*** (0.118)	0.719*** (0.119)	0.693*** (0.119)
Houston, TX	0.843*** (0.086)	0.862*** (0.085)	0.903*** (0.084)	0.854*** (0.085)	0.916*** (0.085)	0.862*** (0.086)
Length of stay (in days) divided by 30	0.239*** (0.006)	0.218*** (0.008)	0.223*** (0.008)	0.219*** (0.008)	0.222*** (0.008)	0.219*** (0.008)
Transitional Housing-only program type		0.422*** (0.112)	0.442*** (0.111)	0.459*** (0.111)	0.464*** (0.112)	0.475*** (0.111)
Emergency Shelter and Transitional Housing-only program type		0.633*** (0.131)	0.443*** (0.133)	0.394*** (0.133)	0.489*** (0.133)	0.437*** (0.133)
Other program type		-0.066 (0.153)	-0.222 (0.154)	-0.330** (0.157)	-0.303* (0.155)	-0.427*** (0.158)
Total number of stays			0.051** (0.024)	0.037 (0.024)	0.044* (0.024)	0.031 (0.024)
Total gaps between stays (in days), divided by 30			0.036*** (0.008)	0.025*** (0.009)	0.038*** (0.008)	0.028*** (0.009)
Any change in household composition during the study period				0.326*** (0.096)		0.350*** (0.099)
Total number of adults in household					0.025 (0.160)	-0.024 (0.160)
Total number of children in household					0.067** (0.028)	0.055** (0.028)
Male adult-only household type					-0.218 (0.237)	-0.230 (0.236)

Total Homeless Cost (log scale)	Model 1 (Length of Stay only)	Model 2 (Model 1 variables plus Program Type)	Model 3 (Model 2 variables plus Number of stays and number of "gap days")	Model 4 (Model 3 variables plus Change in composition during homeless period)	Model 5 (All variables except household change)	Model 6 (All variables)
Female adult-only household type					-0.243 (0.184)	-0.245 (0.183)
African American household head					-0.273*** (0.084)	-0.290*** (0.084)
Household head of other race					-0.038 (0.167)	-0.042 (0.166)
Household head ages 18-24					-0.037 (0.099)	-0.038 (0.099)
Household head ages 25-30					0.023 (0.092)	0.020 (0.091)
Household head ages 41-50					0.084 (0.108)	0.086 (0.107)
Household head ages 51 or above					0.159 (0.246)	0.156 (0.245)
Household with youngest child born after study entry					-0.338 (0.207)	-0.465** (0.209)
Household youngest child ages 6-12					0.198** (0.088)	0.205** (0.088)
Household youngest child ages 13-17					0.184 (0.142)	0.195 (0.141)
Household head race missing					-0.232 (0.214)	-0.191 (0.213)
Household head age missing					-0.763 (0.553)	-0.802 (0.551)
Youngest child age missing					-0.064 (0.261)	-0.061 (0.260)
Constant	6.221*** (0.068)	6.163*** (0.068)	6.012*** (0.074)	6.031*** (0.074)	6.179*** (0.356)	6.283*** (0.355)
Observations	1287	1287	1287	1287	1285	1285
R-squared	0.60	0.61	0.63	0.63	0.64	0.64

Reference categories are: Kalamazoo, MI, Emergency Shelter-only program type, mixed-adult household type, white household head, household head ages 31 - 40, household youngest child ages 0-5.

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

^a Excluded CCG/SAFAH-only families in DC

D.2.2 Analysis of Total Homeless Costs: Approach 2

Description: This approach starts with site dummies and basic family demographics (Model 1) and then adds program type (Model 3), length of stay (Model 4), and then numbers of stays and gap days (Model 5). Models 2 and 6 also add the variable that reflects whether the household changed composition. Model 1 does not control either for length of stay or for program type.

Outcome Variable: Total Homeless Costs in Log Scale

Total homeless cost (log scale)	Model 1 (Basic family demographics)	Model 2 (Model 1 variables plus Household Change)	Model 3 (Model 2 variables plus Program Type)	Model 4 (Model 3 variables plus Length of Stay)	Model 5 (Model 4 plus Number of stays and gap days)	Model 6 (All variables)
Washington, DC ^a	1.630*** (0.149)	1.453*** (0.148)	1.483*** (0.126)	0.898*** (0.104)	0.864*** (0.103)	0.836*** (0.103)
Upstate South Carolina	1.442*** (0.177)	1.377*** (0.174)	1.121*** (0.148)	0.682*** (0.121)	0.719*** (0.119)	0.693*** (0.119)
Houston, TX	1.016*** (0.128)	0.890*** (0.127)	1.007*** (0.106)	0.881*** (0.086)	0.916*** (0.085)	0.862*** (0.086)
Total number of adults in household	0.181 (0.241)	-0.023 (0.238)	0.048 (0.200)	0.067 (0.161)	0.025 (0.160)	-0.024 (0.160)
Total number of children in household	0.085** (0.042)	0.052 (0.042)	0.095*** (0.035)	0.065** (0.028)	0.067** (0.028)	0.055** (0.028)
Male adult-only household type	-0.176 (0.358)	-0.253 (0.350)	-0.226 (0.296)	-0.203 (0.239)	-0.218 (0.237)	-0.230 (0.236)
Female adult-only household type	-0.219 (0.278)	-0.239 (0.272)	-0.368 (0.230)	-0.254 (0.186)	-0.243 (0.184)	-0.245 (0.183)
African American household head	-0.249* (0.127)	-0.277** (0.125)	-0.194* (0.105)	-0.270*** (0.085)	-0.273*** (0.084)	-0.290*** (0.084)
Household head of other race	-0.369 (0.252)	-0.320 (0.247)	-0.046 (0.209)	-0.032 (0.169)	-0.038 (0.167)	-0.042 (0.166)
Household head ages 18-24	-0.387*** (0.150)	-0.349** (0.147)	-0.251** (0.124)	-0.065 (0.100)	-0.037 (0.099)	-0.038 (0.099)
Household head ages 25-30	-0.070 (0.139)	-0.060 (0.136)	-0.088 (0.115)	-0.005 (0.093)	0.023 (0.092)	0.020 (0.091)
Household head ages 41-50	0.293* (0.163)	0.267* (0.160)	0.185 (0.135)	0.092 (0.109)	0.084 (0.108)	0.086 (0.107)
Household head ages 51 or above	0.575 (0.372)	0.518 (0.365)	0.631** (0.308)	0.227 (0.249)	0.159 (0.246)	0.156 (0.245)
Household with youngest child born after study entry	0.988*** (0.299)	0.380 (0.304)	0.481* (0.251)	-0.054 (0.204)	-0.338 (0.207)	-0.465** (0.209)

Total homeless cost (log scale)	Model 1 (Basic family demographics)	Model 2 (Model 1 variables plus Household Change)	Model 3 (Model 2 variables plus Program Type)	Model 4 (Model 3 variables plus Length of Stay)	Model 5 (Model 4 plus Number of stays and gap days)	Model 6 (All variables)
Household youngest child ages 6-12	0.092	0.124	0.165	0.177**	0.198**	0.205**
	(0.134)	(0.131)	(0.111)	(0.089)	(0.088)	(0.088)
Household youngest child ages 13-17	0.120	0.155	0.049	0.170	0.184	0.195
	(0.215)	(0.211)	(0.178)	(0.144)	(0.142)	(0.141)
Household head race missing	-0.778**	-0.602*	-0.398	-0.273	-0.232	-0.191
	(0.324)	(0.318)	(0.268)	(0.216)	(0.214)	(0.213)
Household head age missing	-0.940	-0.994	-0.641	-0.822	-0.763	-0.802
	(0.839)	(0.822)	(0.693)	(0.560)	(0.553)	(0.551)
Youngest child age missing	0.180	0.168	-0.297	-0.034	-0.064	-0.061
	(0.395)	(0.387)	(0.327)	(0.264)	(0.261)	(0.260)
Any change in household composition during the study period		0.926***				0.350***
		(0.125)				(0.099)
Transitional Housing-only program type			2.274***	0.459***	0.464***	0.475***
			(0.109)	(0.113)	(0.112)	(0.111)
Emergency Shelter and Transitional Housing-only program type			2.119***	0.659***	0.489***	0.437***
			(0.146)	(0.131)	(0.133)	(0.133)
Other program type			1.668***	-0.143	-0.303*	-0.427***
			(0.170)	(0.154)	(0.155)	(0.158)
Length of stay (in days) divided by 30				0.215***	0.222***	0.219***
				(0.008)	(0.008)	(0.008)
Total number of stays					0.044*	0.031
					(0.024)	(0.024)
Total gaps between stays (in days), divided by 30					0.038***	0.028***
					(0.008)	(0.009)
Constant	7.025***	7.227***	6.555***	6.307***	6.179***	6.283***
	(0.537)	(0.527)	(0.444)	(0.359)	(0.356)	(0.355)
Observations	1285	1285	1285	1285	1285	1285
R-squared	0.16	0.20	0.43	0.63	0.64	0.64

Reference categories are: clients in Kalamazoo, Emergency Shelter-only program type, mixed-adult household type, white household head, household head ages 31-40, household youngest child ages 0-5

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

¹Excluded CCG/SAFAH-only families in DC

D.2.3 Analysis of the Selection of Program Type, With Household Change as a Covariate

Description: The coefficients for this Multinomial Logit model are expressed as odds ratios, with values greater than one showing that, compared to the reference category, a particular type of household is more likely to use a program type. This model is used to identify the factors associated with the type of program use by first-time homeless families.

Program type Category (ES only; TH only; ES and TH only; Other)	Multinomial Logit Model		
	Base category = Emergency Shelter Only		
Outcome	Transitional Housing Only	Emergency Shelter and Transitional Housing Only	Other
Washington, D.C. ^a	0.866 (0.205)	0.966 (0.311)	5.776*** (2.591)
Upstate South Carolina	1.630* (0.406)	2.865** (0.940)	0.151 (0.163)
Houston, TX	1.002 (0.190)	0.656 (0.200)	0.799 (0.342)
Total number of adults in household	1.112 (0.471)	0.827 (0.399)	1.255 (0.516)
Total number of children in household	0.972 (0.065)	0.830* (0.076)	0.998 (0.091)
Any change in household composition during the study period	0.894 (0.200)	6.057*** (1.446)	15.410*** (4.673)
Male adult-only household type	0.975 (0.597)	0.829 (0.593)	1.849 (1.346)
Female adult-only household type	1.493 (0.720)	0.897 (0.484)	1.438 (0.757)
African American household head	0.939 (0.174)	1.083 (0.296)	0.212*** (0.081)
Household head of other race	0.714 (0.269)	0.177 (0.185)	0.000 (0.000)
Household head ages 18-24	0.749 (0.169)	1.062 (0.343)	0.277** (0.129)
Household head ages 25-30	0.965 (0.200)	1.387 (0.415)	0.988 (0.337)
Household head ages 41-50	1.037 (0.263)	1.831 (0.602)	1.206 (0.428)
Household head ages 51 or above	0.767 (0.457)	1.234 (0.863)	0.390 (0.346)
Household with youngest child born after study entry	1.525 (0.870)	2.729* (1.216)	0.327 (0.205)
Household youngest child ages 6-12	0.761 (0.158)	1.121 (0.313)	1.258 (0.408)
Household youngest child ages 13-17	1.160 (0.365)	1.186 (0.517)	1.626 (0.794)
Household head race missing	0.427 (0.245)	0.456 (0.485)	0.421 (0.469)
Household head age missing	0.576 (0.767)	0.000 (0.000)	0.000 (0.000)
Youngest child age missing	3.273* (1.667)	0.802 (0.894)	2.961 (2.792)
Constant	0.223 (0.205)	0.115* (0.124)	0.035*** (0.036)
Observations	1285		
Log likelihood	-1109.4261		
Reference categories are: clients in Kalamazoo, mixed-adult household type, white household head, household head ages 31-40, household youngest child ages 0-5			
Coefficients in relative risk ratio format			
Standard errors in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			
^a Excluded CCG/SAFAH-only families in DC			

D.2.4 Analysis of the Selection of Program Type, Without Household Change as a Covariate

Description: coefficients for this Multinomial Logit model are expressed as odds ratios, with values greater than one showing that, compared to the reference category, a particular type of household is more likely to use a program type. This model is used to identify the factors associated with the type of program used by first-time homeless families. This analysis is identical to the one shown previously, except that the household change variable is excluded from the model.

Program type Category (ES only; TH only; ES and TH only; Other)	Multinomial Logit Model		
	Base category = Emergency Shelter Only		
	Transitional Housing Only	Emergency Shelter and Transitional Housing Only	Other
Washington, DC ^a	0.852	1.346	9.246***
	(0.201)	(0.414)	(3.822)
Upstate, South Carolina	1.622	3.433***	0.224
	(0.404)	(1.080)	(0.237)
Houston, TX	0.990	0.984	1.433
	(0.186)	(0.283)	(0.562)
Total number of adults in household	1.102	1.220	2.156
	(0.445)	(0.603)	(0.849)
Total number of children in household	0.972	0.890	1.127
	(0.064)	(0.080)	(0.096)
Male adult-only household type	0.965	0.899	1.732
	(0.579)	(0.643)	(1.190)
Female adult-only household type	1.512	0.925	1.369
	(0.705)	(0.509)	(0.688)
African American household head	0.934	1.155	0.286***
	(0.173)	(0.302)	(0.101)
Household head of other race	0.713	0.164	0.000
	(0.268)	(0.171)	(0.000)
Household head ages 18-24	0.747	1.009	0.265**
	(0.168)	(0.316)	(0.118)
Household head ages 25-30	0.961	1.370	0.925
	(0.199)	(0.395)	(0.290)
Household head ages 41-50	1.034	1.829	1.319
	(0.261)	(0.585)	(0.424)
Household head ages 51 or above	0.780	1.391	0.553
	(0.465)	(0.948)	(0.451)
Household with youngest child born after study entry	1.376	7.974***	1.124
	(0.745)	(3.403)	(0.703)
Household youngest child ages 6-12	0.763	1.013	1.016
	(0.158)	(0.274)	(0.303)
Household youngest child ages 13-17	1.164	1.035	1.454
	(0.365)	(0.440)	(0.640)
Household head race missing	0.432	0.290	0.198
	(0.247)	(0.306)	(0.215)
Household head age missing	0.575	0.000	0.000
	(0.757)	(0.000)	(0.000)
Youngest child age missing	3.324*	0.912	3.284
	(1.685)	(0.987)	(2.813)
Constant	0.222	0.086*	0.029***
	(0.197)	(0.094)	(0.028)
Observations	1285		
Log likelihood	-1109.4261		
Reference categories are: clients in Kalamazoo, mixed-adult household type, white household head, household head ages 31-40, household youngest child ages 0-5			
Coefficients in relative risk ratio format			
Standard errors in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			
^a Excluded CCG/SAFAH-only families in DC			

D.2.5 Analysis of the Length of Stay

Description: This series of regressions predicts length of stay, based on study site and household characteristics, and the types of programs used. Model 1 includes all variables. Model 2 excludes the program type variables. Model 3 excludes the household change variable.

Outcome variable: Length of Stay in Log Scale

Total length of stay (log scale)	Model 1 All Variables	Model 2 All Variables except Program Type	Model 3 All Variables except Household Change
Washington, DC ^a	0.913*** (0.115)	1.003*** (0.144)	0.964*** (0.116)
Upstae South Carolina	0.714*** (0.135)	0.991*** (0.170)	0.737*** (0.136)
Houston, TX	0.449*** (0.098)	0.400*** (0.123)	0.507*** (0.097)
Total number of adults in household	-0.045 (0.183)	0.014 (0.232)	0.032 (0.184)
Total number of children in household	0.077** (0.032)	0.056 (0.040)	0.091*** (0.032)
Any change in household composition during the study period	0.443*** (0.104)	0.879*** (0.121)	
Transitional Housing-only program type	2.436*** (0.100)		2.431*** (0.100)
Emergency Shelter and Transitional Housing-only program type	1.988*** (0.137)		2.123*** (0.134)
Other program type	1.921*** (0.164)		2.145*** (0.156)
Male adult-only household type	-0.127 (0.271)	-0.093 (0.342)	-0.105 (0.272)
Female adult-only household type	-0.361* (0.210)	-0.195 (0.265)	-0.362* (0.211)
African American household head	-0.132 (0.097)	-0.214* (0.122)	-0.110 (0.097)
Household head of other race	-0.182 (0.191)	-0.500** (0.240)	-0.175 (0.192)
Household head ages 18-24	-0.269** (0.113)	-0.406*** (0.143)	-0.278** (0.114)
Household head ages 25-30	-0.057 (0.105)	-0.041 (0.133)	-0.063 (0.106)
Household head ages 41-50	0.145 (0.123)	0.238 (0.156)	0.146 (0.124)
Household head ages 51 or above	0.538* (0.281)	0.437 (0.356)	0.567** (0.283)
Household with youngest child born after study entry	0.224 (0.238)	0.390 (0.297)	0.487** (0.231)
Household youngest child ages 6-12	0.103 (0.101)	0.038 (0.128)	0.087 (0.102)
Household youngest child ages 13-17	0.176 (0.162)	0.273 (0.205)	0.156 (0.164)
Household head race missing	-0.312 (0.245)	-0.630** (0.310)	-0.378 (0.247)
Household head age missing	-0.522 (0.634)	-0.860 (0.801)	-0.492 (0.638)

Total length of stay (log scale)	Model 1 All Variables	Model 2 All Variables except Program Type	Model 3 All Variables except Household Change
Youngest child age missing	-0.183	0.337	-0.179
	(0.299)	(0.377)	(0.301)
Constant	2.812***	3.372***	2.726***
	(0.407)	(0.513)	(0.409)
Observations	1285	1285	1285
R-squared	0.48	0.16	0.47
Reference categories are: clients in Kalamazoo, Emergency Shelter-only program type, mixed-adult household type, white household head, household head ages 31-40, household youngest child ages 0-5 Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1% ^aExcluded CCG/SAFAH-only families in DC			

D.2.6 Summary Statistics of Variables Used in the Family Cross-site Regression Models

Variable	Obs	Mean	Std. Dev.	Min	Max
Cost	1287	10,310.99	15,820.13	31.65	97,242.60
Costs in Log scale	1287	7.95	1.92	3.45	11.48
DC	1287	0.25	0.43	0	1
South Carolina	1287	0.11	0.32	0	1
Houston	1287	0.37	0.48	0	1
Total length of stay	1287	144.37	175.48	1	550
Total length of stay (in days), divided by 30	1287	4.81	5.85	0.03	18.33
Number of stays	1287	1.62	1.61	1	25
Total gap days	1287	53.11	139.45	0	867
Total gaps between stays (in days) divided by 30	1287	1.77	4.65	0	28.90
Transitional Housing-only program type	1287	0.18	0.39	0	1
Emergency Shelter and Transitional Housing-only program type	1287	0.09	0.29	0	1
Other program type	1287	0.07	0.26	0	1
Any change in household composition during study period	1287	0.25	0.43	0	1
Total number of adults in household	1286	1.14	0.38	1	4
Total number of children in household	1285	2.12	1.28	1	9
Male adult-only household type	1287	0.05	0.21	0	1
Female adult-only household type	1287	0.83	0.38	0	1
African American household head	1287	0.70	0.46	0	1
Household head of other race	1287	0.05	0.21	0	1
Household head ages 18-24	1287	0.27	0.44	0	1
Household head ages 25-40	1287	0.24	0.43	0	1
Household head ages 41-50	1287	0.14	0.35	0	1
Household head ages 51 or above	1287	0.02	0.14	0	1
Household with youngest child born after study entry	1287	0.03	0.17	0	1
Household youngest child ages 6-12	1287	0.25	0.43	0	1
Household youngest child ages 13-17	1287	0.08	0.27	0	1
Household head race missing	1287	0.03	0.16	0	1
Household head age missing	1287	0.01	0.07	0	1
Youngest child age missing	1287	0.02	0.14	0	1

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This workbook contains the New Tenant Rent Index and All Tenant Regressed Rent Index time series. The documentation for these time series is available on the Bureau of Labor Statistics website at <https://www.bls.gov/pir/new-tenant-rent.htm>. These indices were adapted from the research article. "Disentangling Rent Index Differences: Data, Methods, and Scope" by Brian Adams, Lara Loewenstein, Hugh Montag, and Randal Verbrugge. The column NTR_index is the new tenant rent index, normalized so that 2000q1 is 100. The column NTR_4qtr_Change refers to the year-on-year change in the NTR index. Columns NTR_4qtr_Change_lower_confint and NTR_4qtr_Change_upper_confint refer to the lower and upper bounds of the 95% confidence interval for the year-on-year change in the NTR index. The column ATRR_index is the All Tenant Regressed Rent Index. The column ATRR_4qtr_Change refers to the year-on-year change in the ATRR index. Columns ATRR_4qtr_Change_lower_confint and ATRR_4qtr_Change_upper_confint refer to the lower and upper bounds of the 95% confidence interval for the year-on-year change in the ATRR index. All data is reported at a quarterly frequency. Year-on-year changes are calculated as the difference of logs of the indices.

date	NTR_index	NTR_4qtr_Change	NTR_4qtr_Change_lower_confint	NTR_4qtr_Change_upper_confint	ATRR_index	ATRR_4qtr_Change	ATRR_4qtr_Change_lower_confint	ATRR_4qtr_Change_upper_confint
1999q4					102.2747421	2.249255657	2.189852238	2.308659077
2000q1					102.9382553	2.283521891	2.240398645	2.326645136
2000q2					103.6130447	2.504678011	2.451501369	2.557854652
2000q3					104.8117065	2.809984446	2.766298532	2.853670359
2000q4					105.3065872	2.921323061	2.869258881	2.973387241
2001q1					106.3165054	3.229120016	3.186279535	3.271960497
2001q2					107.1086426	3.31804347	3.275854826	3.360232115
2001q3					108.1791153	3.162285805	3.122095823	3.202475786
2001q4					108.6526031	3.127969265	3.073388815	3.182549715
2002q1					109.2365112	2.709481478	2.658723354	2.760239601
2002q2					109.747963	2.434282064	2.389813423	2.478750706
2002q3					110.6143341	2.226135492	2.189870834	2.26240015
2002q4					110.7644119	1.924986482	1.882841706	1.967131257
2003q1					111.4777451	2.030961514	1.984443903	2.077479124
2003q2					111.7620621	1.818567514	1.763555505	1.873579979
2003q3					112.3944778	1.596512318	1.554077506	1.638947129
2003q4					112.7802124	1.80353713	1.766874552	1.840199709
2004q1					113.0816956	1.42855525	1.377017379	1.480093122
2004q2					113.8235855	1.827758908	1.777868986	1.87764883
2004q3					114.0950012	1.501663923	1.452901602	1.550426245
2004q4					114.7546616	1.73555696	1.689057112	1.782056808
2005q1	113.7182388	1.590976477	1.008319855	2.173633099	114.9203262	1.6128546	1.567648411	1.658060789
2005q2	115.5479507	2.250379801	1.70450604	2.796253443	115.788681	1.711706042	1.672084808	1.751327276
2005q3	115.9570389	2.566114664	2.103226662	3.029002666	116.1834717	1.813914895	1.768976927	1.858852863
2005q4	117.2916794	3.504746199	2.917244434	4.092247963	117.0721893	1.999427557	1.94707334	2.051781654
2006q1	118.6514587	4.246647835	3.663790703	4.829504967	117.591156	2.297475576	2.245079994	2.349871159
2006q2	119.6102219	3.45527029	2.939542294	3.970998287	118.9560013	2.698687315	2.64868784	2.74868679
2006q3	120.5148087	3.855287075	3.329967022	4.380607128	119.7338104	3.010043859	2.954632998	3.065454721
2006q4	121.5570755	3.572009087	2.936747789	4.207270145	120.9345627	3.245884657	3.188087463	3.30368185
2007q1	122.411026	3.119416952	2.6068151	3.632018805	121.2728119	3.082882166	3.050399065	3.115365267
2007q2	123.6523514	3.32357049	2.827662468	3.819478512	122.2808914	2.756710052	2.697943211	2.815476894
2007q3	124.3057938	3.097197056	2.575446844	3.618947268	123.4810944	3.081702948	3.043999434	3.119406462
2007q4	124.7751846	2.612968445	1.892070532	3.333866358	123.9867706	2.492527723	2.436029673	2.549025774
2008q1	125.1194687	2.188458204	1.661851406	2.715065002	124.9061813	2.952025414	2.899410009	3.004640818
2008q2	126.1063004	1.965119481	1.438252687	2.491986275	125.797226	2.835050583	2.767936707	2.902164459
2008q3	126.2683563	1.566484571	1.040266156	2.092702866	126.5700531	2.470787287	2.412219048	2.529355526
2008q4	125.4035645	0.502345741	-0.212371781	1.217063308	126.7886505	2.234665871	2.15828371	2.311048031
2009q1	124.2142029	-0.726151228	-1.480434418	0.028131915	126.917305	1.597282648	1.54956305	1.645002246
2009q2	122.9539871	-2.531500816	-3.201782465	-1.861219287	126.6313553	0.660885811	0.582747698	0.739023924
2009q3	122.9157562	-2.691024303	-3.209103823	-2.172944784	126.4449539	-0.098886773	-0.17450878	-0.023264762
2009q4	121.5617599	-3.111460686	-3.839900017	-2.383021355	126.1083984	-0.537968874	-0.615496218	-0.4604415
2010q1	121.744873	-2.007986784	-2.769544601	-1.246428967	125.5684738	-1.068451524	-1.141970038	-0.994933009
2010q2	122.802063	-0.123638175	-0.687035441	0.439759105	125.3552017	-1.012882948	-1.084107637	-0.941658199
2010q3	123.5348511	0.502409935	-0.079488166	1.084308028	125.815979	-0.498671114	-0.601484716	-0.395857513
2010q4	124.0705948	2.042827129	1.391472459	2.694181919	126.0951004	-0.01054548	-0.098622203	0.077531241
2011q1	124.0406494	1.868167877	1.236993313	2.499342442	126.234436	0.528956354	0.436683357	0.621229351
2011q2	126.0332108	2.597163439	2.024834633	3.169492245	127.1760101	1.442071199	1.374795556	1.509346843
2011q3	127.3001862	3.002465725	2.498616695	3.506314754	128.1999512	1.877080798	1.790299416	1.963862181
2011q4	127.4748688	2.706852198	2.096844196	3.316860199	128.4531555	1.852790236	1.78279829	1.922782183
2012q1	128.4114838	3.463049412	2.900141716	4.025957108	129.1842804	2.309913397	2.246020555	2.373806238
2012q2	129.6457214	2.826006174	2.260446445	3.383565903	130.0240326	2.214726686	2.156163692	2.27328968
2012q3	130.5117645	2.491540432	1.940300941	3.042779922	131.1921844	2.307214022	2.229680538	2.384747505
2012q4	130.2310181	2.139069796	1.475787401	2.80235219	131.3165588	2.204659939	2.139833212	2.269486666
2013q1	131.1924896	2.142580748	1.553851366	2.731310129	132.1470032	2.26750493	2.208394289	2.326615572

2013q2	133.0794373	2.614071131	2.040208101	3.18793416	133.2520905	2.452345133	2.377090454	2.527599812
2013q3	133.6070099	2.343935728	1.803057671	2.884813786	134.2373199	2.294597387	2.219756126	2.369438648
2013q4	133.817337	2.716577768	2.145650148	3.287505388	135.1286621	2.861649036	2.795175791	2.928122282
2014q1	134.6780701	2.622163296	2.008930683	3.235395908	135.8369751	2.754049063	2.687190056	2.82090807
2014q2	136.4012451	2.465465069	1.810370684	3.120559454	136.8094025	2.634598255	2.561339617	2.707856894
2014q3	138.0305634	3.257240534	2.719018459	3.795462608	138.0014038	2.765457869	2.703217745	2.827697992
2014q4	137.9735107	3.058600187	2.374560118	3.742640257	138.9514465	2.789718866	2.727493525	2.851944208
2015q1	139.7566986	3.701577902	3.050766945	4.352388859	139.6230927	2.749114275	2.67171526	2.82651329
2015q2	141.0477753	3.349779129	2.712435007	3.987123251	141.0799103	3.073773623	2.998993158	3.148554087
2015q3	143.5515442	3.921902895	3.263383865	4.580421925	141.9663391	2.832612276	2.778568983	2.886655569
2015q4	143.2787933	3.773061991	3.040864229	4.505259991	143.2528534	3.048670769	2.947701454	3.149640083
2016q1	143.1617126	2.407180548	1.652050734	3.162310362	143.9011688	3.018013954	2.94933033	3.086697578
2016q2	146.2643738	3.631709814	2.888862848	4.374556541	145.7243347	3.239024878	3.130723238	3.347326517
2016q3	147.1942902	2.505925179	1.661664605	3.350185871	146.5631714	3.18665576	3.104557276	3.268754244
2016q4	146.2807465	2.073535919	1.248556018	2.898515701	148.0445862	3.290221214	3.227602482	3.352839947
2017q1	148.2052917	3.462357044	2.700629473	4.224084377	148.4864502	3.136697292	3.053157091	3.220237494
2017q2	151.5170441	3.528235674	2.660218954	4.396252155	150.0659027	2.935783148	2.874634743	2.996931553
2017q3	151.9324646	3.168269396	2.399388313	3.937150478	151.2809753	3.168233156	3.075381279	3.261085033
2017q4	152.3518066	4.066466808	3.21935153	4.913581848	152.2300262	2.787922144	2.680639505	2.895204782
2018q1	152.5787964	2.908274174	1.964274406	3.852273941	153.3356171	3.213538408	3.129960775	3.297116041
2018q2	155.4850769	2.585163832	1.653269053	3.517058611	154.8179932	3.117563963	3.035317898	3.199810028
2018q3	157.2558899	3.443824053	2.567446232	4.320201874	156.0630951	3.112150908	3.02323246	3.201069355
2018q4	156.4381866	2.646859407	1.631393194	3.662325621	156.5989532	2.829539299	2.745520592	2.913558006
2019q1	158.2147827	3.627233505	2.632580042	4.621887207	158.3621521	3.22554183	3.156314135	3.294769526
2019q2	160.414444	3.12109828	2.220011711	4.022184849	159.0938568	2.724413395	2.641661644	2.807165146
2019q3	163.2559357	3.744477749	2.886152983	4.602802277	161.3386841	3.324540138	3.265948057	3.383132219
2019q4	162.2355957	3.638861418	2.310088158	4.967634678	161.9711456	3.373010635	3.311892986	3.434128284
2020q1	163.9300385	3.548624754	2.180582523	4.916666985	163.2194519	3.021111488	2.964353561	3.077869415
2020q2	163.2459259	1.749707103	0.340513587	3.158900499	163.9895477	3.030837059	2.967972994	3.093701124
2020q3	164.8537445	0.973955691	0.098531082	1.849380255	164.9432526	2.209570646	2.151277304	2.267863989
2020q4	165.3326569	1.890997291	0.565213025	3.216781616	165.019043	1.864267349	1.789827943	1.938706756
2021q1	166.5847473	1.606443048	0.250742406	2.96214366	166.1286163	1.766665936	1.690755248	1.842576623
2021q2	170.9633789	4.619156361	2.996415377	6.241897106	168.3708801	2.636647463	2.574429035	2.698865891
2021q3	176.8176727	7.006042004	5.745699406	8.266384125	169.8130798	2.909681082	2.843292475	2.976069689
2021q4	185.1069183	11.29740524	9.112748146	13.48206234	172.1566925	4.234418392	4.14898777	4.319849014
2022q1	187.6419525	11.90314674	10.39151192	13.41478157	174.9126129	5.152420998	5.070521832	5.234320164
2022q2	193.1228638	12.18772125	10.64917469	13.72626781	179.6088715	6.461238384	6.367426872	6.555049896
2022q3	196.0522308	10.32620049	8.823524475	11.8288765	182.1315002	7.003065109	6.923363209	7.08276701
2022q4	192.4893951	3.910746813	1.44289124	6.378602505	186.1933594	7.838063717	7.739385605	7.936741829
2023q1	189.6708221	1.075441599	-0.577935517	2.728818655	187.6815643	7.046022415	6.964345932	7.127698898
2023q2	199.8672943	3.432703257	1.776037812	5.08936882	191.5575714	6.440684795	6.355335712	6.526033878
2023q3	201.1824341	2.583102226	0.415742397	4.750462055	193.2949524	5.948832035	5.862621307	6.035042763
2023q4	183.5764465	-4.740987778	-8.944898605	-0.53707695	196.2644196	5.26771307	5.172621727	5.362804413



Energy Justice in Maryland's Residential and Renewable Energy Sectors

Arjun Makhijani, Christina Mills, and Annie Makhijani
Institute for Energy and Environmental Research



**ENERGY JUSTICE IN MARYLAND'S RESIDENTIAL
AND RENEWABLE ENERGY SECTORS**

**A report of the
Renewable Maryland Project**

By
Arjun Makhijani, Christina Mills, and Annie Makhijani

Institute for Energy and Environmental Research
October 2015

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Preface and Acknowledgements

This report is part of a series of works being produced by the Renewable Maryland Project. The project aims to create a roadmap for an energy sector with the following attributes:

- **Essentially emissions-free:** more than 90 percent reduction in CO₂ emissions relative to 2006 by the year 2050;
- **Reasonable cost:** the fraction of income spent on energy by consumers does not exceed current levels (we use 2011 as our baseline year);
- **Just and equitable:** all Marylanders, including those with low incomes, can meet their energy needs without the high burdens that energy bills impose on them today;
- **Robust and resilient:** resistant to failure for essential services and quick to recover from breakdowns;
- **Democratized:** a transparent electricity sector that provides more choices to people of all income levels, including greater opportunities to participate in various aspects of the electricity system, including electricity generation and demand response.

The first phase of the project, in late 2012 and early 2013 began with consulting various stakeholders and the formation of an Advisory Board, a process in which Stuart Clarke, Executive Director of the Town Creek Foundation, played a central role. The consultations have continued since that time, including Advisory Board meetings that reviewed a draft report on the buildings sector emission reductions and electricity sector modeling, a draft and a final version of the report focused on heating and cooling of buildings in Maryland, and a draft of the present report, which is now being finalized. Advisory Board members serve in their personal (and not institutional)

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capacities; they may or may not agree with or endorse any of the findings, analyses, and recommendations of the work of this project, including the present report.

The role of the Advisory Board is as follows:

1. Ensuring that IEER's work is informed by near-term opportunities and careful understanding of what advocacy groups are doing. Reciprocally, there should be enough understanding on the part of advocacy groups to see what a path to climate protection and an emissions-free energy sector would look like.
2. Ensuring that the project remains grounded in - and cognizant of - Maryland's legislative, regulatory, and business landscape, a project where vision and pragmatism are linked to ensure that policies will be flexible enough to enable correction.
3. Advising on a communications approach and strategy, which is critical to achieving broad acceptance, adoption, and implementation of an emissions-free energy sector.
4. Helping the project not only to illuminate paths to the long-term vision but also to help identify obstacles that may need to be overcome along the way as well as diversions and dead-ends that would distract or detract from the goal.

The Advisory Board members are:

1. Rebecca Bertram, Program Director, Environment and Global Dialog, Heinrich Böll Foundation, Washington, D.C., office;
2. James McGarry, Chief Policy Analyst, Chesapeake Climate Action Center (alternate Tommy Landers, also of the Chesapeake Climate Action Network);

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3. Lynn Heller, Baltimore Commission on Sustainability and Vice-President, Abell Foundation;
4. Larissa Johnson, Coordinator, Climate Change Outreach and Communication, Maryland Department of the Environment;
5. Pranay Kohli, Amidus;
6. Kathy Magruder, Executive Director, Maryland Clean Energy Center;
7. Ed Maibach, Director, Center for Climate Change Communication, George Mason University;
8. Alison Shea, Siemens;
9. Joe Uehlein, Labor Network for Sustainability.

Abby Hopper, who was Energy Advisor to the Governor of Maryland and Director, Maryland Energy Administration (MEA), was also a member of the Advisory Board until the end of 2014. Her appointment as Director of the United States Interior Department's Bureau of Ocean Energy Management has meant that she is unable to continue in that capacity. The Project benefited enormously from her advice and participation.

Overall, it is our assessment that almost every major sector will need to reduce CO₂ emissions by the target of 90 percent or more by 2050. This is because energy use is responsible for the vast majority of greenhouse gas emissions and because 90 percent reductions in some important sectors, such as aircraft fuel, may be difficult.

This report analyzes energy use in and emissions from low-income households in Maryland as well as corresponding costs. It provides some national context, and an approximate assessment for the efficiency of energy use in low-income households compared to average Maryland households. Most of the analysis is focused on low-income households that get bill payment assistance for heating or for electricity costs or both; the main aim of such programs is to reduce the burden of energy

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bills faced by low-income households and to enable heating and electricity supply to be maintained without interruption. Finally, we examine policies for ensuring greater energy affordability and analyze how weatherization and universal solar energy access might benefit low-income households as well as ratepayers and taxpayers who provide the funds for energy assistance.

The high energy burdens faced by low-income households are one part of a larger, complex combination of problems. Ultimately, the fundamental solution to high energy burdens is higher income, which means jobs that pay well, good education, a secure place to live, good health care, all of which become scarce with less income. This report deals with energy alone – and we recognize that brings with it significant limitations since we are dealing with the energy expenses side of the equation rather than the income, education, and other broader issues side. Nonetheless, energy is a critical issue in its own right because lack of it threatens health, economic security, and sometimes even life itself; for these reasons programs exist to assist low-income households to pay energy bills to ensure supply continuity and some measure of energy security, apart from other forms of assistance such as rent and food subsidies.

We are grateful to Paula Carmody, Director of Maryland's Office of People's Counsel (OPC), Seema Iyer of the University of Baltimore, and Bill Ariano and his staff at the Maryland Department of Housing and Community Development for providing many of the materials that we have used in the development of this report and for sharing their insights. Cynthia Riely (Senior Consumer Liaison, OPC) provided useful comments as well.

Besides benefiting from the review of the Advisory Board, we also received feedback from the staff of the Fuel Fund of Maryland and specifically Mary Ellen Vanni (now retired) and

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Bill Freeman (now with Grid Alternatives). They convened a meeting of Energy Advocates, a Maryland group that helps low-income households obtain energy assistance, to review and discuss the report. This meeting was very helpful in providing in-depth practical perspectives on energy assistance, on policies to reduce energy burdens, and on the Affordable Energy Program, a proposal to restructure energy assistance to low-income households. We are thankful to Tiffany Hartung, Senior Coordinator of the Maryland Climate Coalition for making the connection with the Fuel Fund. Roger Colton generously lent us his expertise regarding the intricacies of the use of federal funds in certain assistance programs called Percentage of Income Payment Plans.

We are also thankful to Rebecca Ruggles, Director of the Maryland Environmental Health Network, Cheryl Casciani, Chair of Baltimore's Commission on Sustainability, David Costello, former Acting Secretary, Maryland Department of the Environment, Crissy Godfrey, Director Energy Analysis & Planning Division of the Public Service Commission, Alice Kennedy, Sustainability Coordinator, Baltimore Office of Sustainability, and Kristin Baja, Climate and Resilience Planner, Baltimore Office of Sustainability, who, among others, have given us advice at various times along the way.¹

As always, only the authors of this report are responsible for its contents, analysis, findings, and recommendations, and any errors that remain.

A most special vote of thanks is due to the Town Creek Foundation, which has funded the Renewable Maryland Project in its entirety since its inception. It has been a special privilege

¹ Advice has been proffered in their personal capacity; organizations are noted for identification only.

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that Stuart Clarke has shared his keen insights with us from the start, and has been central to the stakeholder outreach that has been part of our work since the project's inception. We also want to thank Megan Milliken on the Foundation's staff – she has flawlessly organized several stakeholder meetings in the last two years and has participated in them.

Lois Chalmers, IEER's Librarian, provided bibliographic assistance, fact checked and proofread the report, and carefully compiled the reference list. She is always due many thanks for her painstaking efforts in these critical areas.

Arjun Makhijani, Christina Mills, and Annie Makhijani
October 2, 2015

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Report Overview

A. The Problem: Energy, Housing, and Health Insecurity

Low-income households face impossible choices between paying for energy, health, food, and housing. A 2011 national survey stated that sometime in the past five years more than one-third of them had to forgo medical/dental care and purchasing medicines because of high energy bills; almost one in five became ill because their homes were too cold. Six percent of energy assistance recipients were evicted from rental units and four percent faced foreclosure, exacerbating homelessness.

A Maryland household with average income pays 3-4 percent of their income on electricity and heating; for low-income households, that energy burden can be 10, 15, or even 20 percent and more. Why? First, low-income homes have much lower income but their energy consumption is not much lower than average. Their homes are less efficient than the average home, especially when it comes to space heating – on average they use about 50 percent more energy for heating per square foot than the average household. They tend to have older appliances and less effective insulation. Older and sicker people may also need to keep their homes warmer in the winter in order not to fall ill. Additionally, more low-income residents are renters who depend on landlords to improve their properties; yet many landlords may lack the incentive or the capital to do so. Landlords often refuse to give access to auditors even when offered free improvements, trapping low-income families with high energy bills.

B. The Social and Economic Impact

The costs to society of energy-housing-health conflicts are also huge. For instance, a 2010 U.S. Department of Housing and

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Urban Development study found that costs of housing a homeless family in Washington, D.C., ranged from \$1,251 to \$3,698 per month. Homelessness also aggravates health problems and causes new ones. A careful medical assessment of over 6,000 homeless people in Boston concluded that the added health care costs, like hospitalization and emergency room visits, compared to average low- and medium-income people totaled more than \$1,400 per month. Once homeless, all problems become more difficult and complex; individuals and families can remain homeless for weeks, months, and even years.

The problem of high energy burdens has so far been addressed by assistance with paying electricity and heating bills, though some funds are also devoted to improving efficiency. About one-third of eligible Maryland households get aid, which materially reduces their energy burdens. Even so, burdens often remain unaffordable at 7, 8, 10 percent or more of income. Further, assistance funds are limited; household income at the low end of the income spectrum has stagnated or declined; needs have increased.

C. The Solution Part I: Affordable Bills

A fundamental approach is to ensure that the energy bills of low-income families are affordable – generally defined as 6 percent of gross household income. The rest of the energy bills would be covered by public funds from various sources. Such an Affordable Energy Program was researched by the Public Service Commission staff in 2012. It has been put on the shelf mainly due to concerns about cost. But our research indicates that when the social benefits, including reduced costs of health care and homelessness, are taken into account, the overall cost of the Affordable Energy Program to the public will likely be lower than the present assistance costs. The principle of including such benefits when evaluating efficiency programs,

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including for low-income households, was ordered by the PSC in July 2015. Limiting energy bills of low-income households to six percent through the Affordable Energy Program can be the bedrock on which programs to reduce the need for assistance can be built.

D. The Solution Part II: Solar Energy, Efficiency, and Weatherization

The cost of solar installations has fallen dramatically, creating an enormous economic opportunity to bring solar to low-income households, even renters. This is a huge opportunity because providing solar energy at a discount to low-income households would reduce the costs of energy assistance.

Efficiency and weatherization will also reduce energy bills and the costs of assistance. Just one measure, a heat pump water heater, would save \$220 per year compared to a regular electric water heater. For comparison, the average electric bill assistance was \$325 per year in 2013.

The combination of investments in solar energy, efficiency, and weatherization will reduce the amount of assistance needed; in many cases, the bills will be below six percent of income, eliminating the need for assistance. The long-term social cost of a comprehensive program will likely be lower than the present assistance program, even if the number of recipients increases substantially in the future.

E. Complementary Policies

- Maryland should enforce its “minimum livability” and other codes and require landlords to allow property access for weatherization and efficiency improvements.
- Maryland should expand its efficiency and weatherization investments to bring down bills and the long-term cost of assistance.

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- All new public and publicly subsidized low-income housing should be net-zero with solar panels onsite and/or offsite. Generally, residents of such housing will not need energy assistance because their bills will be very low.
- State energy assistance programs should allow units to switch from using fossil fuels, especially propane and fuel oil, to efficient electric HVAC systems. This will save money and reduce emissions.

F. Jobs and the Environment

A solar energy and efficiency program directed at low-income households will create 1,000 to 2,000 steady jobs that will endure for at least 10 to 15 years. Reduced air pollution, CO₂ emissions, health care costs, and homelessness will be other major benefits.

I. Executive Summary

A. The context of energy justice

For low-income households, paying for electricity and heating one component of a complex set of economic problems that includes food, medicine, rent or mortgage payments, and transportation to work. Very often a single event, such as a layoff or an unexpected illness of a family member who requires care, can unleash a crisis that involves missed payments on one or more fronts. The results range from increased distress to family disaster like loss of a home or a job. Energy bills are often a principal component of the economic distress of low-income households since they run to 10, 15, 20 percent or more of gross household income. At very low levels of income – 50 percent or less of the federal poverty level – the fraction of income needed to keep the lights on and the home warm enough to ward off illness can greatly exceed 20 percent. An affordable energy burden is usually defined as being at most 6 percent of gross income; the affordable total of energy and housing costs are considered as being up to 30 percent of income.

A large part of the problem is inadequate compensation for working low-income people. This is not an ideological or political statement. It is simply a fact relating income to cost of living: when rent and energy costs are so high that people stand to lose their homes or wind up in the emergency room or both, despite working one or more jobs, incomes are not adequate to allow people to live with dignity and security. People are housing, health, and energy insecure.

Energy assistance programs reduce the burden of energy bills for those who get such assistance – generally a minority of those who are eligible for it. But for the most part, assistance does not make bills affordable in the sense of keeping them below six percent of income. Nor do assistance programs address how

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access to renewable energy and energy efficiency programs can be made equitable for low-income households, especially those who are renters.

An energy justice approach to assistance would move assistance in a direction of assured affordability and fairness so that low-income households can equitably avail themselves of opportunities to reduce energy bills, and hence the need for assistance. Given that assistance to low-income households is often accompanied by indignities and social opprobrium, an approach to assistance that leads to a structural reduction of bills, and also a structural reduction of the tendency to accumulate arrears, would not only lead to greater energy security, but also allow low-income families to meet their needs with greater dignity and on a basis more akin to non-low-income households. A direction of energy justice is but one component of social and economic justice. Nonetheless, it holds the promise of making a significant contribution to the larger issue of the well-being of low-income families, especially if jobs in the energy sector are created so as to benefit low-income neighborhoods.

In this report we:

- Analyze energy use in average and low-income households, including estimation of energy burdens in Maryland.
- Examine some of the causes of high energy burdens faced by low-income households.
- Analyze how the combination of an Affordable Energy Program that limits burdens to six percent of income and investment in solar energy and efficiency can create a direction of greatly increased energy security, reduce the need for assistance, and provide significant social

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benefits that appear likely to make the overall cost of the program lower in time.

B. Findings

1. Energy burdens of low income households are high

High household energy bills as a fraction of income, known as “energy burdens” are part of the complex of economic problems faced by low-income households. While average-income households in Maryland have energy burdens of three or four percent, low-income households’ burdens are high -- typically in the 10 to 15 percent range. For families at the lower end of the income spectrum, energy burdens are 20 percent or more. Figure I-1 shows energy burdens for the average Maryland household, the average household receiving energy assistance, and a household with income at 75 percent of poverty level.² The figure indicates that households with income significantly less than 75 percent of poverty level can have energy burdens greater than 20 percent. This is in line with national data as well.

² The term “average Maryland household” is used to denote a household with income and number of people equal to the respective averages for Maryland. Similarly, the term “the average household receiving assistance” denotes a household with the average income and number of people of all Maryland low-income households receiving energy assistance.

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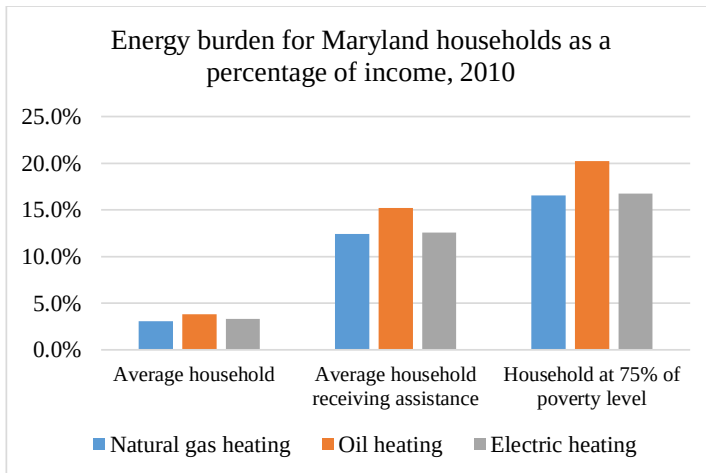


Figure I-1: Energy burdens for average-income households and households at income levels where most energy assistance is targeted.

Energy burdens can spiral to well over 20 percent at even lower levels of income than the 75 percent of poverty level shown in Figure I-1. There were on the order of a million households with children living in “extreme poverty” at the start of 2011 – a condition defined as an income of \$2 per day per person or less (in 2011 dollars), or about \$2,000 per year or less,³ about 12 percent of the federal poverty level.

At high energy burden levels, conflicts between allocating money for food, medicine, rent (or mortgage payment), and energy are frequent and often intense. They can and do have serious consequences for low-income families, including foreclosures and evictions, forgone health care, and medicines. When people become homeless for long periods of time, their life expectancy is greatly reduced.

³ Shaefer and Edin 2012, pp. 2-3

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One critical reason for high energy burdens is that energy use in low-income households is almost as high as the average household energy use, though income is more than four times lower (Figure I-2).

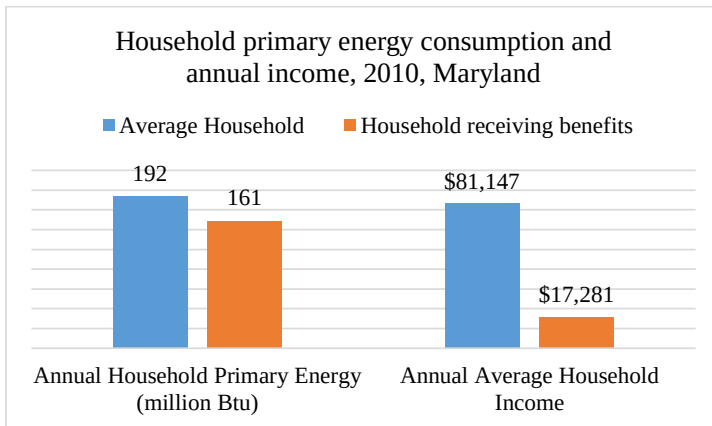


Figure I-2: Average primary energy consumption and annual incomes in Maryland for average-income households and low-income households. Source: IEER.

2. Energy efficiency of low-income houses is relatively low

There are many reasons why energy consumption stays high even though income declines. One principal reason appears to be that low-income homes are less efficient than the average – that is they require more energy to provide the same energy services – heating, lighting, and running appliances than the average house. This is especially true when it comes to heating. Low-income household heating energy use per square foot is about 50 percent more than the average; in this context it is important to remember that the average residential household is also not very efficient. Figure I-3 shows the efficiency per square foot for all energy uses and for heating alone, for both an average household and a household receiving heating assistance.

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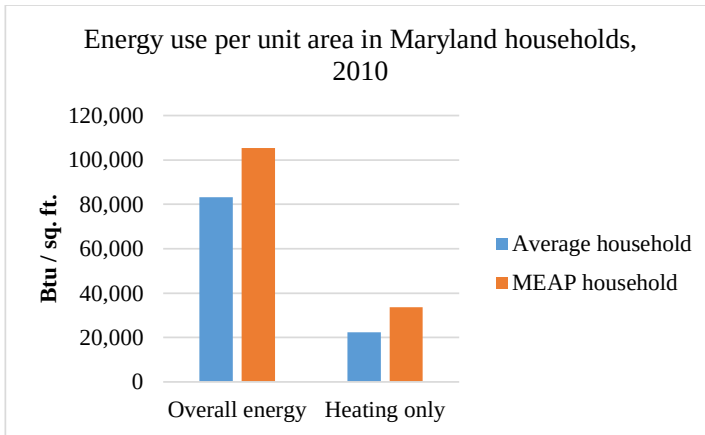


Figure I-3: Total and heating only primary energy use per unit area, average for all Maryland households and the average for low-income households receiving heating energy assistance from the Maryland Energy Assistance Program (MEAP).

The lack of incentive for landlords to invest in energy efficiency who do not pay the energy bills is a well-known problem – it is called the “split incentive.” Since a higher proportion of low-income families are renters, the split incentive problem affects them disproportionately.

3. High energy bills can and do have severe, even devastating consequences for low-income families

Low-income households face impossible choices between paying for energy, health, food, and housing. A 2011 national survey of households receiving assistance found that in the previous five years more than one-third had to forgo medical/dental care and purchasing medicines because of high energy bills; almost one in five had someone become ill because their homes were too cold. Six percent were evicted from rental units and four percent faced foreclosure, exacerbating homelessness.

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The costs to society of energy-housing-health conflicts are also huge. For instance, a 2010 U.S. Department of Housing and Urban Development study found that costs of housing a homeless family in Washington, D.C., ranged from \$1,251 to \$3,698 per month. Homelessness also aggravates health problems and causes new ones. A careful medical assessment of over 6,000 homeless people in Boston concluded that the added health care costs, like hospitalization and emergency room visits, compared to average low- and medium-income people are more than \$1,400 per month. The life expectancy of homeless people is drastically lower than average. Once homeless, all problems become more difficult and complex; individuals and families can remain homeless for weeks, months, and even years.

There are also costs to a variety of other parties. Utilities face higher unpaid bills; landlords do not collect as much rent as they might otherwise. Almost one-third of energy assistance recipients did not pay their full rent or mortgage payment sometime over a five-year period – adversely affecting landlords and banks.

4. Current energy assistance programs materially help aid recipients

A federal assistance program for heating bills and a state/utility program for electricity bills both help reduce energy burdens significantly. However, even after assistance energy burdens for low-income households exceed the affordable six percent amount.

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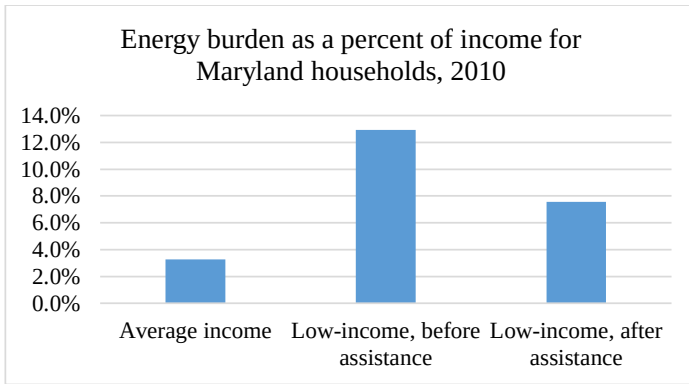


Figure I-4: Average, pre-assistance and post-assistance energy burdens in Maryland. Source: IEER.

The areas where more than 10 percent of households apply for energy assistance are Garrett and Allegany counties in Western Maryland, the City of Baltimore, and Caroline, Cecil, Dorchester, Kent, Somerset, Wicomico, and Worcester counties on Maryland's Eastern Shore.

Heating assistance funds come entirely from the federal government; they are administered by the state under the rubric of the Maryland Energy Assistance Program (MEAP). Electricity bill assistance (the Electric Universal Service Program (EUSP) funds are a mixture of electricity ratepayer and other funds, including funds allocated from the Regional Greenhouse Gas Initiative (RGGI), in which Maryland participates. While the number varies from year to year, about 120,000 Maryland households receive energy bill assistance (heating or electricity or both).

5. Current assistance programs are insufficient and also do not address the problem of energy insecurity structurally

Only about one-third of Maryland's low-income households who are eligible for assistance get it. Yet, incomes are

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stagnating or declining and needs have been growing. Energy burdens after assistance are significantly lowered, but remain high – more than 7 percent for the average low-income assistance recipient. But in many cases energy burdens can be 10, 15, or even 20 percent of income, even after assistance.

More fundamentally, energy bill assistance does not address the problem structurally – it does not reduce the need for assistance. Efficiency and weatherization programs are aimed at doing that, but they are limited, and face many obstacles, especially for renters.

Further, one of Maryland's rules for efficiency actually prohibit some investments that could significantly reduce energy burdens and hence the need for assistance. Specifically, the funds of the state's efficiency program, EmPOWER, cannot be used in investments that involve fuel switching; for instance, assisting a low-income household in shifting from expensive oil and propane heating to invest in efficiency electric HVAC systems is not allowed. However, such fuel switching is available to households who do not need assistance for paying their energy bills. There are even state and utility programs that provide incentives for efficient electric technologies, such as highly efficient heat pumps, even when they involve fuel switching. This is both unfair to assistance recipients and wasteful for taxpayers and ratepayers, because it perpetuates the need for assistance, instead of reducing it.

6. The hurdles in making low-income homes more efficient are immense, even when the funds are forthcoming, especially in privately-owned rental housing.

Many landlords are resistant to efficiency improvements even when they are offered free by government-sponsored or -mandated efficiency programs. A weatherization pilot program in Baltimore found that “the **landlord is a unique and major**

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barrier [to weatherization] **for renters.**" Of the barriers, permission to enter was the biggest: "Nearly half (46%) of all tenants who applied could not get permission for audit despite qualifying for weatherization otherwise."⁴

The issue of weatherization in low-income rentals raises the question: if tenants can be evicted for failure to pay rent, with the costs of homelessness to be borne at least in part by the public, why cannot landlords who spurn help be compelled to bring their properties into conformity with the law or else forfeit them to public ownership?

The problem of a lack of permission from the landlord to enter the property for an audit appears to be particularly serious where it concerns unsubsidized privately-owned low-income rental housing. A pilot project in Baltimore found that in most cases such privately-owned rental units tend to not be up to code. This commonplace lack of compliance exists despite the fact that Maryland has a "livability code" that requires rental properties (and others) to be maintained according to an international code of maintenance. Lack of code compliance may be a critical reason for refusal of permission to enter and hence a significant barrier to implementing energy efficiency measures. But whatever the set of reasons, the result is inefficient low-income rental housing and high energy bills. Such housing may also be unhealthy on other grounds.

Low-income efficiency assistance programs are still in their early stages in Maryland. These include weatherization and replacing heating systems and appliances with more efficient

⁴ Pontious 2012, pdf p. 10 (bold in original)

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models. However, verification of the impacts indicated that early estimates of savings were rather optimistic. They also indicated problems with baseline data – that is, electricity use prior to weatherization. Nonetheless, an energy-bill based review indicated significant benefits, even if in most cases the direct economic benefits were less than the costs.

7. Low-income households lack access to solar energy, despite its rapidly declining cost

Low-income households are almost completely excluded from the economic benefits of solar energy. Low rates of homeownership, lack of a broad community solar program from which renters can benefit, and other factors contribute to this result. **The lack of a broadly applicable virtual net metering law is an also an obstacle.** Recent community solar legislation in Maryland has allowed for a three-year community solar pilot program to be developed by the Public Service Commission (PSC). A stakeholder group will produce a final report documenting the pilot program, including any success of reaching low-income communities.⁵ However there is no requirement in the program development to consider the particular concerns of low-income communities. It is also on a pace that is slow; it will be a long time before a significant fraction of low-income households can benefit from community solar energy.

⁵ “The Public Service Commission, in consultation with the Maryland Energy Administration, shall convene a stakeholder workgroup to study the value and costs of the pilot program established under § 7-306.1 of the Public Utilities Article, as enacted by Section 1 of this Act and make recommendations to the Commission on the advisability of establishing a permanent program... In conducting the study, the workgroup shall identify and examine: ... (12) how community solar project developers can increase participation by low- and moderate-income retail electric customers in community solar projects;” See Maryland House Bill 1087 (2015), Section 2(a) and (b).

8. Universal solar access would lower the cost of assistance

Solar energy costs have declined to a point that larger-scale distributed installations are lower in cost than regular residential electricity costs. This is a recent development in Maryland. **If utilities were required to acquire solar energy for low-income households on a commercial basis, it would lower the electricity bills of low-income households that get assistance, and therefore also lower the cost of assistance.** This conclusion assumes that the largest subsidy to solar energy – the federal investment tax credit of 30 percent – will expire at the end of 2016 as scheduled at the time of this writing (August 2015). Other solar subsidies, such as solar renewable energy credits and rebates on the first cost of solar installations, are also not required. Solar energy acquisition for low-income households can be done outside of the context of renewable portfolio standards and other climate considerations. There would be a climate protection benefit as well as other pollution reduction benefits of added solar energy acquisition.

9. More than 1,000 long-term jobs would be created by implementing a universal solar access and intensive efficiency improvement program for recipients of energy assistance.

Marylanders currently send more than \$10 billion out of state each year to purchase natural gas, petroleum, and to import electricity. Building solar facilities in the state that are dedicated to supplying low-income households would keep some of that money in-state and also create jobs; efficiency programs would also have the same effect. Our initial estimate shows that 1,000 to 2,000 jobs would be created by a comprehensive program to provide universal solar access and efficiency improvements to current recipients of energy assistance. They would endure for 10 to 15 years. Of course, this is only a small slice of the new jobs in the broader transition

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to an efficient and renewable energy system overall in Maryland.⁶

10. CO₂ emissions would be significantly reduced by implementing a program of universal solar access and efficiency for low-income households.

Residential energy-related greenhouse gas emissions are about 22 percent of Maryland's total. Emissions from energy use in low-income households eligible for assistance (361,000 in 2011) are about 3 percent of Maryland's energy-related CO₂ emissions; households receiving energy assistance account for almost 40 percent of that 3 percent. Making the homes of those now receiving assistance more efficient and converting the electricity supply to solar would make an important dent in Maryland's residential sector emissions. The emissions-reduction benefit could be increased if the program were to be extended to low-income households not now receiving assistance.

C. Recommendations

1. The Affordable Energy Program, which would put a cap on energy burdens, should be the foundation of energy assistance

The most basic approach to addressing the core problem of assistance is to put a limit on household energy expenses in relation to income. Just such a program, called the Affordable Energy Program (or Plan), has been proposed in Maryland.

In 2012 the Maryland Public Service Commission (PSC) initiated a review of the adequacy of the Electric Universal

⁶ We will address the transition to an emissions-free energy future as part of the Renewable Maryland Project's final report on the topic. This report will also include an estimate of the total number of steady, well-paying jobs that would be created in the process.

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Service Program. The PSC Staff, with the collaboration of the Office of People's Counsel, prepared a proposal under which **energy burdens, including natural gas (where applicable) and electricity, should, in general, not exceed 6 percent of gross income.**⁷ The program has not yet been adopted, but the matter could be reopened for possible further consideration.

While there would be some provision for crisis assistance, the AEP would put low-income households on a par with non-low-income households in that they would be responsible for the affordable portion of their energy bills. For many households with income at the higher end of eligibility for assistance, this would mean payment of the entire energy bill. For the rest, responsibility would be for payment up to 6 percent of gross income; assistance would cover the entire amount above that.

In this report we assume here that the necessary regulatory and legislative changes to merge the available streams of funds would be taken so that the gas and electricity burdens combined are limited to six percent. Legislative and regulatory changes would be required to accomplish that. On that basis, and using the energy analysis of Maryland low-income household energy use, we estimate that the direct cost of energy assistance would have been about \$29 million more in 2013 compared to the actual cost under the current program of about \$121 million, assuming the same number of recipients. The number of recipients may go up under an AEP. The cost increase is not likely to be proportional to the increased number of participants,

⁷ Maryland AEP 2012, pp. 1-6. The 6 percent figure was arrived at by a general rule that housing plus utility expenses should not exceed 30 percent of gross income and energy expenses not be more than 20 percent of that. In households with both electricity and natural gas bills, there would be a maximum sublimit of 3 percent for each. See also Maryland AEP 2013. For oil and propane heated homes, we assume that heating assistance would continue as at present; in such cases, electricity assistance would limit electric bills to 3 percent of gross income.

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since present assistance is oriented to those most in need at the lower end of the low-income spectrum.

2. Low-income assistance recipients should be granted a choice of getting their electricity from solar thereby reducing the cost of assistance, promoting equity, creating local jobs, and reducing emissions.

Megawatt-scale distributed solar energy is now more economical in Maryland than grid residential supply even without the 30 percent federal investment tax credit. Procuring solar energy supply dedicated to energy assistance recipients would reduce the cost of assistance and reduce emissions of CO₂ and other pollutants. State subsidies and mandates, such as rebates or solar renewable energy credits are not required for this. Distributed solar energy installations in, or close to, the communities served by energy assistance programs would also create local jobs and provide opportunities for job training.

A program of solar energy procurement along the lines of community choice aggregation should be implemented; low-income households applying for assistance would automatically be signed up for solar supply unless they choose to opt out of it. On this basis, utilities could procure a supply competitively, using the instrument of purchased power agreements. We recommend that distribution utilities (or their local subsidiaries) be allowed to participate in the competitive bidding, but not allowed to include the facilities in the rate base, should they win the contracts.

3. The non-energy benefits of the Affordable Energy Program should be taken into account – they are huge, and are likely to offset the increased direct cost of assistance.

There would be large non-energy benefits from an implementation of the AEP; when they are taken into account,

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the net costs may be lower than at present, for the same number of recipients. In July 2015 the Maryland PSC ruled that if the costs to participants in energy efficiency programs are taken into account, then the benefits that accrue to them and to society at large also need to be factored into program decision-making.⁸ The same thinking needs to be applied to the AEP, which would produce a host of non-energy benefits, including more money for food and medicine (and therefore better health), reduced evictions due to non-payment of energy bills, reduced bill payment arrearages, as well as greater incentives for the State of Maryland to promote conservation and efficiency (since that would reduce the costs of the program). We estimate that **the reduction in shelter and health care costs due to reduced homelessness alone is likely to be amount the same as the increase in the direct cost of the AEP for current recipients of aid.** Other non-energy benefits, such as increased rent and utility bill collections, and better performance at school and work due to reduced stress on household budgets would likely make the net social cost lower than the present program. **A major policy issue is how to gather the quantifiable benefits and costs into a single stream and allocate them fairly to various parties.**

4. A comprehensive Affordable Energy Program, including universal solar access and efficiency investments should be implemented; the net cost of such a program for current recipients is likely to be lower than at present; there is more uncertainty about net costs if the number of recipients of assistance increases significantly under an AEP.

Solar energy acquisition would not only reduce the costs of assistance by lowering the cost of electricity for low-income

⁸ Maryland PSC 2015, pp. 13-16

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households. It would create a number of non-energy benefits including reduced air pollution, reduced CO₂ emissions, increased jobs, and, if implemented on a neighborhood basis, possibilities for job training and community economic development. We used the middle estimate (of three) for air pollution reduction and CO₂ emission reduction benefits from in a 2014 study commissioned by the Maryland Public Service Commission. When these are added to the non-energy benefits of reduced costs of shelter and health care due to reduced homelessness, the net benefits of the AEP become very large over time as the solar energy acquisition increases, as can be seen in Table I-1.

Table I-1: Comparison costs and benefits of an Affordable Energy Program, with and without solar energy, to the present assistance program. Numbers in parenthesis and red mean cost savings.

	AEP no solar (2017)	AEP with solar (2017)	AEP with solar (2031)
Total 2013 assistance costs	\$121,000,000	\$121,000,000	\$121,000,000
Total AEP costs	\$150,000,000	\$149,000,000	\$119,000,000
Added AEP costs over present program	\$29,000,000	\$28,000,000	(\$2,000,000)
Non-energy benefits	\$32,000,000	\$35,000,000	\$71,000,000
Net costs	(\$3,000,000)	(\$7,000,000)	(\$73,000,000)

Source: IEER calculations.

Note 1: Estimates based on the number of assistance recipients in 2013

Note 2: All costs, including heating and electricity bill assistance, arrearage assistance, and administrative costs.

Note 3: Administrative costs of the AEP assumed to be double those of the present program

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If the AEP is implemented using funds only from residential electricity ratepayers, but implemented with acquisition of solar energy, the added costs per month would be modest initially and decline to a small level. These costs would be more than offset by the social benefits, as can be seen in Figure I-5.

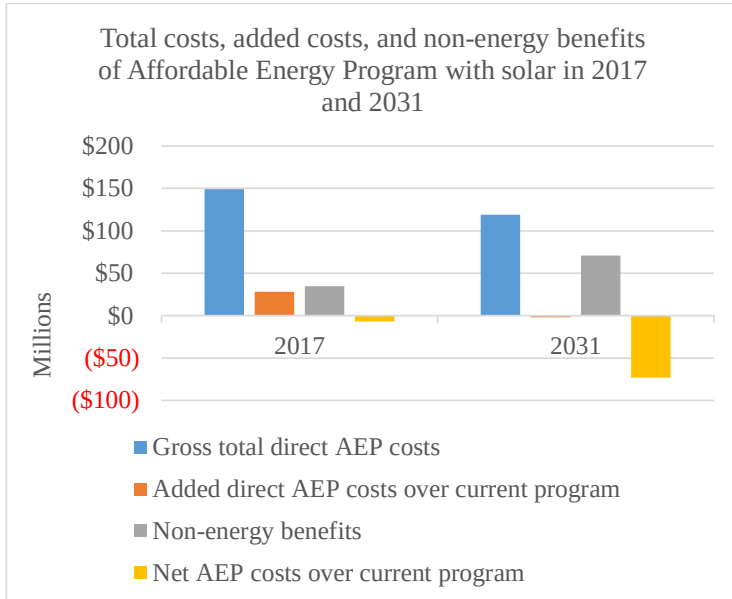


Figure I-5: Gross and net total costs in 2017 and 2031 for an Affordable Energy Program, with universal solar access, for all current energy assistance recipients. Source: IEER calculations.

Note 1: Number of residential ratepayers assumed to grow at the rate of Maryland population growth.

Note 2: Acquisition of solar energy assumed to take place in 15 equal increments, starting in 2017 and ending in 2031.

It is difficult to estimate the costs and benefits in the case of a much larger number of applicants. The cost per recipient is likely to be lower, but the benefit in terms of reduced health and shelter costs are also likely to be lower. The gross and net social

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costs of an AEP with double the number of recipients, if both costs and benefits per recipient remain the same as for current recipients, are shown in Table I-2. This is a highly simplified conceptual calculation.

Table I-2: Direct and net social costs of an AEP, with universal solar access, with double the number of recipients of 2013. Numbers in parenthesis and red mean cost savings.

	2017	2031
Direct AEP incremental cost over 2013 baseline	\$177,000,000	\$117,000,000
Non-energy benefits	\$70,000,000	\$142,000,000
Net added cost for double the recipients	\$107,000,000	(\$25,000,000)

Source: IEER calculations.

Note 1: Number of residential ratepayers assumed to grow at the rate of Maryland population growth.

5. Implement a pilot program to determine the parameters, including costs and non-energy benefits across the range of eligible low-income households

A pilot program of sufficient scope is necessary to estimate the scope of the costs and benefits of an Affordable Energy Program. As noted, both the costs and benefits of adding recipients who are eligible but not currently recipients of assistance are likely to be lower per-recipient than for current recipients. The range of quantifiable non-energy benefits is very large – from reduced expenditure on health care to improved collection of rent and utility bills. But the specific costs and benefits are likely to vary considerably within the broad income criteria of eligibility for assistance in Maryland, up to 175 percent of the federal poverty level. Further, the energy characteristics of assistance vary a great deal across the areas of Maryland where there is a high rate (more than 10 percent of households) of applications for energy assistance – the two

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westernmost counties (Allegany and Garrett), the City of Baltimore, and most counties on the Eastern Shore. The fuels used for heating, the efficiency potential, and the potential for megawatt-scale distributed solar all need to be scoped out and integrated into program design and cost estimation. Income distribution within the low-income category may also be different in different areas of Maryland, including among current non-recipients of assistance. The non-energy benefits may also vary greatly in the three regions of highest need.

In view of the uncertainties, we recommend an intensive pilot program, which would include a sufficient number of households (at least several hundred) in each of the three areas to determine the cost and benefit parameters of an Affordable Energy Program with solar and efficiency as critical components. The number of households in each area would be determined so as to yield statistically reliable results for program design, cost estimation, and policy structure. In regard to policy structure, it will be important to structure the funding of the program to reflect, at least in part, the fact that benefits will be spread widely across government departments and private parties, including landlords and utilities. The pilot program should also be designed to collect detailed energy use and housing structure data. That would benefit assistance programs broadly.

6. Efficiency and weatherization programs should be offered widely and be structured so as to reduce the need for energy assistance.

There are certain efficiency programs that provide clear benefits and short payback times. For instance, the annual reduction in the cost of water heating with a heat pump water heater would be \$220 when compared with a regular electric water heater. For comparison, the annual electricity bill assistance in 2013

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averaged \$325.⁹ Going from incandescent bulbs to LEDs is widely recognized (and implemented) as an energy efficiency measure with a short payback time. Going from oil and propane heating to highly efficient heat pumps would eliminate most heating costs. For a typical single family home, the cost would decline from about \$1,400 per year to less than \$500 if a cold climate heat pump is used. Of course, such heat pumps have higher first cost.

The main point is that with up front investments in carefully selected energy efficiency measures, the need for assistance can be greatly reduced and, in many cases, eliminated. In the context of an Affordable Energy Program, the reduction in energy bills would be directly reflected in a reduction of program cost. And to the extent that bills are reduced below 6 percent of gross income, other areas of life in a low-income household, such as health care, nutrition, and ability to meet housing costs, would benefit greatly. There would be attendant non-energy benefits.

Weatherization is a more complex issue. It is essential that baseline data be correct and that post-retrofit evaluations be done based on bills, supplemented by measurements. Research in Baltimore has shown that programs to improve housing are more effective when the health issues, such as lead paint abatement, are considered along with energy issues. Indeed, when there is an intensive engagement in a particular area, investment by non-recipient households can increase, multiplying the value of assistance programs.

⁹ This does not include assistance with arrearages.

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7. Access to low-income rental housing for efficiency improvements should be generally secured; among other things, Maryland's livability code should be enforced with special emphasis on low-income rental housing.

Efficiency improvements reduce energy bills and the need for assistance. Landlords who do not allow access to their properties for efficiency improvements impose significant burdens not only on the renters but on the public purse (ratepayers and taxpayers). Many properties are not up to the housing code. The question therefore arises as to why landlords should have access to public resources, such as the sheriff's office for evictions, when their properties are not in compliance with legal requirements. Among other things, the use of public resources should be denied to landlords who do not allow access to their properties for efficiency and weatherization programs.

Enforcing Maryland's livability code should be one important component of securing access and of improving low-income rental housing stock.

8. The rule prohibiting the use of EmPOWER efficiency funds for fuel switching should be rescinded.

Switching from fuel oil and propane to efficient electric heating would greatly reduce heating bills and hence the need for regular energy assistance. It may even eliminate the need for assistance in the context of an Affordable Energy Program. Allowing fuel switching to efficient electric systems would also reduce greenhouse gas emissions and make heating systems renewable-grid ready. In other words, CO₂ emissions would decline even further as emissions from electricity generation are reduced.

Allowing fuel switching would also increase jobs in Maryland, since expenditures to install efficient electric systems would be

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made instead of year-in-year-out expenses for importing fuel oil and propane from out of state.

9. All new public and publicly-subsidized low-income housing should be net-zero in energy use.

It is less expensive to build efficient housing from the start than to retrofit existing housing to make it more efficient. It is also less complex to design new housing to include solar energy supply. Heating should preferentially be of the highly-efficient electric variety. In some cases, multi-story housing for instance, there may not be enough roof area or land to build enough solar capacity to supply the entire electricity requirements. In such cases, offsite construction of supplementary solar to make the net energy requirements from external sources equal to zero, should be required.

II. Scope of the problem – energy use, bills, and burdens

Energy use in households is far less variable than income and tends to decline far more slowly than income. This is understandable – energy, including for heating and cooling, but also for refrigeration, water heating, and lighting – is, like food, a necessity. Households tend to sacrifice other things as income goes down in order to keep up with energy costs. In Maryland, low-income households, for purposes of assistance with heating or electricity bills or both, are defined as those with incomes less than 175 percent of the federally defined poverty level.¹⁰

A. Energy use

Table II-1 shows national data for average energy use in all households, average use in all households that are not low-income, all low-income households, and low-income households that get government and/or utility assistance to pay their energy bills. Note that upstream losses, such as thermal losses at electricity generation stations, are not included in the energy

¹⁰ Maryland PSC 2013, p. 2, for assistance with electricity bills, and Maryland Budget Analysis FY2016, p. 31, for heating assistance. Income eligibility limits are at Maryland DHR Eligibility 2014. Maryland's EmPOWER energy assistance program provides weatherization assistance, for which the income criterion is 200 percent of the federal poverty level (EmPOWER 2015). Nationally, states are allowed to set the maximum income level at which assistance will be considered (not all applications accepted result in grants of assistance). The federal upper limit is 150 percent of poverty level or 60 percent of the state median income, whichever is greater, but the cutoff can be as low as 110 percent. See LIHEAP Campaign 2014, p. 7. There is also assistance given at most once every seven years to retire cumulative arrears in electric bills; waivers to the seven year rule are possible (Maryland EUSP Plan FY2015, pp. 11, 14-15). This program is part of the Electric Universal Service Program (EUSP) and is designed to prevent cutoffs of electricity supply. We will not deal with the arrearage part of the program in this report.

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data in Table II-1 (or in subsequent tables unless otherwise mentioned).

Table II-1: Average energy use per household in the United States in FY 2010 for all uses, by income level and by the main heating fuel used.

Census Region	All fuels (MMBtus)	Natural Gas (MMBtus)	Electricity (MMBtus)	Fuel Oil (MMBtus)	Kerosene (MMBtus)	LPG (MMBtus)
US - All households	97.8	113.8	63.2	143.9	55.3	112.9
US - Non low-income households	104.1	118.7	68.1	152.8	61.3	119.8
US - Low-income households	86.1	103.5	54.7	130.1	54.2	99.8
US - LIHEAP recipient households	104.6	114.7	50.7	147.4	77.9	113.7

Source: LIHEAP 2010 Notebook, Table A-2 (p. 57)

Note: The energy use includes all end uses, including heating, cooling, refrigeration, lighting, etc. The households are classified according to the main fuel used for space heating. MMBtu means million Btu. Electricity is converted to Btu at 3,412 Btu = one kilowatt-hour electrical. Energy use is the total at the point of use. Losses at power stations and in delivering fuel are not included.

We can draw several conclusions from Table II-1. First, energy use of all low-income households is lower than the average for non-low-income households by about 17 percent.¹¹ Second,

¹¹ A similar difference (about 20 percent) was found for the year 2009 in the U.S. Energy Information Administration residential energy consumption

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while the differences vary according to the fuel used for heating, the energy consumption in low-income households is consistently lower. Third, households that get energy assistance through LIHEAP (Low Income Home Energy Assistance Program) and use fossil fuels for heating use about the same amount of energy on average as the average for non-low income households.¹²

A comparison of all low-income households with those receiving assistance shows that those receiving assistance use more energy than those who do not. A principal reason may be because low-income households with high energy use and bills are more likely to seek and get assistance. Other reasons may include:

- Households receiving assistance are more likely to live in colder climates.
- LIHEAP households may have more members per household than other low-income families.

Since age is one criterion for getting assistance, LIHEAP households may keep winter temperatures higher than other low-income households. Table II-2 shows the average heating energy use by income level for the United States as a whole. Since low-income homes are smaller than average homes, the data indicate that low-income homes are more inefficient. We

survey. See EIA RECS 2009 Data, Table CE 2.1 for households with income below 150 percent of the federal poverty level compared to those above.

¹² The LIHEAP heating assistance program is known in Maryland as the Maryland Energy Assistance Program (MEAP). LIHEAP programs across the country, including in Maryland, are federally funded. The Maryland electricity bill assistance program is known as the Electricity Universal Service Program (EUSP); it is funded from state and electricity ratepayer money. There is overlap between the two programs in that heating assistance is provided to households who use electricity as their heating fuel. In Maryland, coordination is achieved, among other methods, by a single application for both heating and electricity assistance (Maryland DHR Application FY 2015).

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quantify comparative heating and overall energy efficiency for Maryland in Section 0.

Table II-2: Average heating energy use per household in the United States in FY 2010, according to heating fuel and income group.

Census Region	All fuels (MMBtus)	Natural Gas (MMBtus)	Electricity (MMBtus)	Fuel Oil (MMBtus)	Kerosene (MMBtus)	LPG (MMBtus)
US - All households	40.4	52.4	9.7	92.7	21.5	55.6
US - Non low-income households	41.6	52.1	10.3	96.1	25.5	60.9
US - Low-income households	38.1	53.1	8.7	87.4	20.7	45.6
US - LIHEAP recipient households	53.8	62.5	9.4	93.6	25.5	50.2

Source: LIHEAP 2010 Notebook (2013), Table A-5 (p. 62)

1. Energy burdens, national data

Since household energy use declines much more slowly than income, if at all, the fraction of income going to energy bills, known as the “energy burden,” is greater in low-income households. Table I-3 shows national data for energy cost and average individual energy burden¹³ as a fraction of income for the same four income groups, by main heating fuel used.

¹³ Energy burden is calculated in two ways. The “mean individual burden” is computed by first calculating the percentage of income spent on energy by each household in the group. The mean individual burden is the average of all these percentage values. The “mean group burden” is calculated by adding all the energy expenditures and all the income of households in the group and

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Table II-3: Energy expenditures and average individual energy burdens by income group and main heating fuel used in the United States in FY 2010

Census Region		US - LIHEAP recipient households	US - Low-income households	US - Non-low-income households	US - All households
All fuels	\$ per year	\$1,986	\$1,830	\$2,277	\$2,120
	% of income	15.40%	13.20%	3.50%	6.90%
Natural gas	\$ per year	\$1,762	\$1,663	\$2,149	\$1,993
	% of income	13.40%	11.20%	3.10%	5.70%
Electricity	\$ per year	\$1,346	\$1,653	\$2,059	\$1,908
	% of income	15.10%	13.40%	3.40%	7.10%
Fuel oil	\$ per year	\$3,596	\$3,155	\$3,841	\$3,570
	% of income	24.90%	22.30%	5.50%	12.10%

Source: LIHEAP 2010 Notebook (2013), Tables 2-1a, 2-1b, 2-1c, 2-1d (pp. 4-5)
Note: For brevity we have omitted LPG and kerosene heated households

obtaining the overall energy expenditure as a percentage of total income for the group. Mean individual burden is more indicative of the typical situation of households in the group in regard to energy expenditures. Mean group burden is more useful for estimating the impact of policies to provide assistance to a group of low-income of households.

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The energy burden of low-income households varies by the fuel used for heating, being the highest for fuel oil. Propane heating is comparable to fuel oil. Almost 20 percent of Maryland homes use these two fuels for heating.¹⁴ The burdens shown in Table I-3 are averages for each group. However, the “low-income” group covers a very wide array of incomes and household situation. Energy burdens in the very lowest brackets (less than the federal poverty level) are very high. For instance, in Maryland, households with income at less than 50 percent of the federal poverty level in 2014 had an estimated average energy burden of 40 percent.¹⁵

Eligibility criteria for heating assistance are set by the states with federal guidance. Electricity bill assistance is based on state decisions (including by Public Service or Utility Commissions); the federal government is not involved in them, except that the heating assistance portion for electrically heated homes comes from federal funds. We will use 2010 as a reference year in this analysis since we have detailed Maryland energy data for 2009, 2010, and 2011.

State eligibility criteria vary a great deal. Most states use a percentage of the federal poverty level to define heating assistance eligibility; the criteria ranged from 110 percent (Michigan, North Carolina) to 225 percent (New Jersey) in FY 2010. A number of states use a percentage of state median income to define eligibility. The maximum percentage for determining poverty levels allowed under federal guidelines was 75 percent of median income. For the states using median income criteria, the maximum income eligibility ranged from 167 percent of the federal poverty level (Louisiana) to 266 percent (Connecticut). New England states tend to have a higher

¹⁴ KEMA Draft 2011, Table 3-3 (p. 25)

¹⁵ Fisher, Sheehan & Colton 2015, pdf p. 4

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threshold for qualification, presumably because fuel oil heating, which is the most expensive, is still common in the region.¹⁶

Nationally, about 30.37 million (about 26 percent) households had incomes that were low enough to qualify them for assistance in paying their heating bills under state criteria prevalent in FY 2010; the maximum federal criteria would qualify many more. Figure II-1 shows the national trends from 1981 to 2010 in the number of households eligible for heating assistance under maximum federal criteria and the number actually getting it. Generally, the need increased in the 1980s and 1990s but the fraction of households getting assistance tended to decline. Between 2005 and 2010, both the number of eligible households and assistance recipients increased. Besides income, need for heating assistance depends on the weather in any given year and fuel prices. An analysis of the combination of these factors in the period 2005-2011 showed that the impact varied considerably. In some regions, such as New England, the ratio of assistance needed to that available did not deteriorate in this period relative to a 2007-2008 reference year. But in other regions, including the South Atlantic, which includes Maryland, there was a marked deterioration in the latter part of the period.¹⁷

In FY 2011, the maximum federal criterion for eligibility was changed to the greater of 150 percent of the federal poverty level or 60 percent of the state median income.¹⁸ This drastically reduced the maximum number of households that

¹⁶ LIHEAP 2010 Notebook (2013), p. i, footnote 3, for the state median income percentage, Table B-3 (p. 70) for eligibility criteria, and Table A-4 (p. 61) for heating fuel saturation data.

¹⁷ Colton 2014, p. 15 and p. 17

¹⁸ LIHEAP 2011 Notebook (2014), p. i, footnote 2, and Table B-3, note 2 (p. 106)

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were theoretically eligible from 44 million in 2010 to 36 million in 2011.¹⁹

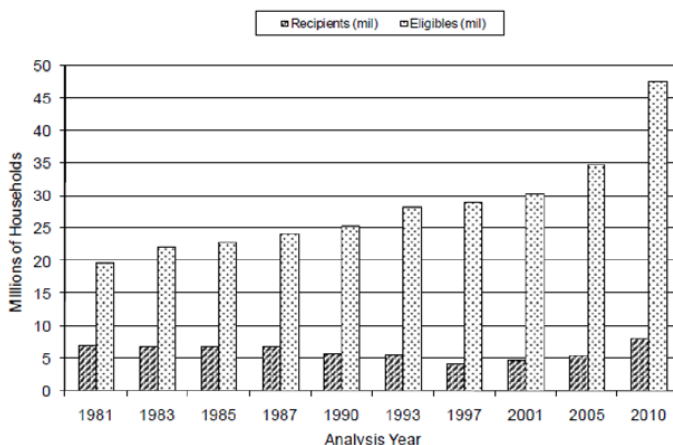


Figure II-1: Number of income-eligible households for heating and/or winter crisis assistance, and the number of households receiving assistance, FY 1981 to FY 2010. Source: LIHEAP 2010 Notebook (2013), Figure 11 (p. xi).

2. Consequences of high energy burdens

The energy burdens in

above represent the average values for that income group. Within those groups there are many households that have energy burdens that are higher. For those with the lowest incomes among low-income households, energy burdens, even with the less expensive fuels, can reach over 20 percent. This creates what are sometimes called “heat or eat” conflicts;²⁰ in reality the conflicts are often not only between energy and food, but also

¹⁹ LIHEAP 2010 Notebook (2013), Table B-4, and LIHEAP 2011 Notebook (2014), Table B-3. There are slight discrepancies for 2010 between the chart shown in Figure I-1 and the LIHEAP notebook data for 2010 cited in this footnote.

²⁰ Frank et al. 2006

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include other critical needs, including medical care and rent. A 2011 survey by the National Energy Assistance Directors' Association found that over five years, low-income households that received assistance in one or more of these years still faced severe distress in many areas:

Because of the difficulty they faced in paying their utility bills, these vulnerable households were forced to make choices that carry serious health risks. As many as **37 percent** went without medical or dental care, and **34 percent** did not fill a prescription or took less than their full dose of prescribed medication. In addition, **19 percent** became sick because the home was too cold.²¹

The survey also found clear evidence of rent or mortgage payment conflicts with energy bill payments, including evictions that resulted from such conflicts:

Many LIHEAP recipients had difficulty paying for housing, in part because of their energy burden. Almost one-third did not make their full mortgage or rent payment. *Six percent were evicted from their homes or apartments, and four percent faced foreclosure on their mortgages.*²²

These problems are, of course, most severe for those experiencing them. But it should be noted that the costs to the public of caring for homeless people, especially if they are ill, can run into thousands of dollars per month, while energy

²¹ NEADA 2011 Brief, pdf p. 3, emphasis in the original. See also NEADA 2011, where the survey is described in detail.

²² NEADA 2011 Brief, pdf p. 7, italics added.

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assistance is typically under \$100 per month. (See Section VIII below for further discussion of non-energy benefits.)

Finally, about a third of LIHEAP recipients resort to using kitchen stoves or ovens to heat their homes. The use of gas stoves or ovens, especially if they are not tuned and maintained, can cause high indoor carbon monoxide levels, leading to poisoning and even death. Carbon monoxide related deaths have been documented throughout the United States, including in Maryland's largest city, Baltimore.²³ But it is unclear how many of these are related to contingencies like furnace failure, lack of appropriate heating equipment, as distinct from inability to pay electricity, natural gas, or fuel oil bills.

About one-fifth of residential fires nationally are due to causes related to home heating. In the 2002-2004 period, there were 49,100 heating-related residential fires per year on average; annual damages were 125 deaths, 575 injuries, and property losses of \$232 million.²⁴ We do not have comparable data for fires in low-income homes. Residential fires have been declining slowly over the years.²⁵ There were 57 deaths due to residential fires in Maryland in 2013. There were four fatalities related to heating and lighting (candles) while the causes of about one-sixth of the fatal fires were undetermined.²⁶

There are also a large number of other collateral effects on third parties, such as increased arrears in bill payment, increased rate of failure to pay rent (and hence lower rent collections), etc. Such considerations will inform our recommendations on

²³ Birkby 2008, see especially slides 9, 12, and 19.

²⁴ National Fire Data Center 2006, p. 1 and Figure 1

²⁵ Data are available at the US Fire Administration website, at <http://www.usfa.fema.gov/data/>.

²⁶ Maryland Fire Marshal 2013, p. 3 and p. 5. There was a total 69 fire deaths in Maryland in 2013.

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energy and assistance policy in regard to low-income households.

3. Energy use and energy burdens in Maryland

Maryland's criterion for heating and/or electricity bill assistance is 175 percent of the federal poverty level. Using this criterion, about 351,000 households were eligible in 2010 and nearly 361,000 households were eligible in 2011. We should note, however, that under the 2010 maximum federal criterion of 175 percent of the state median income, a far larger number of Maryland households -- about 795,000 -- would have been eligible in 2010; under the 60 percent criterion, 645,000 would have been eligible in 2011.²⁷ The latter figure is about 30 percent of Maryland households. The increased Maryland eligibility numbers when the state median income is used as the criterion is a reflection of the fact that Maryland has the highest median income in the United States.²⁸

Figure II-2 shows that just over 30 percent of eligible households have been getting heating aid in recent years and a similar percentage get assistance with electricity bills; however, the fraction of households getting assistance has been declining slightly since 2010, in part due to fiscal constraints.²⁹ Figure II-3 shows the total number of Maryland households applying for heating and energy assistance and the number that receive each type of support.³⁰

²⁷ LIHEAP 2010 Notebook (2013), Tables B-3 and B-4, and LIHEAP 2011 Notebook (2014), Tables B-2 and B-3

²⁸ US Census Maryland 2014; MD highest median: Maryland at a Glance Income 2014

²⁹ Maryland Budget Analysis FY2016, Exhibit 2 (p. 7)

³⁰ Arrearage assistance is also shown in Figure II-3. It is designed to help prevent shutoff of electricity supply by providing aid to clear accumulated past-due electricity bills; it is given at most once in every seven years (with

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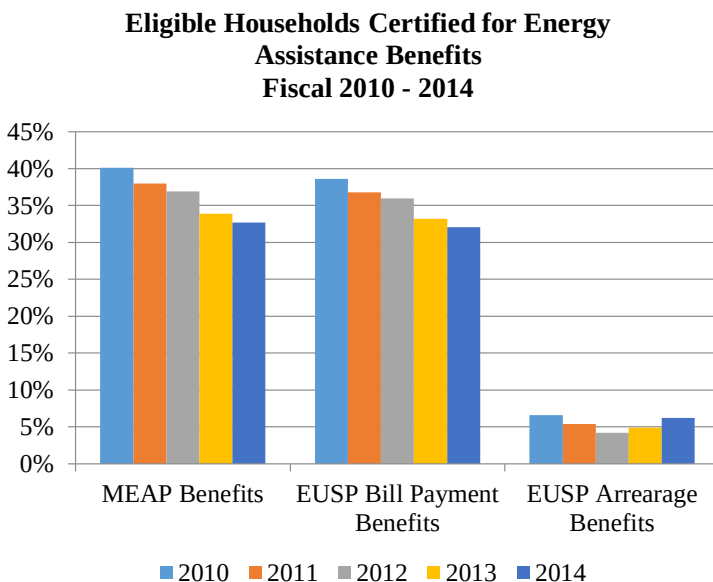


Figure II-2: Trends in heating and electricity energy assistance in Maryland. Source: Maryland Budget Analysis FY2016, Exhibit 5 (p. 11).

waivers available) and is not analyzed in this report (Maryland EUSP Plan FY2015, pp. 11, 14-15).

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**OHEP Benefits Provision History
Fiscal 2006 - 2014**

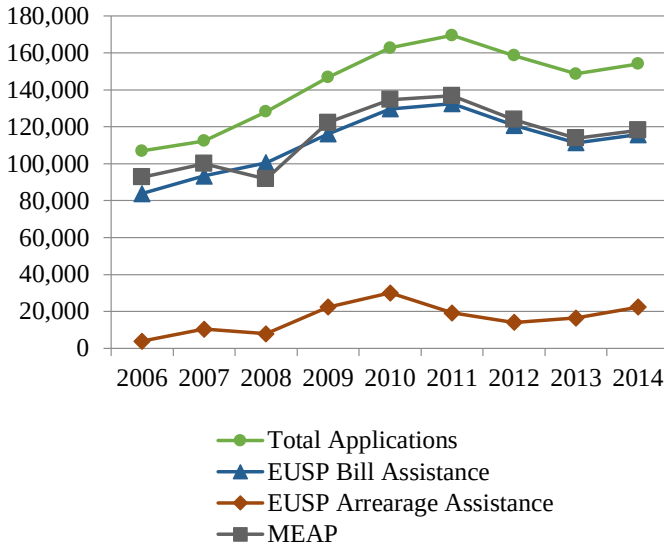


Figure II-3: Number of households applying for and receiving heating and electricity assistance in Maryland. Source: Maryland Budget Analysis FY2016, Exhibit 1 (p. 6).

There is a single, common application in Maryland for the two types of assistance and a considerable overlap between those who get both electricity assistance (EUSP) and heating assistance (MEAP). In the case of households with electric heating, the heating assistance, when provided, is added to the EUSP.

B. Detailed geographic analysis of Maryland energy assistance

Table II-4 shows recent data on county-by-county heating assistance applications (MEAP) and electricity bill payment assistance (EUSP) applications and approvals in each category

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through April of 2014. Table II-4 also shows the percentage of households applying for one or both types of assistance, by county. The application percentage is closely correlated with the percentage of households below the poverty level in the county. Statewide about 73 percent of the heating assistance applications and about 75 percent of the electricity applications were approved.

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Table II-4: Applications for, and grants of, heating and electricity bill assistance in Maryland, FY 2014 (Note 1), by jurisdiction.

County	# of households	% applying	% below poverty level	Total applications	MEAP - applied	MEAP - approved	EUSP applied	EUSP approved
Allegany	31,193	16.0%	17.40%	4,984	4,771	3,589	4,841	3,912
Anne Arundel	212,138	4.0%	6.30%	8,381	8,031	4,989	7,762	4,813
Baltimore City	252,072	13.1%	23.80%	33,092	32,633	24,606	30,368	23,315
Baltimore	328,861	5.9%	8.90%	19,250	18,505	10,903	17,055	10,834
Calvert	31,746	4.6%	4.90%	1,469	1,468	1,312	1,434	1,284
Caroline	11,935	16.6%	14.40%	1,987	1,978	1,764	1,934	1,725
Carroll	61,466	5.5%	5.60%	3,398	3,349	2,433	3,275	2,373
Cecil	37,295	10.9%	10.40%	4,054	4,002	3,387	3,863	3,260
Charles	53,824	5.5%	7.00%	2,965	2,961	2,741	2,902	2,690
Dorchester	13,666	20.2%	16.50%	2,756	2,663	2,532	2,694	2,562
Frederick	90,715	4.7%	6.10%	4,241	4,240	3,251	4,240	3,206
Garrett	12,170	20.6%	13.90%	2,512	2,507	2,339	2,410	2,259
Harford	92,859	6.6%	7.40%	6,152	5,801	4,655	5,523	4,639
Howard	113,383	3.3%	4.60%	3,788	3,743	2,344	3,731	2,346

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Kent	8,068	15.4%	13.20%	1,245	1,241	1,122	1,190	1,077
Montgomery	379,350	2.9%	6.70%	10,942	10,770	5,720	10,500	5,528
Prince	320,032	4.5%	9.40%	14,444	13,351	9,060	13,822	9,406
Queen Anne's	17,991	7.5%	8.10%	1,343	1,339	1,076	1,288	1,040
St. Mary's	40,153	6.6%	7.20%	2,649	2,647	2,458	2,560	2,378
Somerset	11,451	14.8%	23.40%	1,694	1,690	1,525	1,645	1,489
Talbot	16,302	8.3%	8.60%	1,350	1,349	1,274	1,328	1,255
Washington	59,915	6.4%	12.40%	3,812	3,667	2,899	3,683	2,909
Wicomico	38,646	14.0%	17.00%	5,426	5,248	4,790	5,278	4,802
Worcester	20,915	10.6%	10.90%	2,210	2,172	1,993	2,130	1,934
Total	2,256,147	6.4%	9.80%	144,144	140,126	102,762	135,456	101,036

Sources: 2014 households from 2010 population census data at Maryland at a Glance Population 2013, adjusted by population growth rates for 2010 to 2014 from county-by-county census data at US Census Maryland Map 2015. The latter source also has the average number of people per household in each county used to calculate the number of households in 2014. For application and grant data: Maryland EUSP Plan FY2015, Attachment 2 (p. 29).

Note: Data are July 1, 2013 through April 2014

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The City of Baltimore had by far the largest number of applications, followed by Baltimore County, Prince George's County, and Montgomery County, reflecting in part the fact that these jurisdictions had the largest number of households in Maryland.

A different picture emerges when we examine the proportion of households applying for (and getting) assistance. As can be seen from Table II-4 above, this percentage correlates closely with the percentage of households with incomes below the federal poverty level in that jurisdiction. Figure II-4 shows a map of Maryland with county boundaries. In terms of the fraction of the population affected, energy distress is greatest in three regions:

- The westernmost part of Maryland: Garrett and Allegany counties,

The City of Baltimore in the central part of the state, and
Most counties in Maryland's Eastern Shore.

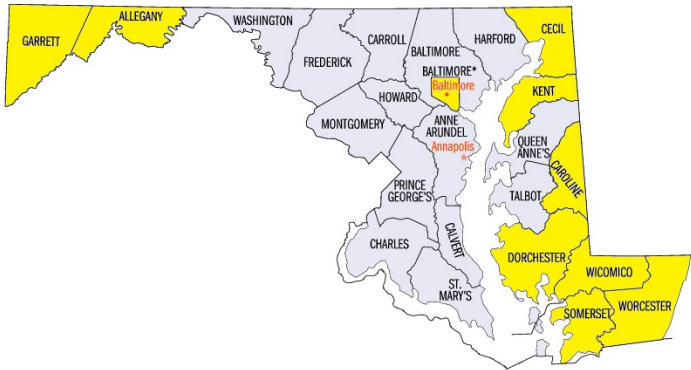


Figure II-4: Map of the State of Maryland, showing locations of its counties. Source: US Census Maryland Map 2015. Coloring added by IEER.

1. Maryland's westernmost and eastern shore counties

In the western and eastern parts of Maryland, energy distress was caused in part by the large proportion of households using

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fuel oil and propane fuels for space heating. These fuels are much more expensive than natural gas per unit of energy. Table I-5 shows the breakdown of space heating fuel types used in the areas served by Maryland's utilities as of 2009.

Table II-5: Space heating fuel used in the service areas of Maryland electric utilities.

Utility	PEPCO	DPL	BGE	Allegheny	SMECO	All MD
Total units	488,546	206,400	1,109,779	243,646	135,219	2,183,590
Gas	62.9%	11.5%	45.5%	32.2%	10.0%	42.5%
Electric	32.1%	50.6%	29.7%	28.3%	52.0%	33.4%
Bottled Gas	0.8%	10.3%	1.6%	8.1%	5.0%	3.2%
Oil	3.0%	25.6%	19.1%	21.9%	27.0%	16.9%
Wood	0.0%	1.3%	1.7%	6.2%	3.0%	1.9%
Other	1.3%	0.6%	2.5%	3.2%	3.0%	2.2%

Source: KEMA Draft 2011, Table 3-4 (p. 26).

Note: Data are for residences in the year 2009. Note that Allegheny is now known as Potomac Edison.

The DPL (Delmarva Power & Light) service area includes the entire Eastern Shore of Maryland³¹ and Allegheny's service area includes Maryland's westernmost counties.³² The combined oil and bottled gas heating saturations in the Maryland portions of the service areas of these utilities is about 36 percent for DPL and 30 percent for Allegheny. Electric heating is used by another 50 percent or so of DPL's Maryland residential customers and about 28 percent of Allegheny's customers. This is largely due to lack of natural gas infrastructure, which is, in

³¹ See map at Delmarva Power 2015.

³² Allegheny was split onto several companies. The Maryland part now falls into Potomac Edison, which is a subsidiary of FirstEnergy. See service area map at FirstEnergy Maryland 2015 and Wikipedia FirstEnergy 2015.

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turn, partly attributable to the more rural nature of these areas. The total number of customers of Columbia Gas of Maryland, which serves the three westernmost counties of Maryland (the same ones served by Allegheny for electricity), is about 32,000,³³ which is under one-third of the total number of households in the area.

Natural gas infrastructure has been expanding on the Eastern Shore of Maryland via the Eastern Shore Natural Gas Company,³⁴ and distribution via local utilities, including Easton Utilities, which is the only municipal gas utility in Maryland.³⁵

Fuel oil, propane, and electricity, if used as resistance heating, are expensive and, compared to the best electric heat pumps, inefficient.³⁶ Therefore it appears that poverty combined with expensive modes of heat combine to create a greater need for energy assistance.

2. The City of Baltimore

Baltimore Gas and Electric Company (BGE) is the distribution utility for the City of Baltimore. However, it covers a considerably larger number of households than just those within the city limits, since its service area also covers most of Baltimore, Anne Arundel, and Howard counties, as well as parts of Calvert, Carroll, Cecil, Frederick, Harford, Montgomery, and Prince George's counties.³⁷

³³ See the map at Columbia Gas 2015. The three counties have more than 100,000 households.

³⁴ ESNG 2015

³⁵ Easton Utilities 2015

³⁶ See Makhijani and Mills 2015, Figure IV-1 (p. 21) for a comparison of primary energy use for heating using various fuels and technologies. Propane is not shown there but the energy use and efficiency are about the same as for fuel oil, other things (such as heating system type and age), being equal.

³⁷ See BGE Fact Sheet 2013 and BGE Map 2015.

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Table II-5 above shows that natural gas is the most common heating fuel in the entire BGE service area (about 45 percent), but that electricity (about 30 percent) and oil and propane (about 20 percent combined) are also important.

However, the picture in the City of Baltimore is considerably different. Table II-6 shows that in Baltimore City natural gas is used for heating in almost two-thirds of the homes; electricity in about one-fourth. Oil and propane are used, but, in contrast to the other BGE areas with high proportions of applications for energy assistance, in only about nine percent of households.

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Table II-6: Space heating fuels estimated to be used in occupied housing units in Baltimore City, Maryland, 2008-2012.

Heating fuel	Number of households	Percent of households
Utility gas	156,517	65.00%
Bottled, tank, or LP gas	2,119	0.90%
Electricity	59,480	24.70%
Fuel oil, kerosene, etc.	19,695	8.20%
Coal or coke	45	0.00%
Wood	213	0.10%
Solar energy	56	0.00%
Other fuel	1,269	0.50%
No fuel used	1,236	0.50%
Total	240,630	100%

Source: ACS 5-yr Table DP04 (2008-2012).

Natural gas is the most economical space heating fuel at present in the sense that households that use it have the lowest heating energy burdens. Oil, propane, and resistance heating are the most expensive (all other things, such as home area) being equal.³⁸

³⁸ Makhijani and Mills 2015, Figures V-1 and V-2 (p. 23)

III. Characterizing residential energy use in Maryland – average and MEAP recipient households

There are no statewide Maryland data that detail the use of energy in low-income households or even the subset of low-income households that get low-income energy assistance (either electricity or heating assistance or both). There are some data for low-income households that have received weatherization assistance. We will analyze these in Section VI. Energy use and costs vary a great deal in response to a variety of factors, including:

- The type of heating fuel used;
- The size, quality, and type of building;
- The type of water heating fuel use;
- Whether there is air-conditioning or not;
- The number and variety of other energy-using appliances;
- The efficiency of energy-using equipment.

We have created an approximate picture of energy use in the average Maryland home (averaged over all types of residential structures) and in households that get MEAP assistance according to the fuel used to heat them: natural gas, electricity, and fuel oil. We did not analyze propane separately, since the costs of propane and fuel oil per unit of energy is usually about the same.³⁹

³⁹ The one major difference is that propane fuel is used mainly in manufactured/mobile structures. Most propane heating systems are therefore to be found in the more rural counties of Maryland, and specifically in the service areas of Allegheny (now Potomac Edison), in western Maryland,

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Several sources of data were critical in building up a detailed picture and verifying that the estimates are the correct order of magnitude. The KEMA 2011 draft report prepared for the Maryland Public Service Commission provides detailed analysis of data (largely based on billing data, but also on some survey data) on the saturation of various heating and water heating systems in the service territories of Maryland public utilities that provide electricity service. Saturations of some other appliances and end uses, notably central air conditioning and room air conditioning, are also provided. In addition, the KEMA 2011 draft report contains data on total energy use for space heating according to fuel, as well as electricity use for cooling. A number of reasonable inferences can be drawn from the data; most importantly, we can conclude that most homes heated with natural gas use the same fuel for water heating but most homes heated with fuel oil and propane use electricity for water heating. Since water heating is a major energy use, this inference is important in building up a more detailed picture of energy use than would otherwise be possible. However, the KEMA 2011 draft report does not contain any data on energy use by income level.

Second, the State of Maryland prepares reports relating to its heating and electricity assistance programs. We have used this data to derive the average amount of electricity used by recipients of electricity bill payment assistance, the average number of people per low-income household, and the heating fuels used.

National and regional data for energy use and expenses in homes classified according to the main space heating fuel are available for four different groups of households – all

SMECO (Southern Maryland Electric Cooperative), and DPL on the Eastern Shore.

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households, all households other than low-income households, all low-income households, and all households that get LIHEAP assistance. We have discussed these data in Section I. We draw on these data for constructing a picture of Maryland homes. Specifically, we found that the weighted average of per household energy use in the Northeast and South regions of the United States was close to the average energy use in Maryland households. We use this fact as an indication that the low-income households in Maryland would have about the same relationship to the average Maryland household as the weighted average of Northeast and South regions. LIHEAP data are also available for one specific end use, heating, disaggregated by the type of heating fuel used. Since we do not have data for heating alone for Maryland low-income households, we used this regional data and all-household Maryland data to get an approximate picture for heating and other uses of fuel. Specifically, we used the ratio of low-income heating fuel use to all-household heating fuel use in the Northeast-South regional data we compiled from the LIHEAP report. We applied this ratio to the Maryland average heating fuel use per household derived from KEMA data.⁴⁰

Data are available on electricity use in households that get EUSP assistance in Maryland. We use these data to check the reasonableness of our detailed calculations for electricity. Finally, data on gas use by recipients of heating assistance in the City of Baltimore are also available. These will likely differ from state averages, as discussed below; nonetheless, they provide a modest measure of verification of calculations related to energy sources other than electricity.

⁴⁰ Since the data we use are from different years between 2009 and 2013, we adjust heating and cooling use to 2010 by the ratios of heating and cooling degree days to get an estimate for the year 2010.

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One more methodological note regarding calculation of energy burdens. The energy data in the LIHEAP Notebooks are in the form of average energy use per household in a given income category (or average for all households in the United States or a specific region). LIHEAP calculates energy burdens in two ways:⁴¹

1. The percent expenditure on energy is calculated for each individual household in a group; these percentages are then averaged over all households in the same group. This is called the “mean individual burden.”
2. The expenditures of all households in a group on energy are added up as is the income of all households in the group. The ratio of the totals represents the “mean group burden.”

The household-by-household energy and income data for Maryland were not available to us. The data we have analyzed allow us to calculate the approximate group energy burden for all households and for recipients of heating energy assistance (MEAP).⁴² Group burden is indicative of the situation of the whole group. Individual burden, which is always greater than group burden, is indicative of the average situation of members of the group. **So it is important to keep in mind that the energy burdens calculated here understate the difficulties**

⁴¹ LIHEAP 2010 Notebook (2013), Appendix A, pp. 51-52

⁴² We calculate the energy expenditure corresponding to the average energy use in the group divided by the average expenditure for that energy. This is equivalent to the group burden since each average is equivalent to the total divided by the number of households in the group. The number of households cancels out so it is equivalent to the group energy burden which is equal to sum of all energy expenditures divided by the sum of all income. (We calculate $E_{avg}/I_{avg} = (\sum E_i/N)/(\sum I_i/N) = (\sum E_i)/(\sum I_i)$ = mean group burden, where E_i – the energy expenditure of the i^{th} household; I_i = income of the i^{th} household and N = number of households.

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faced by individual low-income households in paying their energy bills.

Since energy burdens are quite different for households according to the heating fuel they use, we analyzed three types of households: natural gas heated homes; electricity heated homes; and fuel oil heated homes. These three types cover the vast majority of Maryland homes (over 90 percent).

A. Energy use in average and MEAP assistance recipient households in Maryland

Table III-1, Table III-2, and Table III-3 show energy use, energy expenses, and energy burden (energy costs as a fraction of income) profiles of an average Maryland household and those that receive heating energy assistance (MEAP).⁴³ Table III-1 shows our analysis for a natural gas heated homes, Table III-2 shows the analysis for an electrically heated home, while Table III-3 shows the analysis of an oil heated household. All notes provided for Table III-1 apply to both Table III-2 and Table III-3, unless otherwise stated.

⁴³ All energy data in the tables represent energy use at the point of use. So electricity is counted as 3,412 Btu/kWh. In other words, generation, transmission, and distribution losses have been ignored as have natural gas leaks.

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Table III-1: Energy use for an average household and a low-income household receiving heating assistance (MEAP) in Maryland, 2010, both heated by natural gas.

	Average oil-heated household				Low-income (MEAP) natural gas heated household			
	MMBtu	kWhe	Cost	Energy Burden	MMBtu	kWhe	Cost	Energy Burden
Gas space heating	57.1		\$692	0.9%	63.0		\$764	4.4%
Gas water heating	25.5		\$309	0.4%	20.5		\$249	1.4%
All other gas uses (cooking, some gas clothes dryers)	5.2		\$63	0.1%	4.2		\$51	0.3%
Electric space cooling	11.7	3,428	\$514	0.6%	7.2	2,101	\$315	1.8%
Other electric (assume gas cooking)	20.8	6,087	\$912	1.1%	17.5	5,127	\$768	4.4%
Subtotal Natural Gas	87.8		\$1,064	1.3%	87.7		\$1,064	6.2%
Subtotal Electricity	32.5	9,514	\$1,425	1.8%	24.7	7,227	\$1,083	6.3%
Total	120.2	9,514	\$2,490	3.1%	112.4	7,227	\$2,147	12.4%

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Table III-1 Sources: KEMA Draft 2011, LIHEAP 2010 Notebook (2013), Energy Star 2008, EIA SEDS Prices 2014, IEER analysis.

Table III-1 Notes: 1. We assume that values derived from KEMA Draft 2011, which are for 2009, apply on a per household basis to 2010 use as well, except that heating and cooling values are adjusted for the relative heating and cooling degree days in those years. Values per household derived from the KEMA draft were obtained by dividing total use for Maryland by the number of households using that device or fuel (KEMA Draft 2011, Tables 3-3 and 3-8). Number of natural gas heated homes in Maryland in 2009 were estimated at 42.6 percent of the total of 2,183,000 households.⁴⁴ Natural gas water heating saturation is about the same as natural gas heating (KEMA Draft 2011, Tables 3-3 and 3-5), so we assume that the average natural gas heated home uses natural gas for water heating. Gas water heating use inferred from electricity water heating use of 4,857 kWh/year but with an energy factor of 0.6 (compared to 0.9 for electric heating). Electric water heater energy use is from Energy Star 2008, Table 1 (p. 9).

2. Energy costs are based on residential natural gas and electricity prices for 2010 as provided by the EIA States energy database (EIA SEDS Prices 2014, Table ET3 for Maryland).

⁴⁴ There is a discrepancy between the KEMA Draft 2011 report and U.S. Census data about the number of households in Maryland. The U.S. Census gives the number of households during 2009-2013 as 2,146,240 (US Census Maryland 2014). KEMA Draft 2011 has a higher total for 2009 at 2,183,590 based on utility billing data; KEMA Draft 2011 also cites a figure of 2,181,914 based on Public Service Commission data (KEMA Draft 2011, Table 3-2). The KEMA Draft 2011 numbers are about 1.7 percent higher than the Census value for the 2009-2013 period, so they would be a few percent higher for 2009. This discrepancy should not affect the per household calculations when the total energy use in Maryland for a particular application and the number of households are both based on the KEMA Draft 2011 report.

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3. Other electricity use per household derived from the total in KEMA Draft 2011, Table 3-8, divided by the number of households. Cooling electricity use was derived in the same way assuming 100 percent cooling saturation (see KEMA Draft 2011, Table 6-7), which indicates close to 100 percent cooling saturation, when both central A/C and room air-conditioners are taken into account – some households have both.
4. “Energy burden” is the fraction of individual income spent on energy. Here the average household energy cost has been divided by the average income in Maryland to obtain this percentage. This is equivalent to the “group energy burden” as defined in LIHEAP 2010 Notebook (2013), Appendix A, p. 52.
5. Heating energy for MEAP low-income households is obtained by adjusting the heating energy use in an average household by a ratio obtained as follows. We obtained the heating energy use in average and LIHEAP homes from national and regional data in the LIHEAP 2010 Notebook (2013). We calculated the weighted average of the natural gas used for heating in the Northeast and South regions of the United States for average and LIHEAP households. The weighting was done by the number of households in each region in 2010. The ratio of LIHEAP heating energy use to average heating energy use was applied to the average Maryland heating energy use. Natural gas use for appliances other than heating was determined in the same way by applying the ratio of “Other” use in natural gas heated homes. We assume water heating use is the same in both types of households.
6. Cooling energy use for MEAP household was obtained by multiplying the cooling energy use for the average household by the ratio of the national average of expenses on cooling energy in LIHEAP households to the average (LIHEAP 2010 Notebook (2013), Table 2-6 (p. 10)).
7. We assume electricity use for all other uses is the ratio of LIHEAP to the average household in the Northeast/South

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weighted average as described in Note 5 except that instead of heating energy we took the ratio of all non-heating uses of energy in natural gas-heated LIHEAP households to the corresponding number for all households.

8. The “energy burden” for a MEAP household is calculated by dividing the energy expenditures the weighted average income of households receiving assistance, with that income calculated for 2.85 people per household, calculated from Maryland PSC 2013, Appendix A, Attachment C, pdf p. 37. We adjusted the value for 2013 by dividing by the chained consumer price index between 2010 and 2013 (which reduces the income by a factor of 1.069). Consumer price indexes can be found at US Inflation Calculator 2015.

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Table III-2: Energy use for an average household and a low-income household receiving heating assistance (MEAP) in Maryland, 2010, both heated by electricity.

	Average oil-heated household			Low-income (MEAP) electrically heated household				
	MMBtu	kWhe	Cost	Energy Burden	MMBtu	kWhe	Cost	Energy Burden
Electric heating	14.7	4,303	\$645	0.8%	13.2	3,882	\$582	3.4%
Electric cooling	11.7	3,428	\$514	0.6%	7.2	2,101	\$315	1.8%
Electric water heating	11.2	3,291	\$493	0.6%	9.5	2,772	\$415	2.4%
Electric cooking	2.6	753	\$113	0.1%	2.2	635	\$95	0.6%
Other electric	20.8	6,087	\$912	1.1%	17.5	5,127	\$768	4.4%
Total	60.9	17,862	\$2,676	3.3%	59.5	14,516	\$2,215	12.6%

Sources: KEMA Draft 2011, LIHEAP 2010 Notebook (2013), Energy Star 2008, EIA SEDS Prices 2014, IEER analysis

Notes: 1. Sources and notes as in Table III-1.

- 2. Water heating electricity use is assumed to equal the national average. Source: Energy Star 2008.
- 3. We have broken out electric cooking and electric water heating as a separate items.
- 4. Water heating, cooking, and other electricity uses were calculated in the same manner as in Note 7 of Table III-1, except that the ratio of all other uses for electrically heated households was used.

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Table III-3: Energy use for an average household and a low-income household receiving heating assistance (MEAP) in Maryland, 2010, both heated by fuel oil.

Low-income (MEAP) oil-heated household									
Average oil-heated household									
	MMBtu		kWhe	Cost	Energy Burden	MMBtu	kWhe	Cost	Energy Burden
Oil heating	47.1			\$1,053	1.3%	46.2		\$1,034	6.0%
Electric cooling	11.7	3,428		\$514	0.6%	7.2	2,101	\$315	1.8%
Electric water heating	11.2	3,291		\$493	0.6%	9.5	2,772	\$415	2.4%
Electric cooking	2.6	753		\$113	0.1%	2.2	635	\$95	0.6%
Other electric	20.8	6,087		\$912	1.1%	17.5	5,127	\$768	4.4%
Total	93.4	13,558		\$3,084	3.8%	82.5	10,902	\$2,627	15.2%

Sources: KEMA Draft 2011, LIHEAP 2010 Notebook (2013), Energy Star 2008, EIA SEDS Prices 2014, IEER analysis. See notes to Table III-1.

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We have assumed electric water heating in oil heated homes: KEMA Draft 2011 saturation data indicate that most fuel oil heated homes use electricity for water heating, since the saturation for oil heating is 16.7 percent but for oil water heating it is only 4.6 percent (KEMA Draft 2011, Tables 3-3 and 3-5).

We note that in the case of homes heated with electricity or fuel oil, energy use for heating in all households is about the same as in MEAP households. MEAP homes have about 10 percent higher energy use for heating than the average for homes heated with natural gas. Electricity for uses other than heating, including cooling and appliances is significantly lower in low-income households receiving energy assistance. Overall total energy use at the point of use is 10 to 20 percent lower in Maryland low-income households compared to the average. The difference is accentuated if one takes into account energy losses in electricity generation, transmission, and distribution. Table III-4 shows a comparison of total energy use at the point of use (on-site) and in terms of primary energy, which includes electricity system losses. On a primary energy basis, low-income households' use of energy is, on average, 15 to 20 percent less than that of the average Maryland household, taking all uses of energy into account.

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Table III-4: Comparison of on-site and primary energy use per household, average and MEAP recipient, 2010.

Home heating fuel type	On-site energy use			Primary energy use		
	Average, MMBtu	MEAP, MMBtu	Ratio, MEAP to Average	Average, MMBtu	MEAP, MMBtu	Ratio, MEAP to Average
Natural gas heated	120.2	112.4	93.5%	190.7	165.9	87.0%
Electrically heated	60.9	49.5	81.3%	193.3	157.1	81.3%
Fuel oil heated	93.4	83	88.4%	193.8	161.3	83.2%

Source: Based on Table III-1, Table III-2, and Table III-3 above.

While the overall energy use differences are modest, the energy burden – that is, the fraction of income spent on energy – is much greater for low-income households. For the average household the energy burden ranges from about 3 to 4 percent depending on the type of heating. For households receiving energy assistance the range is 12 to 15 percent, or about three-and-half times as great. The difference is quite consistent across

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heating fuels. Given the same heating fuel, low-income households have an energy burden that is about three-and-half times greater than the average Maryland household.

For households at different income levels with the same number of people as the average for MEAP recipient households, energy burdens range from about 17 percent to nearly 20 percent at a household income of 75 percent of the federal poverty level. The latter figure applies to fuel oil heated homes. The energy burdens range from about 7 percent to about 9 percent at 175 percent of the federal poverty level, with the latter figure applying to fuel oil heated homes.

Finally, we note that we have calculated mean group energy burdens – the total expenditure on energy by all members of the group divided by the total income of all members of the group. The mean individual burdens would be somewhat higher. The mean individual burden for a group is the average of the burdens calculated for each individual member of the group. For instance, the mean group burden for all U.S. low-income households receiving assistance in 2010 was 12.4 percent; the mean individual burden was 15.4 percent.⁴⁵

B. Estimate verification

We performed two checks on the reasonableness of the electricity use estimates presented in the Table III-1 through Table III-3 above. First we weighted the average household electricity use by the numbers of households using natural gas, electric, and fuel oil heating. We compared this total to a 2010 electricity use number derived from the KEMA Draft 2011.⁴⁶

⁴⁵ LIHEAP 2010 Notebook (2013), Tables A-3a and Table A-3b.

⁴⁶ The total residential electricity use estimated in the KEMA Draft 2011 (Table 3-2) report for 2009 is 26,009 GWh, which comes to 11,911 kWh per household on average for 2009. We adjusted the 2009 heating and cooling values to get 2010 values by applying the ratios of the heating and cooling

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The statewide average electricity use per household estimated in this way was just 2 percent greater than the average. This very close agreement is to be expected since much, but not all, of the data for all Maryland households came from the KEMA report.

Similarly, we estimated the average electricity consumption in MEAP households by weighting the consumption of electricity according to the numbers of MEAP households with each type of space heating: natural gas, electricity, and fuel oil. We compared this weighted average with the average for households getting electricity assistance in FY 2013, adjusting for differences in weather between the two years. The value calculated in the analysis was 94 percent of the value obtained from adjusted FY 2013 EUSP data. This is a larger discrepancy than that in the comparison with the KEMA Draft 2011 noted in the paragraph just above, indicating a greater uncertainty in our result. The lower value we derive from the LIHEAP and KEMA Draft 2011 data may also be due to the fact that the economy was still in the early stages of recovery from recession in 2010 compared to 2013.

Overall, the detailed estimates of energy use in the various types of households, differentiated according to the type of heating fuel and whether they receive heating assistance, are reasonably close to the published data.

C. Comparative efficiency – average household and MEAP households

We can compare the approximate overall efficiency of average households to LIHEAP households by estimating the energy consumption and expenditures per unit area of the house. This provides a composite measure of the efficiency of appliances,

degree days for the two years. We assumed that other electricity uses were the same in 2009 and 2010.

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HVAC (Heating, Ventilation, and Air-Conditioning) equipment, and building envelope.

We do not have data on the indoor surface area of LIHEAP households either in Maryland or nationally. However, survey data are available for one year (2005) for households *eligible* for weatherization assistance as well as other income categories. Table III-5 shows national results, using this 2005 survey data, for average energy expenditures per person and per unit area in various income categories.

Table III-5: Average energy expenditures per household member and per square foot for various income categories, 2005 national survey data, by eligibility for energy assistance (2010 dollars).

	\$ / household member	Members / household	\$ / square foot	Area, square feet
Total U.S. Households	\$780	2.6	\$0.86	2,309
Federally Eligible	\$617	2.7	\$1.10	1,532
Federally Ineligible	\$844	2.5	\$0.82	2,590
Below 100% Poverty Line	\$603	2.7	\$1.14	1,442

Source: DOE EERE 2012 BEDB, Table 2.9.10

Energy expenditures per person are lower in households eligible for energy assistance, a much larger group than those who actually get assistance (See Figure II-1 above). But the expenditures per unit area are higher, presumably because low-income households live in smaller dwellings, including apartments.

We have not found comparable data for areas of Maryland residences by income category. We used the national data for area shown in Table III-5 above to estimate the overall energy

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use per square foot in all Maryland households and in households that get energy assistance. We assumed that the areas of residences that are eligible to get assistance would be about the same as the area of those that actually do, since size of the residence is not a criterion for receiving assistance. Table III-6 shows the results for total primary energy use and Table III-7 shows the results for heating primary energy use. In computing primary energy we have taken electricity generation, transmission and distribution losses into account but no processing and delivery losses for natural gas and fuel oil.

Table III-6: Total primary energy use per unit area for all Maryland households and for households receiving heating assistance.

	All households	MEAP households
Total primary energy, MMBtu	192	161
Area, square feet	2,309	1,532
Btu/sq. ft., all uses	83,236	105,316
Percent of average	100%	127%

Source: IEER calculations based on Table III-1, Table III-2, and Table III-3, and data for area from Table III-5.

Table III-7: Primary heating energy use per unit area for all Maryland households and for households receiving heating assistance.

	All households	MEAP households
Heating primary energy, MMBtu	51	52
Area, square feet	2,309	1,532
Heating Btu/sq. ft.	22,290	33,638
Percent of average	100%	151%

Source: IEER calculations based on Table III-1, Table III-2, and Table III-3, and data for area from Table III-5.

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The overall energy use in MEAP households per square foot is about one-fourth greater than average. However, most of the difference is due to higher heating energy use per square foot in MEAP households. As can be seen in Table III-7, MEAP households use about 50 percent more primary energy for heating per square foot than average. For all other uses, the energy use per square foot is about 10 percent more in MEAP households than average.

This analysis indicates an enormous opportunity for improving efficiency by weatherizing low-income homes and by improving the performance of their heating and cooling systems. We examined the latter issue in the report on heating and cooling of the Renewable Maryland Project.⁴⁷

It should also be noted that Table III-7 represents average values in heating energy use per unit area. There is likely to be a very large spread in this parameter among low-income households, depending on many factors such as the age and type of structures and equipment, improvements that may have been made over time, whether the buildings are rented or owner-occupied, income-level, and personal preferences and customs that affect energy usage. It would not be surprising to find that the least efficient low-income homes have energy consumption per unit area that is several times that of the average Maryland household.⁴⁸

Efficiency programs are becoming an increasingly important component of low-income energy assistance. The above analysis indicates that there is a real need for more precise information about efficiency of HVAC systems and the condition of building

⁴⁷ Makhijani and Mills 2015

⁴⁸ Of course, we also expect large differences in efficiency and performance among non-low-income households.

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envelopes in low-income households. The payoff will be more effective assistance and targeting of efficiency programs.⁴⁹

D. Appliance Efficiency

We cannot infer appliance efficiency from the data that we have for low-income households. We note that the per unit area on-site energy use for non-heating uses appears to be somewhat (~10 percent) higher than average despite the fact that air-conditioning use is substantially lower than average in low-income households. Further, the saturation of certain appliances like electric clothes dryers and computers is likely lower in low-income households. We do not have Maryland-specific data but a recent Massachusetts survey provides evidence of this.⁵⁰ In combination, these data indicate significantly lower appliance efficiency in low-income households. Increasing appliance efficiency should therefore be a critical part of retrofitting low-income residences.

The most important item from an energy use perspective, apart from space conditioning, is water heating. Heat pump water heaters can reduce electricity use for this purpose by about 60 percent. General Electric specifies the “energy factor” (the ratio of energy output to electrical energy input) of its GeoSpring heat pump water heater as 2.9. However, the overall efficiency will

⁴⁹ In Maryland “weatherization” programs cover a broad array of efficiency improvements – see Section VI. We use the term “efficiency” to cover the entire array of possible reductions in energy use for the service desired, including appliances, HVAC equipment, and building structure improvements. We use the term “weatherization” to refer only to building improvements such as increased insulation, better windows, reduced leakage from the structure, and so on.

⁵⁰ Opinion Dynamics 2009, pp. 124-134. Table 53 shows that among low-income households that have dryers, more of them are electric, but overall, the saturation of electric dryers is higher among households that are not low-income.

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be lower than that in cold climates.⁵¹ Assuming an energy factor of 2.5, water heating electricity use in low-income homes could be reduced by about 1,700 kWh per year, saving about \$230. The savings are likely to be proportional to the number of people per household.

According to Baltimore Gas and Electric (BGE), the installed cost of a resistance electric water heater is \$800 and that for a heat pump water heater is \$1,700: a \$900 cost difference.⁵² This gives a payback time of about four years based on our savings estimate of about \$220 per year, before any rebates. There is a rebate of \$500 for heat pump water heaters as part of Maryland's EmPOWER program.⁵³ The post-rebate payback time is therefore short: two to three years typically and less for families with four or more members. BGE estimates much larger savings -- \$370 per year for a household with three people. This implies a much larger hot water use per year than we have assumed in our calculations, which are based on the KEMA Draft 2011 report.

Other than light bulb replacements, replacing ordinary electric (resistance-heated) water heaters with heat pump water heaters is among the most cost effective measures that would substantially reduce energy expenditures in low-income households. In most cases it would also be one of the least intrusive measures.

Finally, we have pointed out in our study of space heating and cooling that it is necessary to replace most natural gas heating

⁵¹ GE 2015. The net savings will be somewhat lower than the energy factor for water heaters alone suggests. The heat pump water heater extracts energy from ambient air inside the house. This increases space heating energy consumption but reduces air-conditioning energy use.

⁵² BGE 2015

⁵³ See PEPCO 2015 and BGE 2015

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with highly efficient electrical heating in the long term if Maryland's 2050 greenhouse gas emission reduction goal is to be achieved. In this context we note that EmPOWER program rules do not allow fuel switching when carrying out weatherization in low-income homes. Exceptions may be made for safety if approved by the Department of Housing and Community Development.⁵⁴

Since the vast majority of homes that use natural gas for space heating also use it for water heating, a switch to heat pump water heaters should be part of the process of reducing direct natural gas use in the residential and commercial sectors.

Light bulb change outs are already a major part of efficiency initiatives. Heat pump water heater rebates of the EmPOWER program can help achieve efficiency goals and, in the case of low-income households, energy security and justice goals as well.

E. Sensitivity to natural gas and fuel oil prices

The above calculations provide a static picture for one year for average and MEAP households that use natural gas, electricity, or fuel oil as the heating energy sources. Specifically, they are static as to income per household and also fuel and electricity prices.

The overall national trend in household income at the lower ends of the income spectrum has, with some ups and downs, been in decline. The income of the lowest quintile of households has declined by an average of about 1.2 percent from 1999 to 2013; it has not shown any increase even during the recovery from the Great Recession. The comparable figure for the next

⁵⁴ Indeed, fossil fuel furnaces may not be repaired or replaced with EmPOWER LIEEP funds except in the BGE territory (Maryland DHCD Weatherization 2014, p. 89 and p. 44 (for safety-related exceptions)).

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quintile is a decline of about 0.8 percent per year.⁵⁵ Indeed, at \$11,651, the household income of the lowest quintile in 2013 nationally was lower than the corresponding value in 1973: \$11,899.

In practical terms, the decline of income in low-income households is much larger than these figures suggest. This is because household income now typically reflects a larger number of working people per household than in 1973. Specifically, the labor force participation of women in the 25- to 54-year age bracket increased from about 60 percent in 1977 to about 75 percent in 2012.⁵⁶ This means that, on average, expenses associated with work, such as travel and childcare are greater. Therefore the share of income available for non-work-related household expenses, such as housing and energy, has declined significantly more than indicated by overall household income data.

Finally, the number of households who get energy assistance as a fraction of those who are eligible has tended to decline nationally though the trend since 2005 is not as clear. The number of households who get assistance nationally has been in the five to ten million range since 1981, except for a period in the mid-to-late 1990s, when it was lower (see Figure II-1 above).

Based on these trends, one may anticipate a worsening of the energy burden among low-income households in the coming years unless the forces and policies that have given rise to these socio-economic trends are changed sufficiently to reverse the economic deterioration of low-income households.

⁵⁵ Data from US Census Household Income 2014, Table H-3.

⁵⁶ Estimate by IEER from Sullivan 2013, p. 8.

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Any increase in fuel prices will exacerbate the problems associated with income deterioration. At present, the lowest energy burden is among natural gas households. However, in its *Annual Energy Outlook 2014* reference case, the U.S. Energy Information Administration estimates that residential natural gas prices will increase by about 1.5 percent per year, while electricity prices will increase by 0.4 percent per year.⁵⁷ This means an increase in the residential natural gas price to about \$16 per million Btu (in 2012 dollars) by 2030. Assuming that in Maryland, MEAP household income does not deteriorate further, the overall energy burden in natural gas heated homes will rise to over 13 percent from about 11.2 percent in 2010.⁵⁸ This means that a given amount of energy assistance will be less effective at reducing the various kinds of distress associated with high energy burdens. The vulnerability to severe weather will also increase. As research by Roger Colton has shown, the relative effectiveness of a given amount of assistance depends both on the weather and fuel prices.⁵⁹

A comment on the decline in crude oil prices since mid-2014 -- and, hence, also fuel oil prices -- is in order. Oil prices have fluctuated immensely in the past decade and also over the longer period since the first oil shock of 1973. Our calculations do not reflect the peak of fuel oil prices. We used a fuel oil cost of \$22.36 per million Btu, which corresponds to a retail fuel oil price of about \$3.10 a gallon. That is close to the price of about \$3.13 per gallon in mid-March 2015. The fuel oil price at the peak of crude oil prices last year was about \$4.14 per gallon or about \$30 per million Btu. Thus, there is no need to adjust the energy burden calculations for fuel oil heated homes above; they

⁵⁷ EIA AEO 2014, Table A3

⁵⁸ National burdens are higher than in Maryland. See Table II-3 above.

⁵⁹ Colton 2014

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approximately correspond to the crude oil prices in early 2015.
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F. Carbon dioxide emissions

Nationally, about 22 percent of all energy-sector CO₂ emissions in 2010 were attributable to the residential sector.⁶¹ Almost half of that (10 percent) is attributable to space heating and cooling.⁶² In Maryland, the fraction for heating and cooling is slightly higher at about 11 percent for the year 2011; overall residential energy use accounts for about 23 percent of Maryland emissions.⁶³ Water heating is the most important single source of emissions in the residential sector after space heating and cooling.

As we have seen, about 30 percent of households, nationally and in Maryland, met the maximum federal eligibility criteria for heating energy assistance in 2011 (see Section II). The energy data in the LIHEAP notebooks show that these households' use of energy is about the same or moderately lower (about 10 percent lower) than the average household in the United States. Therefore as a first approximation, we may deduce that about 6 to 7 percent of energy sector CO₂ emissions are attributable to low-income households if the "low-income" upper limit is defined by the federal maximum. Low-income households that

⁶⁰ EIA Fuel Oil 2015

⁶¹ EPA GHG Inventory 2014, Table ES-3 (p. ES-11)

⁶² Derived by IEER from the Buildings Energy Data Base (DOE EERE 2012 BEDB, Table 2.4.3, and the EPA emissions data (EPA GHG Inventory 2014, Table ES-3). The Buildings Energy Data figure for residential sector emissions is slightly higher than the value in the EPA GHG Inventory (1231.4 million metric tons compared to 1,175.2 million metric tons. We applied the percentage of emissions attributable to space heating and cooling in BEDB Table 2.4.3 to the EPA emissions value to derive the 10 percent estimate.).

⁶³ The Maryland fraction of 11 percent was derived by IEER from KEMA Draft 2011, adjusted by heating and cooling degree-day differences between 2009 and 2011.

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are eligible for energy assistance under Maryland criteria account for about 3 percent of Maryland's energy-related CO₂ emissions; almost 40 percent of that is attributable to households that get energy assistance.

From a long-term (year 2050) perspective, Maryland's goal is to reduce greenhouse gas emissions by 90 percent by 2050, with the year 2006 as the base. Low-income households, broadly defined, are a large enough fraction of the residential sector. Therefore it would be very difficult to achieve a goal of 90 percent reduction in CO₂ emissions by 2050 without significant reductions in emissions attributable to low-income households.

It is essential to address energy-sector related CO₂ emissions from low-income households both for energy justice and climate considerations. This is because we may expect that there will be a small fraction of remaining emissions in most sectors due to the costs of squeezing out the last few percent. Further, sectors like aircraft fuel, may not be able to achieve 90 percent reductions, requiring other sectors to get as close to 100 percent as possible. In this report, we recommend starting with households that get energy assistance, with an evaluation of the means and methods for addressing low-income households that do not get energy assistance in the coming years.

IV. Energy burdens before and after assistance

We have already noted that energy burdens can exceed 20 percent in the lowest income households with fuel oil heating. Heating and electricity bill assistance can reduce these burdens, but they remain much higher than the 3 to 4 percent that is typical of households with average income. Table IV-1 shows that, nationally, 91 percent of households receiving heating assistance had energy burdens of more than 5 percent, and 22 percent had energy burdens of more than 20 percent. Heating energy assistance reduced the number of households with burdens of more than 20 percent from 22 to 13 percent, still a high number; more than 40 percent of households still had energy burdens greater than 10 percent.

Table IV-1: Proportion of households with high energy burdens before and after receiving heating energy assistance, national survey data for 2011.

Residential Energy Burden	Pre-LIHEAP	Post-LIHEAP
Number of Respondents	1,275	1,275
[Energy Burden]	[Percent of Respondents]	
0-5%	9%	26%
6-10%	32%	32%
11-15%	23%	20%
16-20%	13%	9%
21-25%	9%	5%
>25%	13%	8%

Source: Recreated by IEER from NEADA 2011, Table IV-3A (p. 18).

As for Maryland, Table IV-2 shows heating bill assistance provided in Fiscal Year 2013 while Table IV-3 shows electricity bill assistance trends from fiscal year 2011 to fiscal year 2014 (which ended on June 30, 2014).

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Table IV-2: Households receiving heating bill assistance and amounts of assistance by heating fuel and income level (MEAP for FY 2013).

Type of heat	0 to 75% poverty level	75 to 110% poverty level	110 to 150% poverty level	150 to 175% poverty level	Total households	Expenditures
Coal	43	31	38	10	122	\$78,009
Electric	18,807	13,945	11,709	4,584	49,045	\$12,477,355
Gas	19,314	11,940	10,550	4,346	46,150	\$19,422,324
Kerosene	651	784	686	217	2,338	\$2,773,506
Oil	3,315	3,355	3,575	1,316	11,561	\$17,727,036
Propane	1,238	1,197	1,282	477	4,194	\$5,530,781
Wood	135	103	104	35	377	\$234,327
Total	43,503	31,355	27,944	10,985	113,787	\$58,243,338

Source: Adapted from Maryland PSC 2013, page 6 and Appendix A, Attachment J

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Table IV-3: Electricity bill assistance in Maryland, total and per recipient, trends fiscal years 2011 to 2014.

	FY 2014	FY 2013	FY 2012	FY 2011
Applicants Served	115,664	111,393	120,739	132,323
Average Grant	\$ 481	\$324	\$334	\$446
Benefit Expenditures	\$ 55,6 million	\$36.1 million	\$40.3 million	\$59.0 million

Sources: Maryland EUSP Annual Report FY2014, Attachment E and Attachment L.

As noted previously, Maryland has a combined application for electricity bill and heating assistance. Figure II-3 above shows that the vast majority of applicants get both electricity and heating assistance.⁶⁴ However, no non-overlapping number for the total number of unique households that get assistance of one or both types is available. Further complicating the problem of understanding this data is that assistance is also available to clear longstanding electricity bill arrears at most once every seven years (with waivers to the frequency available). For FY 2010, the Maryland budget analysis indicates that about 140,000 households received some form of assistance with energy bills amounting to about \$160 million (see Figure II-3 above). Of this assistance the amount provided for electricity bill arrears was just over \$30 million,⁶⁵ making the heating and electricity bill assistance about \$130 million. About 30,000 households received assistance with arrears, but many of them also received other kinds of assistance. Assuming 130,000 unique households received electricity bill or heating energy assistance gives an average assistance amount of about \$923. The weighted average energy burden for low-income households (across heating fuel

⁶⁴ Applicants who have electric heating can get assistance for both electricity bill payments and for heating assistance that is designed to assist with winter heating bills.

⁶⁵ Maryland EUSP Plan FY2015, Table 2 (p. 8)

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types) in 2010 was about \$2,232, or about 12.9 percent of household income. With assistance of \$923, the energy burden comes down significantly, to about 7.6 percent of income – but still about double that of the average household.

Two conclusions are very clear:

- *Heating and electricity bill assistance makes a great deal of difference, especially since it is directed preferentially at those with the lowest incomes.*
- *Heating and energy assistance still leaves lowest income households with energy burdens that are two to three times that of the average Maryland household. In some cases, the energy burden may remain even higher than that. The PSC Staff proposal for limiting energy bills generally to 6 percent of income is reasonable; it would generally cure the problem of high post-assistance burdens (see Section V below).*

We should note here that the largest number of households getting assistance are below the level of income defined by the federal poverty level.⁶⁶ For instance, in FY 2013, about 38 percent of the households getting heating assistance in Maryland had incomes at or below 75 percent of the federal poverty level and another 21 percent had incomes between 75 percent and 100 percent of the federal poverty level.⁶⁷ Assuming an average

⁶⁶ Preference is also given to low-income households with elderly people, small children, or disabled people or combinations of these vulnerabilities (Maryland EUSP Annual Report FY2014, Attachment I (pdf p. 36)).

⁶⁷ Maryland EUSP Annual Report FY2014, Attachment I (pdf p. 36). Normally EUSP reports give income ranges as <75 percent, 75 to 110 percent, 110 percent to 150 percent and 150 percent to 175 percent. Attachment I gives a finer grained split. There would be additional numbers between 100 percent and 110 percent of course, so the proportion of households below 110 percent of poverty level income would be greater than

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household size and a total heating and electricity assistance of \$923, a household with income at 75 percent of the federal poverty level would still have a post-assistance energy burden of more than 10 percent of income. Table IV-4 summarizes pre- and post-assistance burdens at various income levels, assuming an average low-income family size (2.85 people) and an average level of assistance. Of course, in practice assistance is not distributed uniformly (as assumed in Table IV-4) but is oriented to preferentially assisting the lowest-income households.

Table IV-4: Pre- and post-assistance energy burdens, Maryland 2010

Income level	Pre-assistance burden, %	Post-assistance burden, %
75% of poverty level	17.2%	10.1%
Weighted average income of recipients	12.9%	7.6%
175% of poverty level	7.4%	4.3%

Source: Calculated by IEER

- Notes: 1. Average household size = 2.85 people in all cases.
2. Pre-assistance burden is a weighted average of the various types of heating used in homes that get heating assistance.
3. Assumes that each household gets the average amount of assistance.

the 59 percent indicated here. This does not affect the calculations of burdens shown in Table IV-4.

V. The proposed Affordable Energy Program

In January 2012, The Maryland Public Service Commission initiated a “Public Conference” to review the state’s energy assistance programs regarding the energy that was under its purview – that is, electricity and natural gas. The Staff of the Commission, working in coordination with the Office of People’s Counsel, which represents the state’s residential energy consumers before the Commission, filed a report for the Commission’s review on November 1, 2012. The report recommended a modification of electricity and natural gas energy assistance: a new “Affordable Energy Program” or AEP.⁶⁸ The central feature of the program would be that the post-assistance energy burden (electricity plus natural gas) of eligible low-income households would be limited to a maximum of 6 percent of gross household income. This is in contrast to the present program, where a bill payment assistance is determined based on a complex combination of factors, including income, but which leaves many low-income households with energy burdens that are still high.

The central idea was that instead of focusing on bill payment assistance, the program’s focus would be on limiting the energy burden of participating low-income households to 6 percent of their gross income. For all-electric homes, the electric bill would be limited to 6 percent. For homes with natural gas heating, the natural gas bill would be limited to 3 percent of income and the electricity bill to 3 percent. For homes with a non-regulated

⁶⁸ This section is based on Maryland AEP 2012 unless otherwise mentioned; specific page numbers are cited only when there is reference to a number or for quotations. The records in the docket of this Public Conference are located on the Web at <http://167.102.231.189/search-results/?keyword=PC27&x.x=0&x.y=0&search=all&search=rulemaking>.

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heating fuel, like propane or fuel oil, electricity bills would be limited to 3 percent. The rationale for the choice of 6 percent was as follows:

It is generally accepted that a household's "shelter burden" (rent/mortgage plus taxes and utilities) should not exceed thirty percent (30%) of income. In addition, a household's home utility bill should not exceed twenty percent (20%) of the household's shelter costs. Combining these two sets of costs yields an affordable home energy burden of six percent (6%).⁶⁹

No specific provision was made in the recommended program for varying the post-assistance energy burden according to size of household. It was recognized that households with more people may spend a larger fraction of their income on expenses other than energy, such as food, rent, transportation, and medicines. The Commission Staff recommended that "[t]he AEP implementation process should investigate whether an income adjustment mechanism related to household size is necessary to calculate an appropriate POI-based payment ' for each customer.'" ⁷⁰ In other words, for large household sizes the gross income might be adjusted downward for the purposes of calculating the 6 percent energy burden in order to reduce the maximum payment for such households.

Other elements of the proposal include:

⁶⁹ Maryland AEP 2012, p. 5. The 30 percent housing affordability criterion was based on a 2008 analysis that reviewed the history of housing costs and assistance going back to 1937 and set it all in the contemporary context of a 2006 housing cost survey. See Schwartz and Wilson 2008.

⁷⁰ Maryland AEP 2012, p. 6. POI: percentage of income.

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- Eliminating assistance for paying bills that are in arrears, after an initial period of assistance to clear some of the past arrears that would exist at the start of the program;
- Increasing energy efficiency by coordinating weatherization with Maryland's EmPOWER program, which provides incentives for increasing electricity and natural gas efficiency (see below for further discussion).
- Targeting eligible households that have very high electricity and/or natural gas use – three times or more than the average Maryland home. The reasons for such high use are not clear but could result from “poor housing stock, faulty heating or cooling equipment, consumption behavior, or some combination of factors.”⁷¹ Efforts to reduce consumption in homes with very high energy use would be undertaken in a variety of ways ranging from education to implementation of efficiency measures.
- Providing for crisis assistance in extraordinary circumstances, such as unanticipated medical expenses, a reduction in work hours, or loss of a job.

In abolishing payment of arrears that might be accumulated after the start of the AEP, the proposal would put more responsibility on the household to ensure that payments corresponding to the 6 percent maximum are made (equal monthly payments based on estimated annual energy bills). Further, if the bills are less than 6 percent of gross income (as they would be in some cases at the higher end of the eligibility income limit, there would be no assistance, because the energy burden would be deemed to be affordable. The “core principle” here, as articulated by the Commission Staff and the Office of People’s Counsel, is that “the AEP puts eligible [low-income] customers on payment

⁷¹ Maryland AEP 2012, p. 23

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footing equal to non-low-income customers” because once the affordable amount is determined, they would be expected to pay that amount in full.⁷² Crisis assistance would not be for payment of arrears but for true crises such as those occasioned by illness or loss of a job.

The PSC Staff’s proposal recognizes that electricity and gas ratepayers would be unlikely to subsidize heating bill payments for non-regulated fuels – namely fuel oil and propane. These are also the most expensive fuels. Households that use them for heating typically have relatively high energy burdens. This is the main reason that such households get 45 percent of the heating assistance even though they constitute just 16 percent of those receiving assistance (See Table IV-2 where the assistance and household numbers are shown). In such cases, a 3 percent energy burden limit would still apply for the electricity portion of the energy bills of a low-income household. As for heating assistance, the PSC Staff noted the following:

There is no expectation in this proposal that an AEP that is likely to be funded by utility ratepayers would support benefits for non-utility energy sources. If AEP is implemented, OHEP [Office of Home Energy Programs] might take into consideration the 3% POI [percentage of income] electric benefit for MEAP grants to customers with non-utility heat sources.⁷³

As a complement to the PSC Staff’s suggestion, it would be equitable to target more funds for the conversion of fuel oil and propane heated low-income residences to efficient electric heating so that these households do not remain with high overall energy burdens. Such conversions would also reduce the need for energy assistance since heating bills would be greatly

⁷² Maryland AEP 2013, slide 6

⁷³ Maryland AEP 2012, p. 6

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reduced. Finally, converting fuel oil and propane heated homes to electricity (where technically feasible) would also bring them fully under the umbrella of the AEP for both electricity and heating assistance since such homes would have an identical status to homes that are now electrically heated.⁷⁴

Limiting energy burdens not only benefits low-income households but also utilities; experience in other states shows that a larger fraction of low-income households pays 90 percent or more of their energy bills when burdens are reduced. Utility revenues increase and arrearages decrease, making utility collection expenditures more effective and efficient. A restructuring of assistance according to the PSC Staff's recommendation would also likely produce many other benefits. For instance, the AEP would remove low-income households' energy burden from the volatility of energy prices and from inflation in energy prices. Their share of energy bills would be limited to 6 percent of household income, which is generally unaffected by energy price volatility.⁷⁵ By generally limiting the energy burden to 6 percent of income, there is predictability in energy payments, making the management of other financial problems less complex.

The AEP addresses a host of issues, including the major one that post-assistance energy burdens remain high for a large number of low-income households. With a maximum energy burden of 6 percent, income would be freed up for rent or mortgage payments, food, medical bills, transportation to work, etc. This

⁷⁴ This presumes that EmPOWER and other funds for efficiency will be adjusted to allow for conversions from fuel oil and propane to efficient electric systems. This would benefit ratepayers and electric utilities since it would increase electricity use (and use of the transmission and distribution system), other things being equal.

⁷⁵ Of course, larger trends in energy prices have effects on the economy and on jobs.

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would improve the quality of life for low-income households and also reduce assistance needed in other areas such as that for food, homeless shelters, or emergency room visits.

The present system of assistance does provide real relief to well over a hundred thousand Maryland households per year. However, it still leaves many low-income households with high energy burdens even after assistance. It also does not adequately account for the variety of social, economic, and health costs of those high energy burdens. By limiting energy burdens to 6 percent of gross income, the Affordable Energy Program would focus assistance in a way that is likely to significantly reduce the various costs of high energy burdens. At the same time, the AEP is compatible with greater dignity for low-income households, in that they would be responsible for an *affordable* share of their energy bills; this is compatible with energy and economic justice, which should be the central organizing principle for energy assistance. Programs such as efficiency measures, including weatherization, and universal solar access would be complements to the AEP; they would serve to reduce its costs over the long-term. That would benefit both ratepayers and low-income households. See Sections VI and VII below.

In its comments at the start of Public Conference 27, the Office of Home Energy Programs (OHEP), which administers both the EUSP and the MEAP, noted that “making bills affordable to low income families should remain the primary program goal.”⁷⁶ After the Commission Staff submitted the program for review, the Maryland Department of Human Resources (DHR), which oversees OHEP, expressed concerns about the cost of the program and, according to the PSC, suggested other ways that

⁷⁶ Maryland OHEP 2012, p. 2.

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could “increase the efficiency and impact of energy assistance programs.”⁷⁷

DHR also noted two other objective in addition to the main goal of keeping bills affordable at the start of the process of evaluating energy assistance programs:

- “The application process should be easy to understand, incorporate the concept of ‘no wrong door’ and generally minimize the burden on the customer applying for benefits.
- “In order to maximize resources going to the customer, Maryland’s home energy assistance programs should be coordinated and streamlined to avoid unnecessary administrative costs.”⁷⁸

After the AEP was published, DHR, in reviewing the program, noted that “the AEP model would likely have a positive impact on the affordability of utilities for eligible households...” among other advantages.⁷⁹

DHR’s main concern appears to have been the cost of the program and its impact on ratepayers; it estimated that ratepayers “could” see their bills increase by “as much as \$7 to \$10 per month.”⁸⁰ DHR set forth four “themes” that emerged from the AEP proposal and the experience gained from the use of the “Customer Investment Fund that resulted from the Constellation-Exelon merger”⁸¹ in 2012.

- The need for a more holistic approach,
- Addressing the affordability of payments,

⁷⁷ Maryland AEP 2014, p. 5

⁷⁸ Maryland OHEP 2012, p. 2

⁷⁹ Maryland DHR AEP comments 2012, p. 5

⁸⁰ Maryland DHR AEP comments 2012, p. 5; see also p. 4

⁸¹ Maryland DHR AEP comments 2012, p. 5

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- Promoting customer accountability,
- Targeting of energy conservation resources.⁸²

The DHR report on the AEP set forth a number of possible ways in which the existing programs could be enhanced. For instance, bill payment assistance would be combined with “required” participation in energy conservation programs such as the quick checkups offered by utilities.⁸³ However, DHR did not address a major obstacle for many low-income households who rent: the refusal of many landlords to allow access to their properties.

DHR made an important suggestion that could improve the AEP and make it more holistic:

DHR [the Maryland Department of Human Resources] will also work with its local human service partners to connect each client in the enhanced program to a case manager. Case managers would ensure that clients take concrete steps towards improving their self sufficiency such as developing a household budget, screening for additional benefits, and employment development referrals.⁸⁴

The many economic difficulties faced by low-income households are connected via the central fact of limited income, while the specific difficulties faced by low-income families vary widely. In this context, the case-manager approach holds out two promises:

⁸² These four bullets are a paraphrase from Maryland DHR AEP comments 2012, p. 7.

⁸³ Maryland DHR AEP comments 2012, pp. 5-6.

⁸⁴ Maryland DHR AEP comments 2012, p. 6

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- The various forms of assistance could be coordinated while at the same time improving the economic prospects of a household.
- The benefits from coordinating assistance could be realized over time by reduced costs because of better health, lower emergency room visits, better attendance in school and at work, and reducing homelessness.

We noted in the preface that energy is but one part of a larger, complex problem of economic equity and justice; the case-manager approach could help connect energy justice with broader socio-economic goals. It also conforms to the findings of the Baltimore pilot project, discussed below, that a holistic approach can yield far greater benefits and even result in collateral benefits such as investments by households that have not received direct assistance.

However, there is no reason why the case-manager approach could not be made part of the AEP. Further, the measures suggested by DHR, individually or in combination, would not address affordability as thoroughly and integrally as the AEP, though if integrated with the AEP would provide a stronger program. In our view, limiting energy burdens to six percent, as proposed in the AEP, would best accomplish the goal of making energy bills affordable for low-income families. And as the analysis of efficiency, solar energy, and non-energy benefits shows, the AEP can provide the foundation for reducing the need for assistance.

After reviewing the Commission Staff proposal, the Commission itself did not take “final action” on the program. In its 2014 report to the Maryland legislature, the PSC noted some of the reasons for deferring action:

The AEP is a conceptual document designed to address bill payment from a new

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perspective....This [the AEP] would be a major change from existing Maryland energy assistance programs. Such an approach to bill assistance and the additional elements of the AEP would require new legislation, new and revised regulations.⁸⁵

Thus, issues relating to cost, procedures, and possible alternative approaches to enhancing the program appear to have contributed to the deferral of action on the AEP.

The statewide costs of implementing the AEP was estimated by the PSC at \$250 million using data for the year 2011 based on that year's participation level. This is not an incremental amount over present cost, but the total estimated AEP cost.⁸⁶ The total cost of the EUSP program in that year was \$58 million. According to the PSC Staff paper, the addition to a residential bill for the AEP may be between about \$4 and \$8 per month, depending on how those the costs were distributed between residential and non-residential customers.⁸⁷

However, the estimates of the increase in monthly bills assumes that the entire additional cost will come from electricity ratepayers. Part of the AEP would be for assistance with heating bills of households that use natural gas for heating; this currently comes from MEAP, which is funded by the federal government. If the energy assistance program overall, and not only electricity, is revised to reflect the principles of the AEP, the MEAP funds now devoted to assisting low-income households heating with natural gas would, in principle, be available for the AEP. Further, the administrative costs for the AEP were assumed to be considerably larger than for the current

⁸⁵ Maryland AEP 2014, p. 5

⁸⁶ Maryland AEP 2012, pp. 27-28

⁸⁷ Maryland AEP 2012, pp. 29-30

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programs. However, this was the result of the way the cost was estimated – that the AEP would replace only the EUSP and not both the EUSP and the gas and electric heating portions of MEAP.⁸⁸

From a jurisdictional perspective, it is understandable that the PSC Staff did not fold in the funds available from MEAP into its initial estimate of the costs of the Affordable Energy Program. MEAP gets its funding from the federal government's low-income heating assistance program (LIHEAP). The PSC does not have jurisdiction over the use of these funds; they are administered by the Office of Home Energy Programs (OHEP), which is part of Maryland's Department of Human Resources.

However, this does not mean that the funds would not be available to a **properly structured** Affordable Energy Program. The specific structure is important. The federal government has allowed the use of LIHEAP funds in such programs, which go under the general rubric of "Percentage of Income Payment Plan" (PIPP). Guidance for the integration of LIHEAP funds with PIPPs were issued by the federal LIHEAP office in 2010. It stated that "the process of subtracting the LIHEAP benefit from the client's energy bill and to then calculate the PIPP discount and/or the client's payment amount appears to be using LIHEAP as a resource and creates an inequity or adverse treatment for LIHEAP clients participating in the PIPP."⁸⁹ This specific approach was disallowed. But a number of other states have programs in which LIHEAP finds are integrated with PIPPs.

⁸⁸ In commenting on the administrative cost estimate, the PSC Staff noted that "It is reasonable to assume administrative cost could be much less in that the AEP could be implemented largely with the existing energy assistance infrastructure and personnel." (Maryland AEP 2012, p. 28)

⁸⁹ LIHEAP 2010

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For example Ohio has a Percentage of Income Payment Plan that fully integrates LIHEAP funds with ratepayer funds. As part of Ohio's PIPP, the Ohio Department of Development reports on the organization and integration of the various streams of energy assistance funds for low-income households. As is the case in Maryland, electric ratepayers contribute to an electric universal service program, the federal government to a heating program. Ohio has a common application for its PIPP and federal LIHEAP heating assistance.⁹⁰

There are several other states where LIHEAP funds are integrated into PIPP-type programs. Colton 2011 cites several examples, including Colorado, Illinois, and Nevada.⁹¹ Like Ohio, Maryland has a joint application and integrated administration of the assistance programs, since both the MEAP heating assistance and EUSP electricity assistance are administered by the Office of Home Energy Programs. It is possible that regulatory, legislative, and/or executive branch action may be required to enable Maryland to integrate MEAP with the Affordable Energy Program in a manner that conforms to the LIHEAP office's strictures.

Our review indicates that the federal government explicitly allows for the use of LIHEAP funds in PIPPs, like the proposed Affordable Energy Program. However, it is essential that the necessary steps to fully integrate MEAP and the AEP be taken in Maryland and that the integration be reported to the federal government in Maryland's application for federal LIHEAP

⁹⁰ Ohio Department of Development 2012. See especially pdf page 35 onward.

⁹¹ Colton 2011, Attachments 2, 3, and 4.

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funds to ensure acceptability of the use of the LIHEAP funds in the new context.⁹²

The use of LIHEAP funds in Maryland's AEP would substantially reduce costs below those estimated in the 2012 PSC staff memorandum. There will, however, be some added direct costs above the present program if the AEP is implemented. Leaving aside for the moment the issue of where the additional direct funds needed for the AEP would come from, and how the reduced expenditures by other offices and departments due to indirect program benefits would be factored into the AEP, we estimate that *with the same number of recipients as in 2013*, the costs of the AEP would be about \$30 million more than the cost of present assistance. This estimate includes a doubling of the administrative cost, as assumed by the PSC staff.⁹³ If the entire amount is covered by residential electricity ratepayers, it would amount to just over \$1 per month. As we shall see, this cost can be substantially reduced by procuring solar energy for the program (see Section VII).

How many additional applicants there may be and how much assistance they may need are open questions. Present assistance preferentially goes to the lowest income brackets among low-income households.

At the same time, if more people get assistance, many of the costs now borne by society due to high energy burdens, including the costs for health care, shelter for homeless families, energy bill arrears, etc., would substantially decline. We will address this issue once we have considered such non-energy benefits, as well as efficiency, and solar energy; all three can be

⁹² Specifically, the process laid out on page 10 of the PSC staff proposal would have to be reviewed and, if necessary, modified, to conform to federal requirements. Maryland AEP 2012, p. 10

⁹³ Maryland AEP 2012, p. 28

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combined to lower net costs of the Affordable Energy Program. Indeed, they indicate that, when fully implemented, the *net* costs may well be less than the costs of present assistance.

We now turn to the issue of assessing energy efficiency (Section VI), solar energy (Section VII), and non-energy benefits (Section VIII) as they relate to energy assistance, including the proposed Affordable Energy Program.

VI. Low-income energy efficiency programs and their effects

Reducing heating bills by weatherizing homes and installing more efficient appliances and HVAC systems would reduce energy burdens and be beneficial from a number of viewpoints. However, increasing efficiency would be most effective from a public and private standpoint if coupled with the Affordable Energy Program. Increasing efficiency brings down energy bills; under the AEP the benefit of the reduced bill would directly reduce the cost of the program until the energy bills went down to 6 percent of gross income for that household.

We illustrate the benefits to ratepayers of an efficiency program using electricity data for an average all-electric low-income household getting assistance – income and electricity rates are for the year 2013:⁹⁴

- Annual Income: \$17,283
- Electricity use: 14,215 kWh
- Annual electricity bill before assistance: \$1,948
- Affordable amount for paying electricity bill at 6 percent: \$1,037
- Assistance amount under AEP: \$911
- Average EUSP assistance in FY 2013: \$325 (excluding heating assistance) plus \$317 for heating for a total of \$642

In this example, the post-assistance energy burden under the present EUSP and MEAP programs would be 7.6 percent compared to 6 percent with the Affordable Energy Program. The AEP would therefore give recipient households an

⁹⁴ Electricity use: IEER calculation; assistance data for the present EUSP and MEAP program from Maryland PSC 2013, p. 5.

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additional \$269 to spend on other needs. In contrast, a household with income at 175 percent of the federal poverty level (the maximum for current assistance eligibility) and the same electricity usage would get no assistance under AEP because the electricity bill would be less than 6 percent of household income.

Judicious efficiency investments would bring down the costs of the Affordable Energy Program. For instance, a heat pump water heater costs \$900 more than a regular electric water heater; it is about 2.5 times as efficient. The annual savings would be about \$220, equal to two-thirds of the EUSP assistance in 2013. However, we have added an annual \$50 for maintenance compared to a regular resistance water heater, which reduces the savings to \$170 per year. The payback time before any rebates is just over 5 years.⁹⁵ Figure VI-1 shows the investments and payback in a scenario that converts all electric water heaters in homes getting energy assistance to heat pump water heaters over a period of 10 years, the typical lifetime of a water heater. In this scenario, the AEP would go into the black in the third year, since the annual capital investment is constant but the savings are cumulative for an increasing number of water heaters. We can similarly calculate the costs and benefits of replacing other appliances like refrigerators.

⁹⁵ The rated coefficient of performance of the water heater is 2.9. We have used a value to 2.5 as an annual average to account (approximately) for the fact that in the winter, when hot water use is heaviest, the heat pump draws heat from the house thereby increasing heating requirements. Air conditioning requirements in the summer are reduced for the same reason. We have not taken the \$500 rebate into account in the payback time since we assume that the entire cost increment of the heat pump water heater would be borne by ratepayers in the case of low-income EmPOWER programs.

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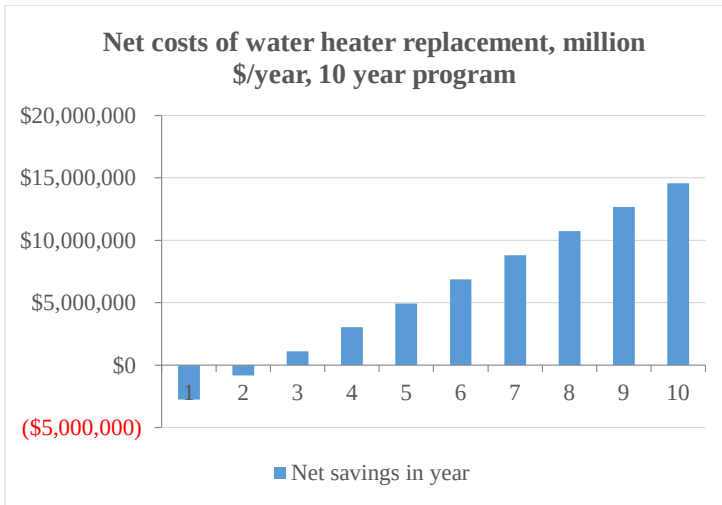


Figure VI-1: Net present value of replacing electric resistance water heaters with electric heat pump water heaters in low-income households currently receiving assistance. Source: IEER.

Both Maryland and the federal government recognize that inefficiency of existing housing stock, both in terms of the quality of the building envelope (with subpar insulation, high air infiltration, etc.), is a major cause of high energy burdens, along with relatively low appliance efficiency (including HVAC equipment) and, in many cases, high cost fuels (mainly fuel oil and propane). There are therefore state programs, in some cases supplemented by federal programs, to fund increases in energy-use efficiency in low-income households. There are also other sources of funds such as the Department of Energy and the Regional Greenhouse Gas Initiative (RGGI).⁹⁶ In the past, there have also been specific funds from Congress, for instance the American Recovery and Reinvestment Act (ARRA).

⁹⁶ Ariano 2014, slide 2

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Maryland's main energy efficiency program, primarily for electricity but also for natural gas, is the EmPOWER program and is administered by the Maryland Department of Housing and Community Development. It is subject to approval by the Maryland's Public Service Commission because the funding for the program comes from a charge levied on utility ratepayers. The EmPOWER program has a low-income weatherization component, described as follows:

The EmPOWER Low Income Energy Efficiency Program (LIEEP), administered by the Maryland Department of Housing and Community Development (DHCD) helps low income households with installation of energy conservation materials in their homes at no charge. These improvements will both reduce a household's energy use and lower the monthly utility bills, and will also make occupants more comfortable and may improve the air quality and overall health of the family.⁹⁷

⁹⁷ EmPOWER website (EmPOWER 2015). All further statements about the EmPOWER low-income weatherization program are based on or quoted from this website, unless otherwise mentioned. We note here that the EmPOWER program is much broader than low-income weatherization. It is based on a 2008 law that mandates energy efficiency and electricity demand reduction targets. Maryland's Public Service Commission sets rates that allow utilities to recover the costs of these programs that cover the residential, commercial, and industrial sectors. The text of the legislation (Maryland Statute Public Utilities §7–211 (2015)) sets an overall target of reducing per capita peak energy demand and per capita electricity consumption by 15 percent by the year 2015 relative to a 2007 baseline. In BGE territory, funds designated for energy assistance in 2011 as a condition of the merger of Exelon with Constellation may be used to convert fuel oil heating systems to other fuels. The usual conversion is from fuel oil to natural gas.

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The eligibility criterion for the program is set at 200 percent of the federal poverty level, compared to 175 percent for heating and electricity bill assistance. The EmPOWER program, known as the Low Income Energy Efficiency Program (LIEEP), may pay the entire cost of the retrofitting in the following areas:

- Insulation in the attic, floors and walls;
- Hot water system improvements;
- Lighting retrofits;
- Furnace cleaning, tuning and safety repairs;
- Refrigerator retrofit, if applicable;
- Health and safety items.⁹⁸

While the heating system item only mentions “furnace cleaning, tuning and safety repairs,” in practice replacement of heating systems and window air-conditioning units is also done. We note here that currently LIEEP funds may not be used for replacing a fossil fuel heating system with an electric one, no matter how efficient.⁹⁹ This is a major obstacle to achieving the AEP goals and the state’s greenhouse gas reduction goals. It also reduces long-term cost relief for ratepayers since efficient electric HVAC systems have the lowest annual operating costs. For instance, the average cost of heating an oil-heated detached home in Maryland is about \$1,400 per year, while heating the same home with a cold climate heat pump cost would be less than \$500 per year – an annual savings of more than \$900.¹⁰⁰ The upfront cost of a cold climate heat pump is considerably

⁹⁸ EmPOWER 2015. The list is a direct quote.

⁹⁹ Maryland DHCD Weatherization 2014, p. 89. Fuel switching is temporarily allowed in BGE territory because it was part of the agreement when Exelon took over Constellation Energy.

¹⁰⁰ Makhijani and Mills 2015, Section V.A, which shows combined heating and cooling costs. The disaggregated costs for heating, cited here for one of the case studies, are available upon request for the three types of houses studied in the report.

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higher than a new oil-fired furnace plus an air-conditioner; yet replacing oil-fired systems with cold climate heat pumps would be very economical even when that higher initial heat pump cost is taken into account. *Indeed, under the AEP such a replacement would likely eliminate the need for assistance for many low-income homes altogether.* Further, efficient electrification of heating systems makes them compatible with a decarbonized grid, and hence with Maryland's goals for reducing greenhouse gas emissions.

A prohibition against using LIEEP funds for switching away from fuel oil and propane is akin to a food assistance policy that would force low-income household to purchase only carbohydrates. It is poor policy and creates a variety of costs that can and should be avoided.

It serves no public interest to leverage public funds for weatherization and HVAC system replacement and then oblige low-income people to stay stuck with expensive fuel oil and propane. It perpetuates the need for assistance. It is also contrary to energy dignity: low-income households are not offered a rational and economical choice of heating systems, which all other individuals are free to make, for the sole reason that they need assistance. ***We strongly recommend that the prohibition against the use of LIEEP funds for fuel switching be repealed.*** This will create more jobs in the HVAC industry though it will negatively affect fuel oil and propane dealers. That concern should be addressed with the community and worker protection fund that we recommend be created to assist with a transition to a low-emissions energy system.¹⁰¹

¹⁰¹ At the present time shifting from fuel oil and propane (when technically feasible) to cold climate heat pumps is economical. Shifting away from natural gas to efficient electric systems should also be allowed. This is

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In all, more than \$154 million was spent between 2007 and 2014 on various efficiency programs (including replacement of furnaces, refrigerators, and air conditioning units) in Maryland. Nearly 20,000 single family homes and nearly 7,000 multifamily homes received assistance, for a total of nearly 27,000 households in the period.¹⁰² Estimates of energy use (both electricity and, where applicable, natural gas) were made before the efficiency program was implemented. Post-implementation evaluations were also done.

The energy savings appear to be substantial. Initial engineering estimates of the savings on energy bills for the single family homes that had improvements were estimated at \$8.3 million per year. The retrofits were mainly to electrically heated homes.¹⁰³

Yet there remains considerable uncertainty in energy and money savings estimates resulting from efficiency investments in low-income households. An evaluation based on actual billing data for 2012-2013 continued to indicate that the savings were substantial but that they were lower than the initial estimates. The evaluation was commissioned by the utilities that participate in the EmPOWER program and the Maryland Public Service Commission.¹⁰⁴ Table VI-1 shows a comparison of the initial estimates (by GDS Associates) of energy savings and the bill-verified savings (by Itron, Inc.).

necessary in the long-term to achieve the goal of 90 percent CO₂ emissions reductions by 2050 (relative to 2006). See Makhijani and Mills 2015.

¹⁰² Ariano 2014, slide 3

¹⁰³ For this paragraph see Ariano 2014, slides 2, 3, 6 and 11.

¹⁰⁴ Itron 2014

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Table VI-1: Initial estimates of the Maryland low-income efficiency program impact and bill verified savings for the year 2013.

Utility	GDS Evaluated Savings			Itron Verified Savings		
	MWh	Utility kW	Therms	MWh	Utility kW	Therms
BGE	7,622	2,104	394,457	5,368	1,390	258,428
PEPCO	1,395	654	73,719	983	341	50,442
DPL	1,493	683	4,093	1,051	364	2,829
SMECO	755	284	1,878	531	146	1,055
PE	1,377	161	8,737	970	238	5,773
Total	12,641	3,886	482,884	8,903	2,479	318,528

Source: Adapted from Itron 2014, Table 1-3 (p. 1-4)

The total benefit-cost ratio as initially evaluated averaged 1.31 overall, and varied from 0.52 to 1.8 for various utilities. But the bill verified evaluation showed the average statewide benefit-cost ratio to be less than 0.86, with a range of 0.4 to 1.11 across Maryland's utilities.¹⁰⁵ The relatively low benefit-cost ratio was

¹⁰⁵ Itron 2014, Table 1-5 and Table 1-6

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seen by the evaluators as part of the learning process in a program that is still quite young:

Overall, the realization rates and cost-effectiveness results found by GDS and Itron are consistent with findings from previous program evaluation studies for program administrators who have just recently assumed the responsibility of developing and managing a suite of energy efficiency programs designed to assist limited income households. Gross realization rates tend to be less than one in the initial stages of any efficiency program launch as kinks in the program tracking systems and energy savings algorithms are worked out. We recommend that the current program administrator focus on improving the design and delivery of the programs going forward and not be distracted by the fact that program savings may have been overestimated in this first program year due to the growing pains associated with developing new tracking systems and new relationships with evaluation firms.¹⁰⁶

A noteworthy finding supporting the above conclusion was that the benefit-cost ratio improved from 0.45 in 2011 to 0.86 in 2013.¹⁰⁷

One of the more surprising findings of the Itron evaluation was that the amounts of initial electricity and gas consumption entered into the database were very frequently wrong, more so for gas than electricity. For electricity, about one-fourth of the

¹⁰⁶ Itron 2014, p. 1-7

¹⁰⁷ Itron 2014, Table 1-6 (p. 1-7)

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data entries were more than 20 percent in error when the database values were compared to actual utility bills. This is very problematic because savings estimates are often in the 10 or 20 percent range. If the initial baseline data are frequently more than 20 percent wrong then considerable uncertainty is needlessly introduced into the analysis of the impacts. A large number of the errors was clustered around 10,000 kWh per year of usage. This may have been due to the program specification that directed resources preferentially to high usage households.¹⁰⁸

The problem of incorrect baseline data was far more severe in the case of natural gas. Over two-thirds of the baseline data entries were wrong by more than 20 percent.

Certainly, it is essential to have a carefully vetted set of baseline data and verified savings estimates in order to estimate the impact of improvements to building envelopes and new HVAC equipment on energy bills and hence on the net costs of energy assistance programs. Nonetheless, it is clear that certain efficiency improvements, notably replacing incandescent bulbs with LED lights and installing heat pump water heaters could play an important role in reducing long-term assistance costs.

The calculation of the benefits of improved weatherization of buildings and upgraded heating and cooling equipment is more complex. First, we do not have adequate data on the savings that would accrue for different types of weatherization investments in Maryland. Second, the costs of replacing HVAC equipment with efficient electric systems will depend on the type of housing structure, whether the home has ducts or not, and other technical factors. Third, the condition of the structure

¹⁰⁸ Itron 2014, pp. 1-15 to 1-17

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is also an important factor in the costs. Some of these points are illustrated by a pilot project in Baltimore.

A. Baltimore weatherization pilot project

The American Recovery and Reinvestment Act enabled the City of Baltimore to carry out a pilot project aimed at assessing the efficacy of efficiency programs with and without accompanying education for low-income households. The program included both renter and owner-occupied low-income households; a variety of renter-landlord arrangements were included. Finally, there was a control group that received neither educational visits nor efficiency investments.¹⁰⁹

A number of steps had to be taken before investments could actually be made to a household:

- The home had to pass an audit and be up to code.
- Permission to enter had to be obtained from the owner in case of owner-occupied homes and from both the renter and landlord in case of renter-occupied homes.
- Being able to contact the parties was a preliminary necessity that could not be accomplished in many cases.
- The applications had to be complete.

The initial project design was to have 70 percent renters and 30 percent owners in the group that got the efficiency upgrade and also in the control group. Both groups had sub-groups that did or did not receive educational visits.

The main measure of the success of any pilot program should be lessons learned so that insights are as rich as possible and may

¹⁰⁹ The rest of the description of the Baltimore pilot project in this section is based on Pontious 2012 unless otherwise specified. Pontious 2012 uses the term “weatherization”; however, various kinds of efficiency investments were made. Many of the difficulties were around weatherization investments, which involve changes to the structure.

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be applied to make larger-scale efforts more efficient and economical (in the sense of results per dollar invested). By that criterion, the pilot program was a big success. Some of the principal lessons relevant to the policy discussion in this report were as follows:

- Possibly the biggest lesson was that “the **landlord is a unique and major barrier** [to weatherization] **for renters.**” Of the barriers, permission to enter was the biggest: “Nearly half (46%) of all tenants who applied could not get permission for audit despite qualifying for weatherization otherwise.”¹¹⁰
- Many homes, both rented and owner-occupied, were not up to code, with bad roofs, mold, and wet basements being the most common problems.
- The pass-rate for audits in rented homes was very high (88 percent) in subsidized housing, which is subject to annual inspections, and where subsidies enable landlords to keep up their properties. In contrast, only 43 percent of unsubsidized low-income rental housing passed the audit. Ownership of such properties by small landlords who do not receive enough rent to keep up the properties may be a factor in the high audit failure rate. The knowledge that their properties are or may be in violation of building and safety codes may be related to their reluctance to grant auditors and weatherization program personnel permission to enter their property. Thus the two barriers – lack of permission to enter and code violations – may well be related.

Verification of the energy savings (both electricity and natural gas) was based on actual bills before and after the efficiency

¹¹⁰ Pontious 2012, pdf p. 10 (bold in original)

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investments. However, the very large differences in weather between the pre- and post-weatherization years complicated comparisons. Adjusting for winter and summer weather by using the heating and cooling degree days in the two years did not eliminate the problems. The most obvious of these was that households that received neither an educational visit nor weatherization showed significant savings even after weather adjustment, indicating that degree-day adjustment of energy consumption, while important, is not enough in at least some circumstances.¹¹¹

It is reasonable to use the control households as the baseline, as the study suggests, because it would eliminate the problem of adjusting for year-to-year weather changes. The data for the control group in any year are compared to the data for the groups receiving various forms of assistance. Weather-related adjustments would still be needed to be to evaluate the effectiveness of the efficiency measure(s) implemented in any particular home. In general, there were still significant energy savings in the homes receiving efficiency investments compared to those that did not, both for gas and electricity except in one case. Ironically, that was the case for electricity use in households that received both weatherization and education visits. Review of this problem indicated that the cause may have been the resetting of programmable thermostats from the factory settings aiming at energy conservation to what appeared to be a preferred summer temperature setting of just 65 °F. This conclusion was admittedly speculative, however.

B. Perspective on efficiency assistance

Our analysis (Section II.C) indicates that low-income homes appear to be considerably less efficient so far as heating is concerned than average Maryland homes. Poverty and

¹¹¹ Pontious 2012, pdf p. 17

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inefficiency combine to create persistent needs for assistance. This was noted in the evaluation of the Baltimore City pilot project discussed just above. Households with high usage got the most assistance; further, of the sample in the pilot project, 44 percent of the households got energy assistance in three or more years in the 2008-2012 period. Cumulative assistance ranged from under \$1,000 to over \$5,000 over this period. Together these findings illustrate the reasonableness of making significant investments in increasing efficiency of low-income households by various means. As the pilot project report noted, “conservation could be an effective investment for both Energy Assistance recipients and the program itself if it can reduce repeated and high energy assistance awards.”¹¹²

The need to address the problem structurally through efficiency improvements is further underscored by the declining fractions of electricity bills that shrinking assistance budgets can cover. This is seen in Table VI-2, reproduced from the Baltimore City pilot project report.

¹¹² Pontious 2012, pdf pages 22 to 25. The quote is on pdf p. 25.

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Table VI-2: Fraction of electricity bills covered by assistance in Baltimore City

Benefit Level (% of Poverty Level)	FY 2012	FY 2011	FY 2010
0-75%	35%	45%	65%
>75%-110%	30%	35%	50%
>110%-150%	25%	27%	40%
>150%-175%	17%	17%	30%
Subsidized Housing	14%	15%	20%

Source: Pontious 2012, pdf p. 23

But the Baltimore efforts, notably the Green and Healthy Homes Initiative (GHHI), show that it is more than an energy issue. The GHHI made investments on a wide front aimed at multiple issues faced by families, beyond just efficiency. The GHHI has eight criteria for green and healthy homes: they should be dry, clean (in relation to dust and contaminants), safe (including in relation to storage of materials, physical configuration, smoke detectors, etc.), well-ventilated, pest-free, contaminant-free (lead, radon, etc.), well-maintained, and energy efficient.

The Baltimore GHHI achieved quite remarkable results with this holistic approach. Two of the most important not only for the low-income families but also for evaluating the Affordable Energy Program are:¹¹³

“Lower rates of foreclosures”: This not only impacts the affected households positively but also neighborhood property values. It would also reduce expenditures on housing assistance, aid to the homeless, and public expenditures associated with adverse health outcomes related to homelessness.

¹¹³ GHHI 2013, pp. 16-17.

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“Reduction of vacant and abandoned housing”: Vacant and abandoned housing negatively affects neighborhood security and property values.

The GHHI work in Baltimore City indicates the need for broadening the scope of low-income housing improvements as well as assessment of non-energy benefits. We will return to this issue in Section VII on evaluating non-energy benefits of energy assistance programs.

C. Scope of Maryland's existing low-income efficiency program

Maryland's utilities charge ratepayers for funds for the EmPOWER efficiency program as part of their electricity bills. A part of these funds have been used for low-income efficiency programs, which have been fully administered by the Maryland Department of Housing and Community Development since July 2012.¹¹⁴ Other funding streams, including federal funds, are also used. The program in its present form is therefore relatively new. However efficiency assistance itself goes farther back.

There were about 27,000 Maryland homes that received efficiency assistance in the eight-year period FY 2007 to FY 2014 (inclusive), which averages out to about 3,400 homes per year.¹¹⁵ This is a very substantial effort. However, it is still short of the need. At the average pace of the past eight years, it would take more than 100 years to reach a majority of the 361,000 households in Maryland currently eligible for energy assistance at 175 percent of the federal poverty level.¹¹⁶ The pace of the program would have to be significantly increased to reach even

¹¹⁴ Maryland PSC EmPOWER 2014, p. 17

¹¹⁵ Ariano 2014, slide 3

¹¹⁶ For the number households eligible under Maryland rules, see LIHEAP 2011 Notebook (2014), Table B-2.

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just the qualified households now getting assistance within a reasonable time. To complete efficiency improvements of the households within 10 to 15 years, the program may have to be ramped up by two- to three-fold from the 2007-2014 average (depending on the number of households that qualify structurally and otherwise). Such a ramping up may require two or three years to sort out the various issues associated with estimating energy savings, various costs and benefits, and putting in place policies to address landlord issues.

For an average efficiency investment of \$5,000 per household, and 10,000 residences per year, the total annual investment needed would be about \$50 million. That is the pace needed to provide low-income households who got assistance in 2013 in Maryland with weatherization by the year 2030. It is difficult at the present time to estimate the direct payback period and the reduction in energy assistance since the efficiency programs are still too recent. The Itron evaluation for the year FY 2013 indicates a simple payback time of about 12 years.¹¹⁷ However, when non-energy benefits are taken into account, the payback period may be reduced by a factor of two or more. (See Section VII below.) Finally, we note that if the efficiency program is implemented together with the Affordable Energy Program, virtually all of the reduction in energy bills would flow back to ratepayers in the form of lower charges for energy assistance (see Section VIII below).

¹¹⁷ The total cost of the program was \$18.9 million. Itron estimated the annual natural gas savings at 318,528 therms and electricity savings at 8,903 megawatt-hours. See Itron 2014, Table 1-3 and Table 1-6. At \$1.20 per therm and \$140 per megawatt-hour, the total annual savings work out to about \$1.6 million, giving a simple payback time of 11.6 years, rounded to 12 years in the text above.

D. Fossil fuel heating systems conversion

The most expensive fossil fuel heating systems use fuel oil and propane – a result of the much higher costs per unit energy of these fuels compared to natural gas. In the case of low-income households receiving heating assistance (MEAP households for short), we have noted the much higher energy burden faced by low-income households heating with fuel oil. Propane's impact would be similar due to similarly higher cost of fuel compared to natural gas. The impact of higher energy burdens creates a need for greater assistance, which in turn is reflected in the disproportionate allocation of assistance to such households. While these MEAP households are just 14 percent of the total, the amount of assistance is about 40 percent of the total.¹¹⁸

The Renewable Maryland Project has previously examined in some detail the issue of energy use and CO₂ emissions related to heating and cooling in the residential sector. This evaluation found that resistance heating and fuel oil and propane heating systems are the most expensive and can be economically replaced by highly efficient electric systems.¹¹⁹ As we have discussed, it is crucial to focus the resources of the LIEEP program to allow conversion of MEAP households with fuel oil and propane heating to efficient electric systems. The prohibition against the use of LIEEP funds for fuel switching needs to be repealed as part of the process of initiating the program.

Relative fuel prices would favor a conversion from fuel oil or propane to natural gas since it is the lowest cost system overall. However, from the point of view of running cost, a cold climate heat pump would cost less to run than a natural gas furnace, reducing the need for assistance after the HVAC system is

¹¹⁸ Maryland PSC 2013, Appendix A, Attachment J (pdf p. 46)

¹¹⁹ Makhijani and Mills 2015

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installed. Conversions from fuel oil to natural gas would complicate the essential long-term need (from a climate perspective) to greatly reduce natural gas use for space heating in the buildings sector (except for combined heat and power and standby electric generation capacity). An approach that prioritizes greater efficiency, lower cost, and climate protection involves

- Investment in cold climate heat pumps by conversion from inefficient electric heating systems, fuel oil, or propane heating systems;
- Reducing the need for assistance by making a one-time investment up front compared to simply converting a household to natural gas heating from oil or propane;

VII. The role of solar energy and energy assistance

There has been an assumption that solar installations are mainly in upper-income households, while all ratepayers (and taxpayers) pay for the associated rebates and other incentives. For instance, a *Wall Street Journal* expert blog presented the following as fact: “Subsidies take money from working-class families and give it to people who can afford high, up-front capital costs.”¹²⁰ However, research by the Center for American Progress published the month before this blog entry showed that solar installations are broadly spread among middle- and upper-income zip-codes, used as a proxy for middle-and-upper-income households.

While upper-income households (defined as having more than \$90,000 in annual income in the report¹²¹) are disproportionately represented, the vast majority of installations are in households in the \$40,000 to \$90,000 income range. Figure VII-1 also shows that the fraction of solar installations in middle-income households has been increasing steadily in the three states studied (Arizona, California, and New Jersey). What is true is that **low-income households, defined as below \$40,000 in annual income, are underrepresented** in all three states that were studied (see Figure VII-1) and that the situation has not improved over time. \$40,000 is approximately 175 percent of the federal poverty level for a family of four. For the average size low-income family getting energy assistance in

¹²⁰ Myers 2013

¹²¹ Hernandez 2013. This is a rather modest lower bound for “upper income” households, especially given that California, where housing costs are high, was one of the three states studied.

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Maryland (2.85 people), 175 percent of the poverty level in 2013 was an annual income of about \$32,000 (rounded).

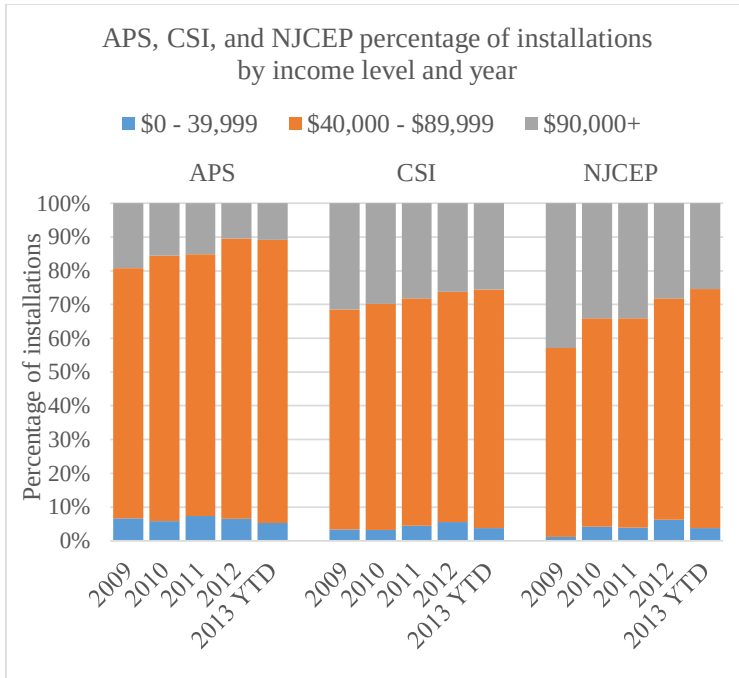


Figure VII-1: Income distribution of households installing solar in the 2009-2013 period (APS = Arizona Public Service; CSI = California Solar Initiative; NJCEP = New Jersey's Clean Energy Program). Source: Recreated from Hernandez 2013, Figure 3 (p. 4). This report, *Solar Power to the People: The Rise of Rooftop Solar Among the Middle Class*, by Mari Hernandez, was published by the Center for American Progress.

The low solar installation rate among low-income households is not surprising. The spread of leasing with zero down payment as a way to acquire solar and also reduce electricity bills has made it possible in theory to overcome the high first cost of solar. But in general one must own the roof for the solar installation, though community solar initiatives, still in their infancy

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generally, are making broader participation, including by renters, possible. Information is also key. Besides, owning the roof is not enough. The roof must have the strength to take the additional load of the solar panels. As it is, the Baltimore weatherization pilot project found that bad roofs were by far the most common problem causing homes to fail the audit required to proceed with the weatherization program (see Section VI above).

Low-income housing problems are very complex, the more so with rented homes, as discussed in Section A above. Economic justice considerations require therefore that the issue of equity in solar be addressed with some thoroughness and urgency.

The answer is not to curtail distributed solar installations among middle- and upper-income households, but to extend the opportunity to every low-income household; it is understood that, as in any other income category, not all of them may take advantage of the availability, independent of feasibility. **The goal should be to provide the opportunity to all low-income households to avail themselves of solar energy, even when they cannot put it on their rooftops, do not own the homes they live in, or do not have the capital to invest in them.** We might call this program “Universal Solar Access” by analogy with the program that exists now, the Electric Universal Service Program, which was created to ensure that low-income households do not have their electricity switched off for lack of funds to pay the bills.

There are many programs that are currently addressing the admittedly complex issues associated with broadening and

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eventually universalizing low-income households' access to solar energy.¹²²

Community solar installations with virtual net metering (that is, where the meter credited with the solar generation is not at the site of the solar installation) represent one avenue, possibly the most important, since it opens up a way for low-income households to actually own parts of solar electricity installations. In this approach, a solar installation much larger than the typical rooftop installation is built and fractions of it are offered for sale to businesses, non-profit groups, or households. The output of the panels is credited to the bill of the owner of those panels. This approach, known as "virtual net metering" is likely to encourage both conservation and efficiency efforts in the same way that ownership of a home encourages and makes possible investments that appear pointless or out of reach for renters. The electricity would belong to the low-income households, presuming that financing assistance can be worked out. Thus, efficiency and conservation would likely be a huge collateral benefit of community solar programs with virtual net metering, if there are appropriate educational investments in promoting them.

This is the type of community solar program which was passed in 2015 as a three-year pilot program in Maryland. In previous years, it has faced opposition from Exelon, a co-owner of the Calvert Cliffs nuclear plant, which provides about 40 percent of electricity generation in the state of Maryland. Exelon also owns the largest distribution utility in Maryland, Baltimore Gas and Electric (BGE), which has about half of the electricity customers in the state. Merchant generation utilities and even some regulated utilities view distributed solar generation as a threat,

¹²² A good summary with links is in Passera 2013.

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though this is not always the case. For instance, Pepco supported community solar legislation in the District of Columbia.¹²³

Despite the success in getting a community solar pilot program started, the prospect for a permanent program remains cloudy. Further, the financing issues will be difficult to solve for many, perhaps the majority of low-income households. The solar energy assistance discussed above could be applied to provide ownership of a part of the community solar system to participating low-income households. Since the community net metering program is only a three-year pilot, we also explore other avenues of providing broad access to renewable energy to low-income households. We do so in the context of the prospect that the largest subsidy for solar electricity, the federal business energy investment tax credit, is due to decline from 30 percent to 10 percent at the start of 2017 for non-residential installations. We assume just a 10 percent investment tax credit in our calculations, since that has no sunset date.¹²⁴

We propose a program to provide all of the electricity requirements of low-income households who now get electricity bill payment assistance, with solar, which should be distributed so far as possible. If all of them subscribe to the solar program, it would amount to about 2 percent of Maryland's total electricity usage.

There are various ways in which low-income households could get solar energy assistance. A project in Denver involved low-income renters. Residents were provided with solar electricity and their electricity bills were taken over by the landlord in exchange for an effective rent increase of \$25 per month. The renters did not own the solar installations; in fact, actual

¹²³ Makhijani 2015, pp. 8-9

¹²⁴ DSIRE Federal 2015, Business ITC

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ownership arrangements were rather complex because of the nature of solar incentives, including federal tax credits.¹²⁵

A somewhat limited community net metering, called aggregate net metering, has been initiated in Maryland. Under this program, agricultural entities, local governments, and non-profit institutions could aggregate electricity consumption from various meters located at different places and have them net-metered from a single solar installation.¹²⁶ Thus, some buildings that are not suitable for on-site solar or do not have enough rooftop or land area to accommodate a sufficient amount of solar panels can nonetheless benefit from solar energy. This is, in effect, virtual net metering, but its application is very limited at the present time.

Maryland's aggregate net metering program could be expanded to cover low-income housing that is owned by landlords and subsidized or owned by governmental agencies or non-profits. A variant of community choice aggregation (CCA) could be used. Community choice aggregation is being used to expand renewable energy access broadly, both to increase the range of households and businesses that could benefit by it and also to allow households and small businesses to benefit from more economical supplies if their renewable energy demand is aggregated. The core idea is as follows:

CCAs are statutorily authorized retail electricity choice programs administered by municipalities, which aggregate the demand of all customers within their jurisdictional boundaries, *enrolling customers on an opt-out basis* (2014 U.S. avg. opt-out is 15%), in order to leverage the

¹²⁵ Makhijani and Mills 2015, Section XI.E, contains a description of the program; references can also be found there.

¹²⁶ Maryland PSC 2014, pp. 5-6

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negotiation of contracts with retail or wholesale energy providers, as well as energy efficiency installers and renewable energy developers, variously and with differing local rules and regulatory conditions according to state CCA laws and other state-defined retail energy utility industry regulatory structures. Some CCAs also aggregate community gas service for heating. CCAs form in order to control energy sourcing locally, lower and stabilize rates, green their power supplies, and in some cases to make and repay investments in accelerated and expanded energy efficiency measures, and/or develop local renewable energy and energy efficiency projects.¹²⁷

As of March 2015, CCA is available in about 1,300 cities and counties, including Chicago and Cincinnati.¹²⁸ The CCA principle could be applied to recipients of energy assistance or applicants for weatherization assistance or both. If successful, it could be expanded to all households eligible for low-income energy assistance. Community choice aggregation can, in principle, be applied to any group of consumers in a region; in other words, geographic continuity is not required so long as all of them are supplied by the same distribution utility (in deregulated areas such as Maryland). Recipients of low-income energy assistance would be automatically signed on to the program, unless they opted out, which is the normal model for community choice aggregation.

The main questions are:

¹²⁷ Local Power 2015, italics added

¹²⁸ Local Power 2015

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- How can the supply of renewable energy be integrated into energy assistance programs?
- How much would a program cost that supplied half of the electricity requirement by renewable energy if it were made available to recipients of energy assistance?

The Interstate Renewable Energy Council (IREC) has proposed a model that integrates California's program to provide lower-cost electricity to low-income households. This is California's equivalent of Maryland's EUSP but in California's case low-income households get electricity at reduced rates (under a program called California Alternate Rates for Energy, or CARE) rather than bill payment assistance. IREC has suggested a program modification, CleanCARE, under which some of the CARE monies would go towards procuring renewable energy:

Under CleanCARE, a portion of the funds allocated to the support of CARE customers would be invested in the development of shared distributed generation coupled with energy efficiency, energy storage and demand response. CARE customers electing the CleanCARE option would be allocated program shares that would offset a portion of their monthly bills, with the intent of bringing those bills to levels equivalent to customer bills under the broader CARE program. In this respect, the CleanCARE option would increase opportunities for low-income households to participate in renewable energy options while retaining the average rate levels and benefits of the current CARE program.¹²⁹

The impact on the bill of the low-income recipient would be the same but the impact on renewable energy and carbon dioxide emissions over time could be substantial, especially if, as

¹²⁹ IREC 2013, p. 1

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proposed, the program is coupled with efficiency and conservation improvements. The CleanCARE program proposes to include distributed solar energy but also larger scale and farther located solar and wind resources.¹³⁰

We propose a Universal Solar Access program that is a variant of the CleanCARE program proposed by IREC. The program we propose has a greater emphasis on distributed solar generation and local jobs: solar resources dedicated to the program would generally be distributed and built, so far as physically and legally feasible, in the neighborhoods of the low-income household subscribers.¹³¹ This would create the most job training opportunities and jobs, thereby increasing the non-energy benefits.

We did a calculation of the effects of a Universal Solar Access program with the following features using data for the year 2013:

1. The program would work on the community choice aggregation principle. We assume applicants who are granted assistance would be automatically signed up for the subsidized solar supply, unless they opt out.¹³²

¹³⁰ IREC 2013, p. 2

¹³¹ Maryland's urban utility-scale and rooftop solar potential is about 43,000 gigawatt-hours (NREL Potentials 2012, Tables 2 and 4), or about two-thirds of the state's electricity usage. This does not include parking lots, roads, and other urban areas with "imperviousness greater than or equal to 1%" (NREL Potentials 2012, p. 3). There is therefore no resource problem in supplying about 5 percent of the state's electricity that would be represented by the Universal Solar Access program with exclusively distributed (i.e., rooftop and urban utility-scale) projects that are located on the distribution side of the grid. The solar requirement for universal solar access to current EUSP assistance recipients is about 3 percent of this technical potential.

¹³² We do not expect a significant number of low-income households to opt out. This is because the solar electricity generated under the program will be cheaper than both residential rooftop (due to scale) and subsidization. Further, the structures of the homes themselves would not be involved.

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2. Participating households would get solar electricity equal to their annual electricity use.
3. Participating households would have the same net electricity bills as they currently do, post-assistance. This was approximately \$1,231 per year for 2013. This approach has the goal of not increasing the recipients' net electricity payments under the solar program when compared to the current assistance program. The Universal Solar Access program can also be combined with the Affordable Energy Program; we recommend that, since it is likely to save millions of dollars per year. But the Universal Solar Access program does not have to wait until the completion of the recommended pilot program for the AEP is completed and evaluated (see Section IX).
4. Any remaining electricity costs for the low-income household above the 2013 net bill payment of \$1,231 would be covered by a charge on all other ratepayers (in common with the present EUSP program). As the cost of solar declines, the cost of assistance declines.
5. The solar electricity generated would not be part of the renewable portfolio standard (RPS) and would not have renewable energy credits or other financial incentives allocated to it. In other words, the solar electricity for this program would be in addition to the renewable energy mandates under Maryland's RPS.
6. One method of ensuring that low-income households received the most economical solar electricity would be to adopt the approach of the new German solar farm pilot program. A maximum price of solar electricity is set and bids are invited to supply it at or under that price cap.¹³³ The regulated utilities in Maryland as well as

¹³³ Meza 2015

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non-regulated corporations would be eligible to bid; however, the utilities would not be allowed to include the cost in their rate base. This would likely require a change in the law under which Maryland's wires-only regulated utilities operate, since they are not now allowed to own generation facilities. If non-regulated corporations win particular bids, the power would be purchased under Purchased Power Agreements. Decisions regarding winning bids would be made by the Public Service Commission.

7. The solar generation facilities would be constructed in the low-income neighborhoods where the recipients live, so far as feasible given technical, zoning, and community considerations. Job training for residents would be part of the program. Community participation would be essential to the success of such installations.
8. Recipients would reapply every year to ensure eligibility for low-income electricity bill assistance.

The issue of the duration of the solar subsidy deserves more detailed exploration in the pilot projects. We have suggested an annual application process, since that is the basis of the EUSP program; as proposed here the Universal Solar Access program would be folded into the EUSP program. Similarly, the AEP would require annual evaluation of incomes and energy burdens. Since the realization of universal solar access to all recipients of low-income electricity bill assistance would take some time (we suggest a period of 10 to 15 years), there is little or no risk of stranded solar surpluses under the program until nearly full enrollment is reached. If there are fewer actual recipients than planned, the solar electricity could be marketed as any other electricity under the regulatory authority of the Maryland Public Service Commission (since it would be on the distribution side of the grid).

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Given the current cost of utility- and commercial-scale distributed solar installations in Maryland and the fact that solar costs continue to decrease, creating solar generation earmarked for low-income households would likely reduce the cost of the EUSP program, assuming that post-assistance bills remain the same. It would positively impact the Affordable Energy Program even more since the savings would accrue to ratepayers first (until the electricity burden is below the AEP threshold). Low-income households would be protected since their electricity burden would, in any case, be capped at 6 percent for electrically heated homes and at 3 percent for other homes. See Section IX.

A. Cost and structure of the Universal Solar Access program

Solar electricity costs for installations on a megawatt-scale are now low enough to be competitive with residential energy costs in Maryland. In the last quarter of 2014, utility-scale, fixed tilt solar installations cost \$1.55 per watt, while non-residential rooftop installations averaged \$2.25 per watt.¹³⁴ The trend has continued into the first half of 2015, with costs falling by \$0.20 to \$0.50 per watt.¹³⁵ Further, the CEO of First Solar, one of the largest U.S. solar PV companies that both makes panels and builds utility-scale solar systems, was quoted in the trade press as saying that the installed cost of a tracking, utility-scale solar system in the western United States would be less than \$1 per watt; he expects the downward cost trends to continue.¹³⁶ \$1 per watt is the goal for the year 2020 of the U.S. Department of Energy's SunShot Initiative. The corresponding goal for

¹³⁴ GTM Research and SEIA 2015, bar graphs on pp. 15 and 16

¹³⁵ Weiner 2015

¹³⁶ Wesoff 2015

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commercial scale rooftop installations by the year 2020 is \$1.25 per watt.¹³⁷

The solar installations built under this proposal would mostly be on a megawatt or multi-megawatt scale, but still mainly installed on the distribution side of the grid and built in urban areas with community participation and consent. The scale makes it likely that most installations would be of the lower-cost ground-mounted variety. Given the likelihood that the program will not begin until 2017 at the earliest, we have assumed an initial cost of \$1.75 per watt, declining to \$1.25 per watt by 2022, and constant after that date (all in 2013 dollars). Given that costs are likely to continue to decline, this is a rather conservative (high-cost-side) assumption. Looked at another way, the procurement of solar would include a small component of rooftop solar for low-income homeowners with robust enough roofs without materially affecting the cost calculations.¹³⁸ Table VII-1 shows the costs per kilowatt-hour of solar energy as delivered to end users that we have used in this analysis.

¹³⁷ DOE 2012 SunShot, p. xix. We recognize, of course, that solar costs are changing fast and are difficult to estimate with precision five or ten or more years in the future. We have used assumptions that include cost reductions that are slower than is anticipated by the authorities cited and indicated by current trends. This enables our conclusions about costs to be robust in the sense that they are unlikely to be higher than estimated here.

¹³⁸ The SunShot goal for residential rooftop solar is \$1.50 per watt by 2020. (DOE 2012 SunShot, p. xix)

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Table VII-1: Analysis of the costs of solar electricity supply for low-income households (in 2013 dollars)

	Solar installed in 2017	Solar installed in 2022 and thereafter
Capital cost, \$/watt	\$1.75	\$1.25
Investment tax credit rate	10%	10%
Corporate tax rate	35%	35%
Capital cost, \$/kWh, with accelerated depreciation	\$0.088	\$0.063
Operations and maintenance cost, \$/kWh	\$0.011	\$0.011
Distribution and other costs, \$/kWh	\$0.030	\$0.030
Total solar electricity cost, \$/kWh	\$0.129	\$0.104

Source: IEER analysis

Note: We assume that the typical system type and size will be on the order of 1 MWdc. For additional information see notes to Table VII-2.

Table VII-2 shows how the program would look from the point of view of an average recipient of electric bill payment assistance.¹³⁹ We have used 2013 data for bill payment assistance budgets and approximate number of recipients. As solar is implemented to cover all recipients, the cost of the

¹³⁹ As noted previously, we exclude assistance to cover accumulated arrearages; only annual assistance to pay bills, and heating assistance to households with electric heating are included here.

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program goes down under the assumption that the net bill payment by the recipient of assistance would remain the same. The average annual cost of assistance would go down from about \$36 million in 2017 to an average of about \$21 million over during the 2017 to 2031 period. If no AEP is implemented, but solar is procured for all recipients of electricity assistance, the cost of assistance would go down to \$4 million by 2031. All these calculations assume the same number of electricity assistance recipients as in 2013.

Table VII-2: EUSP Bill Assistance total and per recipient in 2013 and average assistance with a Universal Solar Access program implemented over 2017-2031

	Total bill assistance per year	Bill assistance per recipient	Post-assistance bill paid by recipient
Current program, 2013 costs	\$36.2 million	\$325	\$1,231
Average annual program cost for solar implemented over 2017-2031	\$21.4 million	\$190	\$1,231

Notes: 1. The cost of solar energy in the first year of the program (assumed to be 2017) was computed as follows: Urban utility solar PV capital cost: \$1.75 per watt; federal tax incentive: 10 percent; accelerated depreciation of 85 percent of the post-tax-incentive cost over 5 years (worth \$0.094 per watt in present value at a tax rate of 35 percent and a discount rate of 8 percent); operation and maintenance cost: \$0.011 per kWh. Generation per year: 1,286 kWh AC per kWdc capacity; 20 year installation life; 8 percent weighted average cost of capital. Net cost of generation: about \$0.099 per kWh. A distribution cost of

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\$0.03 per kWh was added. Total solar cost in 2017: \$0.129 per kWh.

2. The program would include more solar generation each year at a rate that all assisted households would be getting solar energy by 2031. Costs of new solar installations are estimated to decline from \$0.129 per kWh in 2017 to \$0.104 per kWh in 2022; they are assumed to remain constant at \$0.104 for installations built after that. The average electricity rate each year for all recipients is the weighted average of normal electricity cost and the solar cost, according to the proportions of each that are supplied in any year. The solar cost is weighted by date of installation of the solar. Overall, this approach gives the average electricity cost to all recipients in any year during the implementation of the solar program. Weighted costs of electricity supply to low-income households would decline from \$0.134 per kWh in 2017 to \$0.109 per kWh in 2031 due to the implementation of the solar program.

3. Normal electricity cost (i.e., without the solar program) for residential customers: \$0.134 per kWh. It is assumed to remain constant (in 2013 dollars) during 2017-2031.

4. Annual average usage by low-income EUSP recipients: 11,596 kWh per year. In the solar plus EUSP example, all electricity for the low-income household is supplied by solar PV.

5. The cost share of ratepayers is flexible according to the cost of solar. The low-income household electricity bills are kept constant, with any remaining costs covered by ratepayers. As solar costs decline, the excess costs decrease as well. At \$1.75 per watt (the cost used in this example), ratepayers cover a portion of the solar costs (about 19 percent in this example). At about \$1.30 per watt, no assistance is needed to maintain the post-assistance bill at the 2013 level of \$1,231.

6. This solar program as proposed here would be outside the renewable portfolio standard framework. No solar renewable

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energy credits or other state or utility credits would be applied to it.

Of course, the funds saved could be used to increase assistance per recipient or expand the coverage. Or the funds could be used to expand efficiency programs, further reducing the need for assistance. The direction of the program is clearly such that it could be integrated with the Affordable Energy Program whose costs would decline as a result. Some of the funds saved could also be used for job training and other investments in the communities where low-income people live. That may require a broadening of the scope of assistance for which EUSP funds can be used.

The net impact on ratepayers is very likely to be a substantial cost savings. In this context, we should stress that the cost calculations do NOT assume a continuation of the 30 percent federal investment tax credit. Rather, we assume a 10 percent investment tax credit, which will still be available for non-residential installations after 2016. At the time of the finalization of the calculations for this report (August 2015), there is no provision for federal tax credits for residential solar installations after December 31, 2016.

We recommend that universal solar access be integrated with the Affordable Energy Program. Along with energy efficiency measures, it would reduce the costs of the AEP over time. We will explore this in Section IX.

Offering Universal Solar Access to current EUSP households would allow increases in local jobs and increase neighborhood collateral benefits like reduction of air pollution, improvement of health, as well as reduction of CO₂ emissions. If the program is implemented over 15 years, the cumulative CO₂ emission reductions to 2030 would be about 10 million metric tons, assuming electricity sector emissions at the 2011 rate. The

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corresponding undiscounted value the CO₂ reduction (@\$42 per metric ton¹⁴⁰) would be about \$420 million.

A Universal Solar Access program would provide a variety of benefits:

1. It would allow distribution utilities the opportunity to put distributed solar in their portfolios (*but NOT in their rate base*), provided they can offer it competitively (possibly through a subsidiary of the distribution utility). This could help overcome the utilities' reluctance to envision large amounts of distributed solar, since they fear loss of revenue.
2. It would allow strategic and economic combinations of distributed solar generation with distributed energy storage, enabling to lower costs for all customers.
3. It would allow for the development of solar microgrids, including public purpose microgrids that would supply power to essential community facilities in the event of prolonged outages, such as those accompanying extreme weather events like Hurricane Sandy in 2012 or the derecho storm in Maryland (and environs) in the summer of 2012.
4. There would be collateral benefits of jobs and other neighborhood value improvements that cannot be realized with simple energy bill assistance.
5. The Universal Solar Access program would be a complement to the low-income efficiency programs that are already being implemented in Maryland (and that need to be expanded).

¹⁴⁰ The medium value estimated in Itron NEBs 2014, Table 2-7 (p. 2-23).

B. Considerations relating to distributed solar facilities

In any case, a program along the lines recommended above would require the construction of solar facilities. To the extent possible they should be in the neighborhoods where the people to be served live. There is more than enough technical potential to supply all households in Maryland with 100 percent distributed solar, provided one includes utility-scale solar in urban areas under the rubric of “distributed solar.” Figure VII-2 shows the technical potential for distributed solar generation in Maryland.

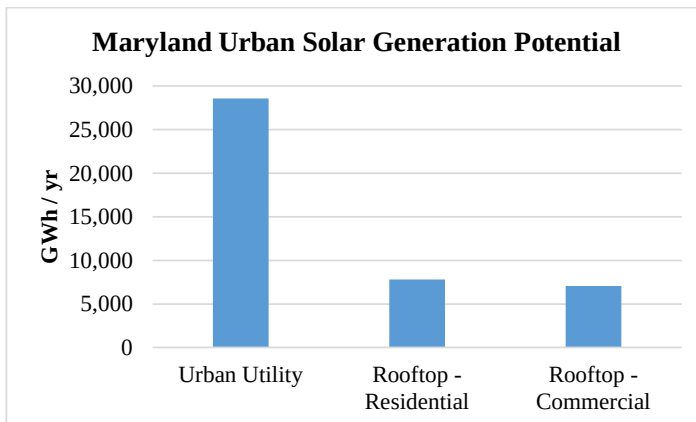


Figure VII-2: Urban solar generation potential in Maryland. Source: NREL Potentials 2012, Table 2, provides urban utility-scale potential; Table 4 provides a total rooftop potential. Note: The reference used in NREL indicates that residential and commercial potential are about equal (Denholm and Margolis 2008, Figure 4 (p. 8)).

Of course, it should be noted that Figure VII-2 shows technical potential. For instance, developed areas indicated by impermeable surfaces were excluded from NREL’s calculation of urban utility-scale potential. However, as the NREL study notes, the practical potential, called the “market response” also

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depends on other factors like investor response and regulatory issues.¹⁴¹ The maximum amount of distributed solar potential that can be realized will depend on many local factors that should be evaluated in detail. On the other hand, we have not included the generation potential of solar canopies over parking lots; this could be substantial. We will provide a recommendation in this regard in the report on the Maryland energy sector as a whole.

In addition, if the solar is to be built in neighborhoods where the recipient communities are located, then there must be a process of community participation in the decisions as to where the facilities will be built. Low-income families already face many challenges and insecurities. Putting large installations in their neighborhoods without community participation may risk non-acceptance by the community and failure of the project. On the other hand, the Baltimore pilot project discussed above shows that projects that address the needs on a holistic basis can, in the right circumstances, result in benefits that are considerably beyond those yielded directly by the investments in the properties themselves.

Even if the areas suitable for solar projects are much more restricted than indicated by the technical potential, that potential is so large that it may be possible to accommodate most of the Universal Solar Access program in low-income neighborhoods themselves. Further, low-income areas exist in both urban and rural parts of Maryland. Building distributed solar should also be possible in the relatively sparsely populated areas in Western Maryland and on the Eastern Shore. Mapping the specific areas where distributed solar facilities can be built and matching them with the areas where assistance is most needed would provide a

¹⁴¹ NREL Potentials 2012, Figure 1 (p. 1)

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powerful tool for creating jobs, reducing assistance costs, and improving the environment at the same time.

A technical note is in order. Megawatt-scale distributed solar energy projects may, in some cases, require modifications to and investments in the distribution system in order to ensure safety and reliability. Such investments are likely to be required in any case as Maryland moves towards an efficient and renewable electricity system. Technical issues associated with the larger transformation will be discussed in an overall report related to the transition to a low-emissions energy system in Maryland.

1. Procurement of solar electricity for the program

We propose that the solar energy procurement be integrated with the Affordable Energy Program. This means that it would be separate from other renewable energy programs that are part of the Renewable Portfolio Standard. But, by its very nature, it would provide CO₂ emission reduction benefits and the associated climate protection.

We propose that solar generation for the program be procured each year under the supervision of the PSC. A maximum price for purchase of solar over 20 years would be set each year for that year's procurement. Companies would be invited to bid competitively. Wires-only utilities would be allowed to bid on the same basis as any other enterprise. Regulated utilities would NOT be allowed to put the cost of these solar installations into their rate base. This would ensure that (i) utilities have a shot at participating in the solar business and (ii) that utilities do not have an unfair competitive advantage over non-utility companies.

The structure for solar procurement for the program suggested here would make it separate from the renewable portfolio standard process. Among the advantages of this separation are:

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1. It removes the Universal Solar Access program from the politics of the renewable portfolio standard.
2. It allows wires-only utilities to own the solar, though they would have to bid competitively to do so. This would be contingent on the solar they would create (if their bids are accepted) being on the distribution side of the grid. They may have to set up for-profit subsidiaries to bid.
3. The proposal would also allow community-based for-profit corporations to bid on and, if successful, own the solar installations. It is possible in principle that non-profit corporations could also do so but it may be difficult or impossible for them to avail themselves of the 10 percent federal tax credit (the level starting in 2017) and accelerated depreciation allowances.
4. Renewable energy credits are not necessary to provide universal solar access to all current recipients of energy assistance provided it is done on an appropriate scale.
5. It removes the Universal Solar Access program from the net metering issues. Eventually net metering will have to be changed to some “value of solar” system. That is going to take time and it will involve controversy. Adding a distribution charge to the solar electricity cost should (at least in principle) remove any objection utilities may have to universal solar access for low-income households.

The last point is worth exploring in more detail. Solar has become an intense arena for conflict in some areas with regulated utilities and merchant electricity generating companies. There is much talk of a “death spiral” for utilities who fear that the increase of distributed solar would erode their revenues and their very business model, which attaches a transmission and distribution charge to every kilowatt-hour sold.¹⁴² Net-metered solar electricity reduces the electricity that

¹⁴² For a brief description of the issue with references see Makhijani 2015, Section I.A

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flows through the utility's wires and so reduces the revenues. Merchant generating companies, of course, stand to lose business as more and more households and businesses generate larger fractions of the electricity they use "behind the meter" – that is, for direct consumption on the premises where the electricity is generated. The utility simply does not "see" this electricity.

The actual financial impact of distributed solar generation is at present very low. The cumulative residential capacity as of the end of 2013 in Maryland was just 28 megawatts, which amounted to just 0.05 percent of Maryland's electricity consumption. A 2014 study done by Lawrence Berkeley National Laboratory estimated that at a distributed, "customer-sited" solar PV penetration of 2.5 percent of electricity use, the rate increase would only be 0.2 percent for a northeastern utility operating in an environment where generation has been deregulated.¹⁴³ Maryland's distributed solar is a long way from this target.

It is generally acknowledged that net metering should be converted to a "value of solar" structure, but what that value should be remains a matter of debate and includes huge disparities in estimated value. There is no question that the value of solar is considerably higher than the wholesale generation rate advocated by the CEO of Exelon.¹⁴⁴ But whether it is as high as the 33.7 cents per kilowatt-hour estimated in a recent study published by the Maine Public Utilities Commission¹⁴⁵ should be a matter of careful study prior to determination of a reasonable and equitable value of solar in Maryland. Moreover,

¹⁴³ LBNL 2014, p. ix. The study used Massachusetts data in its calculations (Section 3.2). Maryland's per unit costs are somewhat higher than the model used in the study, which took Massachusetts for its case study.

¹⁴⁴ See Makhijani 2015, Section I.A, for citations and discussion.

¹⁴⁵ Maine PUC 2015, Figure ES-2 (p. 6)

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that debate should occur in the context of the need to revamp the role of utilities to serve as a platform for a host of services, along the lines now being considered by the New York Public Service Commission as part of its process of “Reforming the Energy Vision”.¹⁴⁶

Despite these facts, it is the political reality that Maryland does not have a broad virtual net metering law that would allow widespread community ownership. The 2015 pilot program is a start in that direction that could benefit low-income households as well if it is made permanent. **It is important to include low-income households in community net-metering projects during the three-year pilot phase.**

It will also take time to investigate and decide how the structure and function of distribution utilities should be changed, where community solar might fit into such a structure, and how generation from such facilities would be valued. **The proposal for Universal Solar Access made here would allow low-income households to access solar without waiting for the results of prolonged regulatory processes.** It would nonetheless require changes in the law and regulations to modify the Electric Universal Service Program and to allow wires-only utilities to bid competitively on solar resources built expressly for this program, either directly or through subsidiaries. Ideally it would be combined with the restructuring of assistance to limit energy burdens to 6 percent of income, which would require restructuring of both the EUSP and MEAP programs.

¹⁴⁶ New York PSC 2015. The Maryland Public Service Commission has set a similar proceeding as a condition of the merger of Exelon and PHI. See Maryland PSC 2015, p. 76.

VIII. Collateral benefits of the Affordable Energy Program

A reduction of energy bills and, over time, a reduction of the need for assistance are not the only benefits of efficiency programs. The collateral benefits, also called “non-energy benefits” (NEBs, for short) are important to include, particularly when looking at the costs of various programs.¹⁴⁷ The importance of NEBs, like improved health, reduction in greenhouse gas emissions, improved comfort, and longer structure life have been increasingly recognized in recent years. Quantifying and incorporating them into efficiency programs presents significant challenges, but even partial consideration shows that taking NEBs into account can make a significant difference to program design and evaluation.¹⁴⁸ There are also important non-energy benefits of a well-structured energy assistance program and solar energy access for low-income households.

Malone (2014) has pointed out that non-energy benefits of efficiency can be viewed from three perspectives – the utility, the participant (or consumer), and society, as seen in Table VIII-1 below:

¹⁴⁷ We should note that “non-energy benefits” include energy benefits in some cases. In the usual procedure, only energy benefits relating to the entity being regulated are taken into account. Very often only electricity-related benefits are counted, since efficiency programs are largely run with electricity ratepayer funds. Increasingly, natural-gas related benefits are taken into account, since natural gas distribution is regulated. But fuel oil and propane, being unregulated, are usually ignored.

¹⁴⁸ Neme and Kushler 2010, p. 5-305

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Table VIII-1: Non-Energy Benefits of efficiency programs from various perspectives¹⁴⁹

Utility Perspective	Participant Perspective	Society Perspective
- Reduced arrearages - Reduced carrying costs on arrearages - Reduced bad debt	- Improved safety - Improved health - Reduced O&M costs - Increased worker and student productivity - Increased comfort - Reduced water use - Improved aesthetics	- Environmental externalities - Health care cost savings - Reduced reliance on fossil fuels

Figure VIII-1 shows how including some quantification of non-energy benefits can change the benefit-cost picture for efficiency dramatically in some cases. The utility cost test relates to utility costs and benefits; the Total Resource Cost (TRC) test includes both utility and participant costs; it is shown without and with the inclusion of non-energy benefits.

¹⁴⁹ Quoting Malone 2014, slide 5

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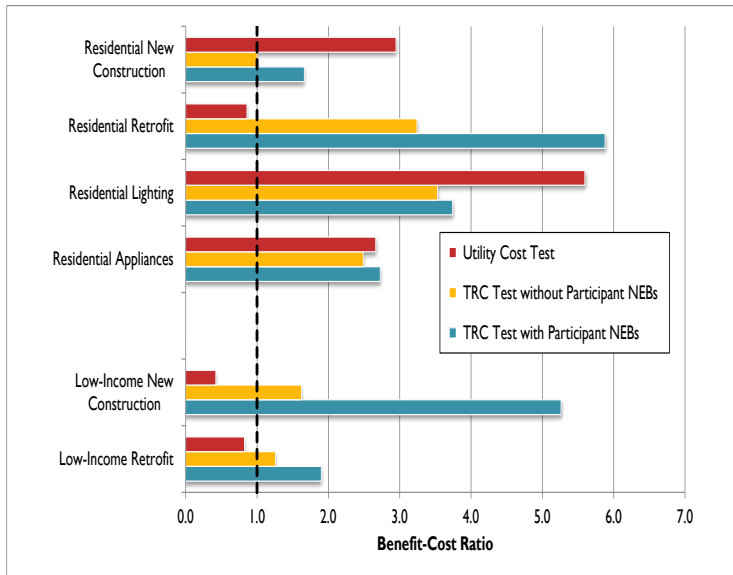


Figure VIII-1: Effect of including non-energy benefits in evaluating efficiency: actual results from Massachusetts.
Source: Woolf 2015, slide 8

Figure VIII-1 shows that in many important cases, like lighting and electrical appliances, benefit-cost ratios are always greater than one, independent of the test. However, in cases where efficiency entails significant investments, tests that do not include non-energy benefits often have benefit-cost ratios less than one. Conventional economics based on such tests would then reject such investments. But the real world benefits show the conventional view to be both economically and socially narrow and incorrect.

The most striking feature of Figure VIII-1 is that residential retrofits, including in low-income housing, show high benefit-cost ratios when non-energy benefits are included and often fail the benefit-cost test when they are not. When low-income households have more money for rent and food and medicine, and when mold is cleared from their homes in the course of

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retrofitting them, there are fewer emergency room visits, fewer evictions, and fewer absences from work (and hence higher labor productivity). We examine the issue of the non-energy benefits of the Affordable Energy Program in detail in light of the Maryland PSC's order in July 2015 to consider such benefits in efficiency programs, including in programs directed at low-income households.

A. The Maryland PSC's July 2015 EmPOWER efficiency order

The Maryland Public Service Commission opened the door to integration of non-energy benefits into energy efficiency programs in its July 2015 order (No. 87082) on Maryland's efficiency program known as EmPOWER. Among other things, PSC ordered a "Societal Cost Test" (SCT) as the primary screening test along with widely used Total Resource Cost (TRC) test, which was the main screen prior to the order. The latter includes the program costs to the utility and to the participant in the efficiency measure (such as purchase of a more efficient appliance with a rebate from the utility), but, except for the reduction in the participant's energy bill, it does not include many other benefits to the participant and to society at large. The PSC argued that if participant costs are included, so should participant and social benefits:

However, we are not persuaded that the TRC should remain as the *only* screening tool on a prospective basis; on the contrary, we concur with parties such as PE [Potomac Edison] that note, "[t]he TRC test alone fails to consider the cost-effectiveness of investments from a nonparticipating ratepayer point of view." Indeed, the Coalition [of Maryland Energy Efficiency Advocates] contends that failing to account for "benefits that accrue to participants and non-participants alike, such as reduced air

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pollution and the corresponding reductions in adverse health effects” mischaracterizes the true cost-effectiveness of energy efficiency investments. A failure on our part to consider a broader societal impact stemming from the implementation of energy efficiency programs would ignore the codified intent of the General Assembly “to provide affordable, reliable, and clean energy for consumers of Maryland.” This directive is not limited to only those consumers who participate in an energy efficiency program, just as the benefits of energy efficiency investments do not accrue only to direct program participants. We concur with MEA that the **directive of the General Assembly to the Commission requires a societal viewpoint as the primary orienting framework**, and thus we direct the use of both the TRC *and* the SCT as assessment tools for purposes of conducting preliminary cost-effectiveness screening.¹⁵⁰

The PSC also concluded that Maryland law requires the consideration of non-energy impacts to society in a variety of areas, including jobs and the environment and even much farther than that:

In order to determine whether a proposed program or service encourages and promotes the efficient use and conservation of energy, the Commission is explicitly directed by statute to consider non-energy categorical *impacts on jobs and on the environment*, and more broadly to rely on energy efficiency as a resource *to assist with the provision of affordable, reliable, and clean energy* to Maryland ratepayers.¹⁵¹

¹⁵⁰ Maryland PSC EmPOWER 2015, pp. 5-6, bold emphasis added

¹⁵¹ Maryland PSC EmPOWER 2015, p. 14, italics added

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Finally, the PSC also noted that efficiency programs directed at low-income households should take the same approach as the overall EmPOWER program both to ensure that ineffective programs are eliminated and effective programs with important non-energy benefits are considered:

With respect to limited-income programs, which constitute a separate and distinct sub-portfolio of programs, ... simply waiving the requirement that the limited-income programs undergo cost-effectiveness screening may do our ratepayers a disservice by failing to maximize the benefits of the energy efficiency investment. However, requiring that the limited-income sub-portfolio “pass” cost-effectiveness screening may do our ratepayers a similar disservice by too greatly limiting these critical program offerings. Therefore, we accept the recommendation of the Coalition [of Maryland Energy Efficiency Advocates] that, while cost-effectiveness screening of the limited-income sub-portfolio shall be required *in the same manner as with respect to the other EmPOWER sub-portfolios*, the results of the limited-income sub-portfolio screening shall serve as a point of comparison to other jurisdictions and past programmatic performance rather than as the basis for precluding certain limited-income program offerings.¹⁵²

Clearly, the PSC now requires that non-energy benefits be included when evaluating efficiency programs, including for low-income households. The specific order applies to EmPOWER efficiency programs, but there is nothing in the reasoning that would preclude it from being extended to the inclusion of non-energy benefits of assistance programs,

¹⁵² Maryland PSC EmPOWER 2015, pp. 9-10, italics added

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including the Affordable Energy Program or Universal Solar Access program for low-income households. The same reasoning applies to them: if we are going to include the costs of these programs, then the benefits must be considered too.

In its EmPOWER order of July 2015, the PSC ordered the specific inclusion of three distinct NEBs in EmPOWER program screening:¹⁵³

- Benefits due to reduced emissions of air pollutants: “business-as-usual” due to reduced air emissions benefits.
- Reduced arrearages in bill payments
- Itron quantified business-as-usual valuation of non-energy comfort benefits for residential customers and reduced operations and maintenance costs for commercial and industrial customers.

This is a rather limited list, as contrasted with the expansive language that the PSC used in its analysis of NEBs. But that is only because the consideration of NEBs is at a very early stage in Maryland. The PSC appears to be proceeding cautiously as regards the quantitative aspects for that reason. The PSC also left the door open for changing the list of NEBs and their valuations:

Given that work is ongoing in this important area of research, we find that it is appropriate at this time to adopt the business-as-usual value equivalents of the Itron quantified NEBs for the categories of air emissions, comfort, C&I O&M, and reduced customer arrearages. We find that the inclusion of these specific NEBs in the TRC test and the SCT as described above

¹⁵³ Maryland PSC EmPOWER 2015, p. 31. The benefits due to reduced air pollution are essentially health benefits.

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will enhance the parity of cost-effectiveness screening and assist us in completing the necessary statutory inquiries. Should the parties *develop additional quantifications of Participant, Utility, or Societal NEBs* moving forward, or should the parties seek to revise the valuation of the NEBs directed by our Order today, the parties may present such analysis in conjunction with planning for future program cycles.¹⁵⁴

In the spirit of this invitation from the PSC to explore “additional quantifications” of non-energy benefits and new valuations, we explore some non-energy benefits of the Affordable Energy Program as well as of the Universal Solar Access program for low-income households that we recommend.

B. Non-Energy Benefits of the Affordable Energy Program

The non-energy benefits of the Affordable Energy Program to low-income recipients could be so large as to reduce the net costs of the AEP below current assistance programs. Preventing loss of homes and associated increases in shelter and health costs are among the more important non-energy benefits that would accrue to low-income families directly, but also to society more broadly. We address these issues in some detail.

A 2011 national survey found that significant numbers of families receiving assistance lose their homes as a result of energy bills they cannot afford. They are evicted or foreclosed

¹⁵⁴ Maryland PSC EmPOWER 2015, pp. 15-16, italics added

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out of their homes. Many move with friends or family; many become homeless or use shelters for the homeless:

This section examines housing problems that [survey] respondents have faced in the past five years due to unaffordable energy bills. Table IV-21A shows that 31 percent skipped a mortgage payment, 14 percent moved in with friends or family, six percent were evicted, and four percent moved into a shelter or were homeless. While four percent reported that they had a mortgage foreclosure in the past five years, three percent reported that they had a foreclosure in the past year.¹⁵⁵

In all, the survey indicates that almost one-fourth (24 percent) lost their homes over a five year period – or about 5 percent each year. This assumes that each of the categories of home loss is mutually exclusive. However, it is possible that some of those foreclosed or evicted would have moved in with family or friends. Hence the net figure over five years may be less than 24 percent.

Three percent reported having been foreclosed in the past year and four percent reported foreclosure over five years. The gap between three percent of respondents being foreclosed within the past year compared to only four percent over five years may be due variations in foreclosures or due to recall issues regarding dates in the course of the survey or both. We will treat the more recent data for the past one year, when it is available, as more indicative of the likely events.¹⁵⁶ In the case

¹⁵⁵ NEADA 2011, p. 38

¹⁵⁶ There are other areas where the data for the past year are not fully consistent with five-year recall. For instance, 41 percent of respondents said they went without medical or dental care in the past year, but only 37 percent reported going without medical or dental care in the past five years (NEADA 2011, Table IV-24A (p. 41)). Recall of the past year may be better, since

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of foreclosures, we use the national data to assume that three percent of energy assistance recipients who owned their homes are foreclosed in a typical year.

It is important to stress that these figures are for households who got assistance at least in one of the five years, with most getting assistance in more than one year, and 20 percent received assistance in each of the five years.¹⁵⁷ Another way of looking at it is that the survey described problems of households whose energy burdens were already reduced from what they would have been without energy assistance.

The problems are more severe among the more vulnerable segments of the low-income population. For instance, the fraction of those who were evicted or had foreclosures in the survey group overall was 10 percent (over five years). That number rose to 18 percent for those with the lowest incomes, in the range of 0 to 50 percent of the federal poverty level. Fifteen percent of households with a child under 18 years of age were evicted or faced foreclosure; in contrast, it was 9 percent among households that did not have any vulnerable category of person in the home.¹⁵⁸ The extremely poor, families with children, and the elderly are among the groups that are preferentially selected for energy assistance. Other data also indicate that the problem of energy burdens and loss of homes is severe. In St. Paul, “[t]wenty-six percent of evictions were due to utility cut offs.”¹⁵⁹

more recent, than recall of such things over a five-year period. We will place greater emphasis on survey results from the past year, when available.

¹⁵⁷ NEADA 2011, Table V-2A (p. 47)

¹⁵⁸ NEADA 2011, Tables IV-21A through IV-21C (pp. 38-39). Data by vulnerability category are in Table IV-21B.

¹⁵⁹ HUD Office of Environment and Energy Website 2015

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In Maryland, about 34,000 (31 percent) of 2013 electricity bill assistance recipients owned their homes; for heating assistance recipients, the figure was 35,000.¹⁶⁰ National data for all income groups indicate that about 70 percent of homeowners have mortgages. Maryland data by county indicate that the percentage of homeowners with mortgages varies, by county, from 60 to 80 percent, approximately.¹⁶¹ Assuming that three percent of energy assistance recipient mortgage-holders are foreclosed each year, we can estimate that about 700 (rounded) households in Maryland were foreclosed in 2013.

Evictions of renters occur at higher rates than foreclosures; further, the percentage of assistance recipients who rent is about 69 percent. Putting these data together leads to an inference that roughly 2,000 to 3,000 households from among energy assistance recipients would lose their homes to evictions and foreclosures in a year similar to 2013. Some fraction of these families actually become homeless and need additional public services, such as shelter and more frequent and intensive medical care. Others would move in with family or friends; they have nonetheless lost their homes and have become dependent on others, who also face unexpected costs.

It is essential to emphasize again that the survey data relate to those who get energy assistance and whose energy burdens are significantly reduced as a result. Only about a third of those who are eligible for assistance in Maryland get it. We have found no data on the degree to which high energy burdens costs induce loss of home among low-income households who are eligible for, but do not get, energy assistance.

¹⁶⁰ Maryland PSC 2013, Appendix A, Attachment G (pdf p. 41)

¹⁶¹ Zillow 2015. See the interactive map by county at <http://www.zillow.com/blog/more-homeowners-are-mortgage-free-than-underwater-108367>.

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For the purposes of this report, we assume that one percent of energy assistance recipients – about 1,100 households per year¹⁶² -- will be prevented from becoming homeless due to high energy burdens if the Affordable Energy Program is implemented.

Reduction of homelessness and the higher health expenditures associated with it would be a key non-energy benefit of implementing the proposed AEP. It is therefore important, in view of the Maryland PSC's invitation to include relevant non-energy benefits, to estimate what homelessness costs. A 2010 study by the U.S. Department of Housing and Urban Development of the costs of homelessness found that the costs of housing a homeless family for one month in Washington, D.C., ranged from \$1,251 per month for permanent supportive housing to as much as \$3,698 per month in case of the highest emergency shelter costs. Costs for sheltering individuals were generally lower than those in Washington, D.C.; they ranged in various states from \$408 per month to \$1,817 per month depending on the type of shelter and location. These figures indicate annual costs of about \$5,000 to well over \$40,000.¹⁶³ The range of costs for Washington, D.C., is more likely to be representative of the urban and densely populated suburban areas, while the range from other states representative of the less densely populated areas. We use the low end of the range of Washington, D.C., costs as a reasonable estimate to represent statewide monthly shelter costs for Maryland where most people live in urban and suburban areas. This also makes approximate

¹⁶² Rounded to two significant figures.

¹⁶³ HUD 2010, Exhibit 1 (p. ES-4)

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allowance for the fact that not all homeless persons use shelters every day.¹⁶⁴

Homelessness increases other costs as well, notably health care costs. There is clear evidence that such costs are huge, as demonstrated in a study of 6,494 patients in the Boston Health Care for the Homeless Program:

Homeless individuals had high health care expenditures—\$2036 per member per month compared with \$568 per month for all MassHealth members. Almost half of total annual expenditures were incurred by 10% of the study population.... The 2 highest categories of health care expenditure were hospitalizations and ED [Emergency Department] visits, which represented 40% and 11% of total expenditures, respectively.¹⁶⁵

Among other things, the rate of diabetes was extremely high:

Diabetes mellitus was an example of a disease made much worse by the social circumstances of homelessness, including limited access to nutritious food, an irregular meal schedule, inability to refrigerate insulin, and challenges of carrying needles. The prevalence of diabetes mellitus was extremely high in this population

¹⁶⁴ Basic Maryland data on homelessness in Maryland can be found in the Needs Assessment part of the Maryland's housing development plan at <http://www.dhcd.state.md.us/WEBSITE/About/PublicInfo/Publications/Documents/2010-2015homelessneeds.pdf> (Maryland DHCD Homelessness).

¹⁶⁵ Boston Health Care for the Homeless 2013, p. S314. 71 percent of the study population were men (p. S313)

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(18%) compared with the general population
(8.3%).¹⁶⁶

The actual annual health care cost for a displaced household is likely to be higher, because the *added* health expenditures of \$1,468 per month are for a single individual, while there are, on average, 2.85 persons per household.¹⁶⁷ However, among the homeless, the average household size is about 2.¹⁶⁸ Homeless people are sheltered in various ways: from emergency shelters (days to weeks), transitional housing (which can extend many months) and long-term shelters, which can extend to one or more years. We estimate that the average stay is about 7 months.¹⁶⁹ On this basis, and assuming 2 persons per average homeless family, we arrive at a value of about \$28,000 per homelessness prevented when shelter and added health costs are taken into account.

There are many other categories of cost, once people become homeless. The American Roundtable to Abolish Homelessness estimates that when all costs are taken into account, the range of costs to society of one homeless person is between \$35,000 and \$150,000 per year.¹⁷⁰ For a two person family, this would mean \$70,000 to \$300,000 per year. Using the estimate of an average duration of homelessness of 7 months, we get a range of

¹⁶⁶ Boston Health Care for the Homeless 2013, p. S314

¹⁶⁷ The health care expenses for the homeless were estimated to average \$2,036 per person per month; for the control group of low and medium income people, the average expenses were estimated at \$568 per month per person, making for a difference attributable to homelessness of \$1,468 per month. (Boston Health Care for the Homeless 2013, p. S314)

¹⁶⁸ Calculated by IEER from data in National Alliance to End Homelessness 2015

¹⁶⁹ Calculated by IEER from data in National Coalition for the Homeless 2009. The average is weighted over single people and families who become homeless.

¹⁷⁰ Mangano 2013, slide 18

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\$40,000 to \$170,000 for total costs of homelessness per family made homeless.

In order not to overestimate the cost savings produced by the AEP, we are not using the higher range of \$40,000 to \$170,000 in costs of homelessness. Rather, we take into account only the shelter and added health care costs of homelessness. This amounts to about \$28,000 per year per family rendered homeless and in need of shelter and added health care. This is admittedly a preliminary number that may well be on the low side when considering the various avoided costs that are not included.

We should also note that many health problems far beyond those due to homelessness are attributable to high energy burdens. The 2011 NEADA survey found that about one in eight households receiving LIHEAP funds were still so cold that a member of the household became ill enough to have to go to the doctor or to the hospital; among households with at least one child under 18, that fraction was 19 percent. In addition, 3 percent of the households also had someone who needed a doctor or hospital visit because the house was too hot.¹⁷¹ This indicates that the magnitude of the health problem associated with high energy burdens is considerably greater than the added health care costs associated with homelessness alone. We have not attempted to estimate these added health care costs associated with high energy burdens.

Data from a multi-year project by the Green and Healthy Homes Initiative in Baltimore, evaluated by the University of Baltimore, clearly shows a dramatic fall in foreclosure notices after GHHI efforts “to repair and improve housing in

¹⁷¹ NEADA 2011, Tables IV-25A and IV-25B (pp. 43-44)

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economically challenged communities”¹⁷². Out of a total of 580 houses pre-intervention, there were 57 total foreclosure notices to 49 different households (some received more than one notice in the study period). Post-assistance, the numbers were 7 total notices to 6 households out of a total of 580.¹⁷³ **This means over 8 percent of the households received notices prior to participation and only about 1 percent received such notices after participation – more than an eight-fold decrease.**

We note that the GHHI is a comprehensive program that involved efficiency and weatherization retrofits, other improvements in home safety and indoor environment (such as lead abatement), and attention to the specific needs of the household and the structure in question.

There are some limitations to the use of the Baltimore data in the statewide context. First, we do not have data on how many foreclosure notices resulted in actual foreclosures and therefore homelessness in the Baltimore GHHI project. Second, the project was comprehensive in terms of its attention to various aspects of health and energy. It would not be correct to attribute all of the reduction in foreclosure notices to energy investments alone. Third, the houses in the project were in clusters;¹⁷⁴ it is difficult to extrapolate from that to rural low-income areas, such as those in Western Maryland and on the Eastern Shore. In less densely populated areas, there may be less of a demonstration effect in investments in some homes lifting up a whole neighborhood to the same extent.

Admittedly, there is considerable uncertainty in the estimate of the non-energy benefits arising from prevented homelessness. A carefully designed pilot program, with hundreds of homes in

¹⁷² GHHI 2013, p. 3

¹⁷³ GHHI 2013, Table 8 (p. 12)

¹⁷⁴ GHHI 2013, Figure 1 (p. 6)

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each of the areas of Maryland with a high fraction (more than 10 percent) of families applying for assistance (the two westernmost counties (Garrett and Allegany), the City of Baltimore, and the Eastern Shore) would provide reliable data on the expected extent of the non-energy benefits from reduced costs related to shelter and health care for the homeless.

Our calculations of the non-energy benefits of the AEP do not take into account a number of other non-energy benefits, such as increased rent and mortgage payment rates, increased electricity and gas bill payment, reduced arrearages, etc.

It should be noted that many non-energy benefits are quantifiable in financial terms; however, they accrue to a wide spectrum of governmental and private parties. For instance, the reduced costs of homelessness would, to a large extent, be reflected in lower expenditures by the Bureau of Homeless Services, which is situated in Maryland's Department of Human Resources. But heating assistance is now provided by the federal government, via its Low-Income Heating Assistance Program (LIHEAP). While this is also administered by the same Maryland Department, it is a different office with a different budget. Further, a part of the assistance is from electricity ratepayers, whose interests are overseen by the Public Service Commission, and in the case of residential customers, also by the Office of People's Counsel.

Sorting out how to integrate the various assistance programs and budgets will be a complicated matter. If the net costs of the Affordable Energy Program are indeed lower than at present (for a fixed number of recipients), then a tax increase should not be necessary in principle. But how would the putative reduction of expenses in one bureau (homeless services) be reflected in increased resources for another (heating assistance)?

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To complicate the picture further, the reduction in health care costs would, in large measure, be experienced by the Department of Health and Mental Hygiene. Other reductions in health care costs would be experienced by hospitals that provide services to the indigent. Similarly, lower expenses for collection of unpaid rent and utility bills as well as actual higher collections would be experienced by landlords and utilities. Bringing all these non-energy benefits under one umbrella and especially into a coherent funding stream that reflects the benefits to various parties of the AEP will be a major policy challenge. But that should not obscure the fact that the non-energy benefits of an AEP would likely be very large.

Development of appropriate quantification of non-energy benefits and estimation measures to integrate costs and quantifiable benefits should be part of a pilot project process, so that by the time Maryland is ready for full implementation, there can be clarity on the magnitude and distribution of both costs and benefits across the various parties involved. That would help illuminate the funding streams for the Affordable Energy Program to the extent that its direct costs are higher, before non-energy benefits are taken into account. Table VIII-2 shows the three non-energy benefits of the AEP with and without a solar energy program that are quantified in this report.

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Table VIII-2: Non-energy benefits of the AEP, with and without solar

	AEP no solar	AEP with solar (2017)	AEP with solar (2031)
Air pollution reduction, medium estimate	\$0	\$946,327	\$14,194,905
CO₂ reduction benefit	\$0	\$1,903,214	\$24,391,008
Non-energy benefits of AEP, no solar (rounded)	\$32,000,000	\$32,000,000	\$32,000,000
Total non-energy benefits for AEP with solar (rounded)	\$32,000,000	\$35,000,000	\$71,000,000

Source: Itron NEBs 2014, for value of a unit of air pollution reduction and CO₂ emission reduction. For the rest, IEER analysis,

Notes: 1. We have used the Itron-recommended middle estimate of air pollution reduction benefit of 1.1 cents per kWh (Itron NEBs 2014, Table 6-1 (p. 6-2)) and the second lowest of four estimates of CO₂ pollution social cost of \$42 per metric ton (Itron NEBs 2014, Table 2-7 (p. 2-23))

C. Other non-energy benefits

There are many non-energy benefits that we have not quantified here. Some are difficult to quantify in the specific context of high energy burdens. A very important one relates to life expectancy. We have seen that thousands of low-income households may become homeless partly as a result of high energy burdens. The reduction of life expectancy is one important result. Homeless people have a life expectancy in the

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range of 42 to 52 years compared to 78 years for the population as a whole.¹⁷⁵ For statistical purposes (similar to an insurance calculation), the EPA considers the value of a life to be \$7.4 million in 2006 dollars, which equals about 8.6 million in 2013 dollars, or about \$110,000 per year of life expectancy reduced. While this includes a variety of factors, including lost wages, the EPA recommends that this value be used “regardless of the age, income, or other population characteristics of the affected population....”¹⁷⁶ It is clear that improving life expectancy may be an important non-energy benefit of the Affordable Energy Program.

Low-income Marylanders would also benefit from being better able to pay for transportation to work and for food and medicine – benefits that were noted by the PSC staff in its paper on the AEP.

A very different type of non-energy benefit would accrue to utilities, landlords, and banks. Utilities would benefit from more consistent bill payments and improved bill collection efficiency.¹⁷⁷ With more money available for rent, landlords would collect from more low-income households more regularly. The same would apply to banks and others holding mortgages taken out by low-income homeowners. It is not that such problems would disappear. Far from it. As we noted at the outset in the preface, that the financial problems of low-income households are many and complex. But energy costs constitute one critical piece of the problem; the Affordable Energy Program with solar and efficiency would address that piece in a structural way.

¹⁷⁵ National Coalition for the Homeless 2009 Health

¹⁷⁶ EPA FAQs 2015.

¹⁷⁷ Maryland AEP 2012, p. 31

IX. Affordable Energy Program – Overall Assessment

We can now put together the pieces of costs and benefits of the Affordable Energy Program, efficiency, universal solar access, and non-energy benefits that we have quantified. This will allow us to compare the costs of the current assistance program to the AEP with and without solar and with and without non-energy benefits. We also make a preliminary calculation for the case where the number of recipients of assistance would double. Admittedly, this is just a heuristic, even exploratory, calculation. We used 2013 as the base year for cost comparisons. Total EUSP and MEAP costs in 2013 were about \$121 million, including administrative costs of about \$10 million.¹⁷⁸ About \$26 million of the heating assistance was for households that heat with fuels other than electricity or natural gas.¹⁷⁹ We assume that this assistance would remain the same with or without the AEP, since only electricity and natural gas are regulated by the PSC (see Section V). We also assume that, with appropriate legislative and regulatory changes, federal funds that now go to assisting low-income households that heat with electricity or natural gas would become available to the AEP.

¹⁷⁸ Rounded value estimated from: Maryland PSC 2013, Appendix A, Attachment H for administrative cost and Attachment J for MEAP cost; Maryland EUSP Annual Report FY2014, Attachment L for EUSP cost.

¹⁷⁹ Maryland PSC 2013, Appendix A, Attachment J

Affordable Energy Program Costs and Benefits

The direct cost of the AEP per year would be about \$30 million more than the current program, or about \$1.03 per month per residential electric customer. With solar energy and heat pump water heater investments, the cost would be less than those of the present program by 2031. There would also be tens of millions of dollars in reduced costs of shelter and medical care because of reduced homelessness and better air quality, among other social benefits. The net cost over the long term would likely be considerably less than the present cost of assistance for the same number of assistance recipients – a conclusion that may also hold if program participation increases

It is important to address the issue of administrative costs. We have assumed that administrative costs of the AEP would be double what the costs were in 2013, even though the structure of the AEP indicates that administrative costs would likely be lower. We use an estimate of double the cost for two reasons: first, it allows some resources to be allocated to emergencies as part of the AEP. Assistance to reduce or wipe out bill arrears would be phased out under the AEP. The larger administrative amount is a placeholder for emergency assistance (for instance, if a family member becomes unexpectedly unemployed or seriously ill). Second, the PSC staff used an estimate of about \$30 million for administration of the AEP, about 7 times that of the EUSP and about 3 times that of all assistance programs. A part of the reason was that some amount of this money would be available for a one-time arrearage retirement when the AEP is put into place. We have not made any estimate of this element, since arrearage assistance would not be a routine part of the AEP. Whatever is needed at the start of the program would be a

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one-time funding need.¹⁸⁰ However, some provision does need to be made for emergency assistance. Hence we have added about \$10 million per year for this purpose, assuming that the AEP and the present program would have comparable administrative costs. For comparison, arrearage assistance in 2013 was about \$16 million.¹⁸¹ Routine arrearage assistance responds to a composite of problems including high energy burdens, unanticipated medical costs, or loss of a job. Routine arrearage assistance would be eliminated (after an adjustment period) under the AEP; hence, one would expect the costs associated with only the emergency assistance part to be considerably lower than the overall arrearage assistance costs of the current program. We used our estimates of energy use for heating in the various types of low-income households (Section II.A above) to arrive at estimates of the cost of the AEP.¹⁸² For the initial, baseline calculation we assumed that the number of recipients would be the same as in 2013. A reasonably good estimate of cost is possible on this basis since we know the average income of the recipient group, in addition to having a reasonably detailed energy use picture. Of course, there are some uncertainties in our calculations since the detailed energy use picture for different fuels was built up from state, regional, and national data. Ideally, state data would be available and the use of regional and national data would not be necessary.

In line with the proposed structure of the AEP, we calculated its cost for an average recipient family as follows:

¹⁸⁰ Maryland AEP 2012, pp. 3, 27-28

¹⁸¹ Maryland EUSP Annual Report FY2014, Attachment L

¹⁸² The heating degree days in Maryland, as reflected in Baltimore-Washington Airport data, were about the same in 2010 and 2013. The analysis in Section II is for 2010 data, while the analysis for the AEP is for 2013 data. The slight error introduced by this is small compared to other uncertainties.

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- For households with electric heating, the energy burden would be limited to 6 percent. Costs above 6 percent would be covered by assistance funds (a mixture of federal heating and state assistance funds, including EUSP funds);
- For households with any other heating fuel type, the electricity bill burden would be limited to 3 percent. Electricity bill costs above 3 percent would be covered by assistance funds;
- Natural gas bills would be limited to 3 percent of income for households with natural gas heating. The rest (costs above 3 percent) would be covered by assistance funds;
- For households with heating other than electricity or natural gas, the total amount of assistance would remain constant at about \$26 million per year, which was the 2013 assistance level for such households.
- Administrative costs and emergency assistance in the AEP would amount to about double the administrative costs of the current assistance program (EUSP plus MEAP).

Under these assumptions, the cost of the Affordable Energy Program would be about \$150 million per year, almost \$30 million more than current assistance programs if the number of recipients were the same as in 2013. If the entire amount were added uniformly to the bills of residential electric ratepayers only, the added amount would be about \$1.03 per month. This does not take into account any cost reduction from acquisition of solar energy for low-income households, efficiency investments, or non-energy benefits.

If solar were acquired for all assistance recipients, phased in over a 15-year period, as described in Section VII, the cost per household electric bill in 2031 (when all recipient households

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would have 100 percent solar energy¹⁸³) would be slightly less than the present program (\$0.06 per month less per residential ratepayer). Additional savings would accrue by a systematic implementation of the heat pump water heater program.¹⁸⁴

A. Gross and Net Costs of the AEP

The net costs become lower than present costs when non-energy benefits are added. We provide the results of our analysis below in a series of tables.

Table IX-1 shows the total annual costs of the present program, of the AEP without and with solar (implemented fully by the year 2031), and the added costs. It also shows the total non-energy benefits for the three categories quantified in this report: reduced homelessness and associated health care costs, reduced air pollution, and reduced CO₂ emissions.

¹⁸³ This is not actual electricity from solar but that the total acquisition of solar energy would correspond to the total electricity use of low-income assistance recipients.

¹⁸⁴ See Section VI. No fuel switching is assumed. Heat pump water heaters would be installed without cost to the low-income household (or landlord) in place of existing electric resistance water heaters. Ratepayers would recover their investment via reduced costs of the Affordable Energy Program.

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Table IX-1: Gross and net costs of the AEP compared to 2013 assistance costs, \$/year. Numbers in parenthesis in red mean cost savings.

	AEP no solar (2017)	AEP with solar (2017)	AEP with solar (2031)
Total 2013 assistance costs	\$121,000,000	\$121,000,000	\$121,000,000
Total AEP costs	\$150,000,000	\$149,000,000	\$122,000,000
Added AEP costs over present program	\$29,000,000	\$121,000,000	\$1,000,000
Non- energy benefits	\$32,000,000	\$35,000,000	\$71,000,000
Net costs	(\$3,000,000)	(\$7,000,000)	(\$70,000,000)

Source: for 2013 costs: Maryland EUSP Annual Report FY2014, Attachments H and L and Maryland PSC 2013, Appendix A, Attachment H. For AEP costs and benefits: IEER analysis

- Notes: 1. All quantities in constant 2013 dollars
2. Assumes the same number of beneficiaries as in 2013. All values are rounded to the nearest million dollars per year.
3. For solar energy costs see Section VII.A
4. It is assumed that the solar program would be implemented in 15 years, starting in 2017.
5. See Table VIII-2 for details on non-energy benefits.
6. Many non-energy benefits are not quantified – see Section VIII.C.

Table IX-2 shows the results of our analysis in the form of added costs of the AEP per electric residential ratepayer, assuming that the entire added cost of the AEP would be borne

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by residential ratepayers. It also shows net non-energy benefits per residential ratepayer. Since these benefits would not actually accrue to ratepayers directly, we have not shown a net monthly cost per ratepayer. This calculation is an illustration only. There are a number of policy issues that must be sorted out since benefits do not accrue to electric ratepayers alone but to taxpayers and other parties. See Section IX-B below and Section VII.B and VIII.C above.

Table IX-2: Incremental costs of the AEP, with and without solar, dollars per residential electric ratepayer per month. Numbers in parenthesis in red mean net benefits

	AEP no solar (2017)	AEP with solar (2017)	AEP with solar (2031)
Added AEP electric bill cost	\$1.03	\$1.00	(\$0.06)
Non-energy benefits with solar, \$/month	(\$0.11)	(\$0.25)	(\$2.36)

Source: Table IX-1

Note: We assume that the number of ratepayers will grow at the rate of Maryland population growth of in the 2010-2014 period (0.89 percent per year).

Over the implementation period of the solar program assumed here, the added costs decline from \$1 per month to less than the costs of the current program, if universal solar access is implemented. The net costs are even lower, due to the substantial non-energy benefits.

B. Number of assistance recipients

One of the issues that has been raised in connection with the AEP is that it may result in a large increase of applicants and beneficiaries, since the program, in effect, would cover energy payments above 6 percent of gross income by third parties, including ratepayers. This is quite possible, perhaps likely. However, the benefits would also increase as the number of

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beneficiaries rises. The balance between increased costs and increased benefits of a larger number of assistance recipients is, at present, unclear.

The current assistance program is oriented to the neediest of the low-income group, according to criteria that include income and whether there are children, old, or ill members in the household. In 2013, only about one-third of assistance recipients had incomes in the range of 110 to 175 percent of the federal poverty level. We do not know the detailed income distribution of the non-applicants. However, it is reasonable to assume that the increase in applicants would likely be from the higher part of the income range of those eligible compared to present recipients.

We might therefore anticipate that the amount of assistance needed would be lower, on average, per household than that calculated for the AEP for current recipients in Section IX.A above. Many households who do not apply may already have bills less than six percent of their gross income. In that case they would not get any funds from the AEP (though they may remain eligible for emergency assistance).

The same line of reasoning indicates that the non-energy benefits calculated for the population of current recipients may also be lower for those not now receiving assistance. Specifically, the benefits due to reduction of homelessness and associated shelter and health costs, may also be lower. Hence the lower costs per added recipients may be offset to some extent by the lower non-energy benefits. However, the non-energy benefits due to a broadening of the Universal Solar

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Access program would go up proportionately to the number of recipients as a first approximation.¹⁸⁵

We made a simple calculation assuming that both costs and benefits would be the same per household as at present if the number of recipients increases. In other words, if the number of beneficiaries doubles, the costs and non-energy benefits would also double. The result of the calculation is shown in Table IX-3; the estimates assume that a solar energy supply program would be implemented for all recipients.

Table IX-3: Costs and benefits of doubling the number of assistance recipients, based on extrapolation of estimated AEP costs for current recipients. Numbers in parenthesis in red mean cost savings.

	AEP no solar (2017)	AEP with solar (2017)	AEP with solar (2031)
Direct AEP incremental cost (over 2013), \$/year	\$179,000,000	\$177,000,000	\$117,000,000
Non-energy benefits, \$/year	\$64,000,000	\$70,000,000	\$142,000,000
Net added cost for double the number of recipients, \$/year	\$115,000,000	\$107,000,000	(\$25,000,000)

If we assume the added costs for the AEP with double the participants is borne entirely by residential ratepayers, the initial added direct cost would be about \$4 per month. The direct added costs becomes smaller over time as the solar program is implemented. We conservatively assume that solar costs will not decline after 2022. This produces costs on the high side.

¹⁸⁵ This assumes that the energy consumption per additional household is, on average, the same as that of current recipients.

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Yet the net costs of a program with universal solar access and a larger number of recipients should be less than the cost of the current program by the year 2028. It is important to remember that the net costs above do not factor in a number of non-energy benefits.

Despite its admitted shortcomings and uncertainties, Table IX-3 indicates that the long-term net cost of the Affordable Energy Program will not be greater than the cost of present assistance, even if the number of recipients increases significantly. This conclusion depends most importantly on two things: (i) that a program of acquisition of solar energy is implemented for all low-income households as described in Section VII, and (ii) that non-energy benefits of reduced CO₂ emissions and air pollution as well as reduced costs of homelessness and associated shelter and health costs are taken into account.

A big policy issue is how the quantifiable net benefits can be used to generate revenues to meet the added direct costs of the AEP.

C. Policy considerations relating to the Affordable Energy Program

The AEP is a sound approach on which to reorganize energy assistance. The PSC made an excellent start when it initiated a review of the program; the analysis of the PSC Staff, done in collaboration with the Office of People's Counsel, provides the starting point for policy implementation. However, a central issue that needs to be addressed is the manner in which federal heating assistance funds are to be integrated into the AEP. While this was an understandable omission from the PSC Staff's analysis, there is no question that the federal government allows the use of heating assistance funds for programs like the AEP,

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provided they are structured according to federal guidance.¹⁸⁶ The evaluation in this report shows that the incremental cost of the program for current recipients would be far lower than estimated by the PSC staff when this is done – on the order of \$1 per month. The cost would decline if a program of solar energy provision using the approach of community choice aggregation is added to the AEP. The added cost of the AEP for current recipients would be about the same or lower than the current program by the time universal solar access is fully implemented.

Below we discuss the importance of five policy arenas in which action is needed to achieve energy justice and climate protection goals.

Policy issue 1 – Integration of federal funds into the AEP

Our review shows that federal funds can be integrated into the type of Affordable Energy Program developed by the PSC Staff in 2012. Other states, such as Ohio, have done it for many years. Sorting out the policy approach, jurisdictional issues, and mechanisms for compliance with federal rules for such integration should be a high priority.

Policy Issue 2 – Acquisition of solar energy for low-income households

Solar energy can be economically acquired for low-income households if done on a community choice aggregation principle under the supervision of the PSC. A universal solar access program should be done independently of renewable portfolio standards or renewable energy credits. It is economical in its own right and would reduce assistance costs. Legislation to

¹⁸⁶ LIHEAP 2010

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direct the PSC to require utilities to acquire solar energy via purchased power agreements for the Electric Universal Service Program. This would allow a scale of solar implementation that would enable cost-savings, while providing climate protection as well.

Given the drastic declines in the cost of solar energy and the fact that megawatt-scale solar is already comparable to or less than the retail cost of residential electricity, it is strongly desirable from every point of view to commence the acquisition of solar energy along community choice aggregation principles for recipients of energy assistance. Besides economic and environmental considerations, there is an aspect of remedying the near-total exclusion of low-income households from access to solar energy. This exclusion has many complex causes; yet the solution is rather straightforward. Solar energy acquisition for low-income assistance recipients does not need to wait for a full-blown adoption of the AEP.

Policy issue 3 – Actions regarding solar energy

It is necessary to map out where distributed solar can be built on a significant scale in compliance with local zoning and community considerations. At the same time, distribution utilities need to map out the areas where interconnection of solar on a megawatt scale would most help the distribution system and where upgrades and other investments may be needed. This should be done statewide with collaboration from local jurisdictions.

A very different set of policies will be needed for encouraging private investment in increasing the efficiency of the homes where low-income families live. The available state, utility, and federal funds are rather limited, raising questions as to how to best use these funds as well as existing regulatory authority to achieve significant efficiency gains in low-income households.

Policy issue 4 – Increasing the effectiveness of efficiency investments

Below we discuss the primary areas where investments in efficiency improvements of low-income households could be improved.

a) Rental housing

The lack of investment across a large portion of rental housing to bring it up to code appears to be a significant problem both in itself and because it creates a disincentive for landlords to grant permission for energy efficiency auditors to enter - even though the property improvements would be at no cost to the proprietor. Yet, landlords use public funds via the office of the sheriff, for instance, to evict renters who are behind on their payments.

State and local regulatory authority should be able to prohibit use of public resources to evict tenants from properties that are not in compliance with Maryland's livability code. This can also leverage investment. Of course this also raises the risk of landlords simply abandoning properties, especially in the case of small landlords who lack funds for improvements. Incentives in the form of low-cost financing and/or green bank financing could help to alleviate this problem.

b) Heat pump water heaters

Heat pump water heaters, used to replace existing electric resistance water heaters, have a very short payback time. For rental properties, where the utility rebate would be available, the landlord would have a payback time of about 2 years. **Green bank financing can be made available for investments in heat pump water heaters, so that no capital outlay above the cost of replacement of the existing water heater type would be needed.** A program to replace all resistance water heaters with heat pump water heaters over 10 years would materially

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reduce the cost of the AEP. Of course, this would require green bank financing or some similar instrument to be established in Maryland. Existing Property-Assessed Clean Energy (PACE) programs could also be used for rental properties.

c) Replacing oil and propane heating systems with efficient electric heat pumps

It is economical to replace oil and propane heating systems with efficient electric systems such as cold climate heat pumps. The main issue here is the higher upfront capital required. For rental properties it can be addressed via PACE or green bank financing. The same can be done for low-income households who own their homes, provided the total utility bills and tax or loan payments do not exceed utility bills without efficiency improvements. This may limit investments to structures that are sound and that meet other criteria for investments that will have a low likelihood of default.

An important obstacle is that the EmPOWER efficiency program's funds used for low-income efficiency investments cannot be used for fuel switching; in other words using these funds to invest in conversions from oil or propane to efficient electric systems in low-income households is prohibited. No such prohibition exists when rebates are given for HVAC systems to non-low-income households. For instance, such households can get both utility and state rebates to go from oil, propane, or natural gas heating systems to geothermal heat pumps. An investment of public funds to improve low-income household efficiency should be made on the merits, without an eye to preserving markets for any particular fuel. Moreover, switching from fossil fuel heating to efficient electric systems is, in any case, necessary in the long term to achieving goals for

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reduction of greenhouse gas emissions.¹⁸⁷ In light of these observations, the following policies would help reduce the costs of assistance programs as well as CO₂ emissions:

- Modify EmPOWER rules to permit fuel switching for HVAC and water heating systems.
- Make green bank and commercial PACE financing available to landlords for efficient electric HVAC systems like cold climate heat pumps and geothermal heat pumps.
- Require all new low-income housing to be net-zero energy. This means that housing must be very efficient, with standards at, or close to, passive house construction – that is, very low energy use. It also means on-site solar energy generation, supplemented by off-site generation, if dictated by space considerations. Maryland's aggregate net metering can be extended to cover low-income rental housing. This would make solar energy both cheaper and more accessible to such housing developments.

None of the above measures require new state or utility money, other than some funds committed to project design and measurement and verification.

Policy Issue 5 -- Revenues for the AEP

We have shown that the non-energy benefits of an Affordable Energy Program are so large that they could offset the increased direct costs of the AEP for a given number of recipients and even for a larger number of recipients. However, the allocation of costs and benefits needs to be evaluated. Some of the non-energy benefits accrue to ratepayers, via reduced arrears and

¹⁸⁷ Makhijani and Mills 2015

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higher bill collection efficiency. A variety of other parties would also benefit: including landlords, via increased rent collection, and government offices and departments, including those that have budgets for shelter and health care for the homeless. Gas utilities would also benefit in a manner similar to electric utilities. Fuel oil and propane dealers would benefit from the increased ability of low-income customers to pay their bills since the electric bill payments of those customers would be at most 3 percent of gross household income, freeing up income to pay their other bills. Businesses would benefit from increased spending power of low-income families on food, medicines, and transportation.

Deciding how the measurable non-energy financial benefits of the AEP in a variety of areas can be channeled into an equitable set of revenue streams for the AEP is a major policy challenge. In other words, we can approach the policy challenge of funding the direct added costs of the AEP in two ways:

- Raise the added revenues from electricity and natural gas ratepayers;
- Find innovative policy approaches or use existing mechanisms to convert portions of the quantifiable non-energy benefits into revenue streams that can be channeled to fund the increased direct costs of the AEP.

If the new revenues are raised only from residential electric ratepayers and if the AEP is coupled with solar energy acquisition, the initial added monthly costs would be about \$1 per month, decreasing over about a decade to zero, provided the number of assistance recipients remains the same. Some of the added cost could reasonably be shifted to natural gas ratepayers since the AEP would reduce natural gas bills; this would cover about 7 percent of the added direct cost of the AEP.

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Costs could also be spread out over all electricity ratepayers, rather than attributed only to the residential sector. In that case, the increase in residential ratepayer bills would be reduced by a little more than 50 percent. Such a proposal might raise objections from the commercial and industrial sectors; however, it should be noted that the increase in bills in these sectors would be less than half a percent. Moreover, the increased spending power of low-income people would reflect itself in the marketplace, benefiting commerce in the state.

Given the magnitude of the non-energy benefits, it is important to explore possible approaches to convert the quantifiable ones into funding streams for the AEP. Among the possible approaches would be to:

- Monetize the CO₂ emission reductions associated with solar energy acquisition for low-income households. This could become a significant stream of revenues as the federal Clean Power Plan is implemented.
- Find ways to translate some of the increased revenues or decreased costs in the private sector (both for-profit and non-profit) into funding to offset the increased direct costs of the AEP. Some of the increased rent and utility revenues or decreased health care costs could contributed to AEP revenue streams.
- Create revenue streams for the AEP that reflect the past inequities of renewable energy programs that have nearly excluded low-income households.

The direct costs may increase significantly if the number of recipients increases much above the present level.

We explore some examples of revenue streams outside the energy sector.

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Since non-energy benefits in the health care sector would be very large, we cite a proposal that has been put forward by the Community Innovators Lab of the Massachusetts Institute of Technology. This could be applied in a modified form to the AEP.

The Community Innovators Lab has suggested an approach for broader investment in healthcare that could be one way of developing the needed revenue stream without resorting to additional charges to the electricity ratepayer. The approach is novel and worth exploring. We therefore quote the paper outlining the basic idea at some length:¹⁸⁸

The 2010 Affordable Care Act included a new provision requiring tax-exempt hospitals to develop community health needs assessments, participatory processes, implementation plans, and evaluation procedures in order to justify and maintain their tax-exempt status. Additionally, the Internal Revenue Service (IRS) has in the past several years prescribed a transparent reporting regime and signaled that increased scrutiny of “community benefits” compliance is on the horizon. Further, the IRS has indicated that a broad range of activities, including community organizing, may qualify as “community benefits.”

....Patterns of community benefits vary by both state and by the degree of pressure on hospitals, but most experts believe that hospitals will choose to spend between 3-5% of revenues on CBAs in an effort to insulate themselves from

¹⁸⁸ MIT CoLab 2013, pp. 1-2

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IRS challenge. Last year, the top 50 non-profit hospitals had annual revenues of \$214 billion. Under the 3-5% regime, between \$6.4 billion and \$10.7 billion would be available for community development each year from the top 50 non-profit hospitals alone, in an effort to meet their non-profit status requirements. If we consider the more than 2,800 additional non-profit hospitals in the U.S., the aggregate numbers will be much higher.

A 2009 IRS survey of 500 large hospitals showed that total community benefits expenditures were allocated to the following activities: 56% toward uncompensated care; 23% toward medical education and training expenditures; 15% toward medical research; and 6% toward community programs. When the Affordable Care Act is fully implemented by 2014, it could well reduce the number of uninsured patients and thus total hospital expenditures on charity care. This means more community benefits dollars will be freed up to flow out into surrounding communities, and hospitals will have to invest more aggressively in addressing the negative social and physical conditions that lead to poor health, rather than in simply treating patients.

These developments offer a major opportunity for progressive activists to convince tax-exempt hospitals to invest a portion of their “community benefit” funds in efforts that:

1. Engage community residents in a planning process about their future with local institutions

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and organizations such as schools, businesses, labor unions, and others;

2. Introduce green infrastructure and economic development programs and processes that leverage the buying power of community institutions (such as hospitals, schools, and housing complexes) to create local service and manufacturing jobs to supply goods and services that local institutions buy; and

3. Build multi-stakeholder partnerships between community groups, participating local businesses, local government, and trade unions to guide and expand local economic development and policy/political initiatives.

Such novel approaches may allow the generation of new revenue streams that are not new income taxes and not new charges to residential (or non-residential) electricity ratepayers.

Another approach would be to convert some of the non-energy benefits that would accrue to some government departments into funds for the AEP using a carbon pricing scheme now used by many corporations. The basic approach, used by a variety of companies from oil companies and airlines to information technology companies, is to require each department in a company to account for its carbon emissions and to apply a carbon price to those emissions.¹⁸⁹ Funds corresponding to the carbon price are transferred to a central account where investments are made in renewable energy and carbon offsets. Since the amount of money transferred corresponds to a department's carbon emissions, each department has an

¹⁸⁹ CDP North America 2013

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incentive to become more efficient and reduce its emissions. At Microsoft, the carbon price is set according to the company's requirements for investments in renewable energy and carbon offsets.¹⁹⁰ Figure IX-1 shows the scheme that Microsoft uses to generate revenues and make investments to reduce its carbon footprint.

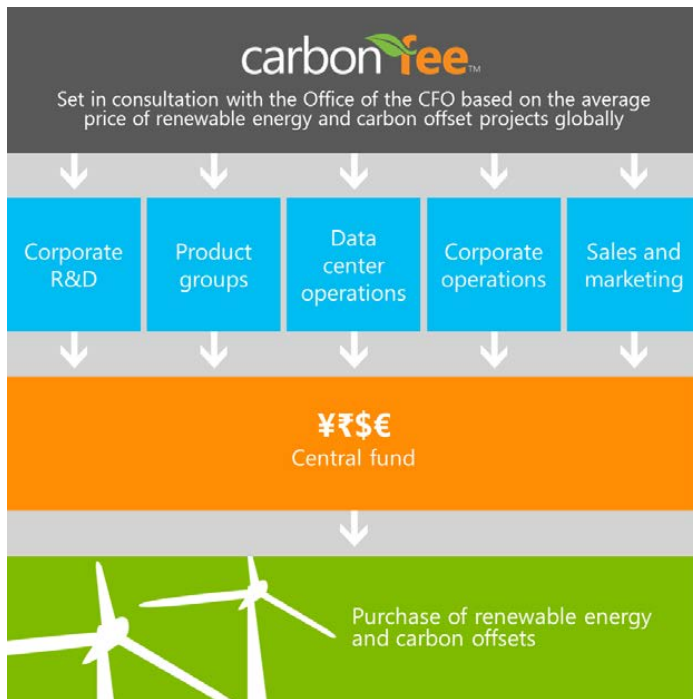


Figure IX-1: Microsoft Corporation's scheme of internal carbon pricing and carbon reduction investments

Source: Microsoft 2012, p. 12 (Used with permission from Microsoft.)

This scheme could be applied to generate funds for the AEP. Each department, such as the Department of Housing and

¹⁹⁰ Microsoft 2012

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Community Development or the Department of Human Resources, that would have non-energy benefits would pay into a common fund according to its carbon emissions and the portion of the non-energy benefits that are sought to be monetized for energy assistance.

There is also the traditional approach of raising revenue: income taxes. They should not be ignored for a part of the revenues needed to implement the AEP. We recognize that the general political climate in Maryland (and in most of the country) runs counter to suggestions of increased personal or corporate taxation, especially as it might concern assistance to low-income households. But there is a reasonable case to be made that they should at least be considered in the context of the AEP. Private revenues to corporations would increase because the low-income households would have increased purchasing power, for instance for buying more food, medicine, and transportation fuel. Landlords and utilities can expect to increase their revenues as well. Since assistance to low-income households would be the direct reason for these increased revenues, there is a case that some of the benefits should accrue to the budget as well. Further, government departments dealing with health care and shelter costs for low-income families would see somewhat reduced pressures on their budgets. One way of reflecting that reality would be to raise some of the added revenues needed for the AEP through a state income tax surcharge.¹⁹¹

¹⁹¹ State personal income tax revenues amounted to about \$7.7 billion in 2013 (Maryland Comptroller 2013, p. 13). Each 0.1 percent tax surcharge would therefore result in \$7.7 million in revenue. This revenue stream would grow with personal income while the need for assistance per recipient would decline with increasing implementation of solar energy access.

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All of these approaches can be evaluated while the pilot program we recommend clarifies the scope, costs, and benefits associated with implementing the AEP.

We should note that the Universal Solar Access program does not need new revenues; it only needs to be authorized and implemented.

D. A Pilot Program

We recognize that implementation details of an Affordable Energy Program need to be worked out, especially as combined with universal solar energy access and expanded efficiency investments. Therefore, we recommend a pilot program be carried out so as to establish a statewide program on a sound footing.

The pilot program should be implemented in in the three areas of Maryland that have high energy assistance needs, but which are quite different from one another in other ways: the two westernmost counties (Garrett and Allegany), Baltimore City, and the low-income counties on the Eastern Shore. The pilot in each area should be of sufficient scale – at least several hundred low-income assistance recipients – in order to empirically establish the cost of the program, provide reliable estimates of the likely participation, establish the procedures needed for integrating universal solar access and efficiency with the AEP, and make estimates of the collateral benefits of the program in terms of better health, lower homelessness, etc. In deciding the size of the pilot in each area, it will be important to have a size that will allow a statistically reliable determination of the likely participation and costs in each of the income brackets (0 to 50 percent, 50+ to 110 percent, 110+ to 150 percent, and 150+ to 175 percent of the federal poverty level income).

The pilot program in each area should include a representative mix of homeowners and renters. Methods to overcome barriers

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by landlords who are reluctant to allow access to rental properties should be tested. Finally, the case-manager approach recommended by the Department of Human Resources should also be tested.

X. Energy justice and jobs

The efficiency and solar programs recommended here would create a significant number of jobs in Maryland. Making estimates of jobs is quite difficult and different models yield widely varying results.¹⁹² Making estimates of in-state impacts is even more difficult because it requires the separation of in-state and out-of-state labor for any investment. For instance, lighting expenditures would be mostly out-of-state and would have small in-state jobs impacts in Maryland but significant global jobs impacts. In contrast, weatherization expenditures involve local labor for installation, as do changes in heating and air-conditioning (HVAC) equipment. Similarly, solar energy investments have a large component of local labor for design and installation, even though the hardware, including the solar panels, would not be in-state for the vast majority of states, including Maryland, unless Maryland can attract solar manufacturing investment by making a commitment to procure a large amount of solar through universal solar access for low-income households, an expanded solar renewable portfolio standard, or both.

Additionally, it is important to include indirect jobs effects: the jobs created when there are net in-state spending increases. For instance, essentially all the money spent to acquire fossil fuels in Maryland goes out of state to the places that produce them. When less money is spent on natural gas or electricity or fuel oil, there is more money available to spend on general household or business requirements. **For instance, an assessment in Massachusetts, which has a situation similar to Maryland in that fuels are almost all imported, found that one million dollars of expenditures on fuel oil, natural gas,**

¹⁹² Bower et al. 2012

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or electricity created only 1.0, 0.7, or 1.1 jobs in-state, respectively.¹⁹³ In contrast, a million dollars of general household spending created 9.1 in-state jobs. At the same time, ratepayers who pay for efficiency programs have less money to spend on general expenditures, demonstrating that a net assessment is important.

A. Efficiency sector jobs

Jobs associated with efficiency investments include

- direct jobs created by the investment,
- supply chain jobs,
- indirect jobs due to the stimulation of the economy,
- jobs created when people spend the money they save on energy on other goods and services (which are, on average, more job intensive).

Some estimates also take into account offsetting factors such as the jobs that would be created if the money spent on energy investments were spent on other types of investments.

The Pacific Northwest National Laboratory of the Department of Energy has compiled the various estimates made by different methods into a single study published in 2014.¹⁹⁴ The American Council for an Energy Efficient Economy has published net jobs estimates for efficiency investments as well.¹⁹⁵ The State of Vermont, which has its own energy efficiency utility (Efficiency Vermont) did its own assessment of net in-state jobs created due to its efficiency programs.¹⁹⁶

¹⁹³ Breslow 2011, slide 9

¹⁹⁴ Anderson et al. 2014

¹⁹⁵ ACEEE 2011

¹⁹⁶ Bower et al. 2012

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Estimates vary widely depending on the methods used and the types of jobs considered. It is particularly complex to sort out jobs that would be created in-state as distinguished from total jobs as a result of a particular investment. This is because supply chain jobs as well as jobs created due to the stimulus of added spending are only partly in-state; the rest are dispersed across the country and in other countries as well.

For the purposes of illustration, we assume a program of efficiency improvements in low-income households getting assistance implemented over 15 years, with \$5,000 invested in each household. The ACEEE and PNNL estimates range from about 450 net jobs to about 1,150 net jobs; the higher estimate does not include the offsetting estimate of the jobs that could have been created by investing the same money in areas other than energy efficiency. Vermont's analysis, based on its own experience, gives an estimate of about 1,600 in-state jobs. In all cases, these would be jobs that are steady jobs that would endure for 15 years, the assumed duration of the investment program.

B. Solar sector jobs

There is ample empirical data for estimating solar jobs. There would be a redirection of energy expenditures from a mix of electricity imports and in-state fossil fuel and nuclear generation to electricity generated entirely in the state by new solar installations. We estimate that the solar electricity procured for the program in the manner described in Section VII would free up money for expenditures in other areas.

The solar industry estimates that 15.5 jobs per megawatt of installed capacity were created by the solar industry in the

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United States for capacity installed in 2014.¹⁹⁷ This represents a mix of residential-, commercial-, and utility-scale installations, with most of the capacity being in the latter two categories. Since residential installations are more labor intensive per unit of capacity, we will use 12 jobs per megawatt for purposes of this report.

Using the cost structure for the solar access program described in Section VII, we estimate that low-income household electricity bills will be lower by about \$23 million per year, on average over the 2017-2031 period, at the end of which all assistance recipients would be getting 100 percent solar electricity. This would create almost 200 jobs, based on Massachusetts data that indicates about 8 additional jobs per million dollars of additional money used for general rather than energy expenses.¹⁹⁸

Table X-1 shows the distribution of solar energy jobs in the United States in 2014 for the various types of work involved. Note that most solar panel manufacturing was not in the United States in that year. However, there are many other types of manufacturing jobs involved in solar, including inverters, installation hardware, wiring, etc. Note that manufacturing represents less than one in five jobs in the U.S. solar industry.

¹⁹⁷ Solar Foundation 2015, p. 3. The number of jobs per megawatt declined from 19.5 in 2012 to 15.5 in 2014 since efficiency in installation and other cost reductions meant reduced labor requirements.

¹⁹⁸ Breslow 2011, slide 9

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Table X-1: Distribution of solar jobs in the United States, 2014, by job type.

	Jobs	Share
Installation	97,031	55.8%
Manufacturing	32,490	18.7%
Sales and distribution	20,185	11.6%
Project developers	15,112	8.7%
All other	8,989	5.2%
Total	173,807	100.0%

Source: Solar Foundation 2015, Table 1 (p. 6)

Maryland has no significant solar panel manufacturing facilities. In light of that, Table X-1 indicates that about three-fourths of the U.S. jobs would be in-state, assuming that all installation and sales and distribution jobs and half of the project developer jobs and half of all other jobs are in-state. We assume that for the proposed Universal Solar Access program about two-thirds of U.S. jobs will be in-state (instead of three-fourths for the average of installations of all sizes).¹⁹⁹

On this basis we estimate that about 570 jobs (rounded) in would be created in Maryland for supplying all current energy-assistance recipient households with 100 percent solar from distributed solar facilities that would be of a commercial- or utility-scale (hundreds of kilowatts to a few megawatts each). In addition, other jobs would be created if the solar energy is procured at a price lower than the grid because households would have lower electricity bills. As noted above, this amounts to almost 200 jobs. A total of 700 to 800 in-state jobs would therefore be created by providing all assistance recipients with

¹⁹⁹ Some jobs are also in other countries since a large fraction of solar panels is imported.

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solar electricity. There would be another 250 to 300 jobs elsewhere in the United States.

Overall, we estimate that the combination of solar and efficiency investments for 2013 assistance recipients would create at least 1,000 steady jobs and possibly as many as 2,000 jobs (over 15 years). We have rounded the numbers in this section in order to reflect the uncertainties inherent the jobs estimates themselves.

Finally, we note that it is possible to use policy commitments that give investment certainty to leverage manufacturing investment. For instance, in 2014 CPS Energy, the municipal utility owned by the City of San Antonio in Texas, leveraged its commitment to build 400 megawatts of solar to bring the first solar manufacturing plant to Texas. But it requires a substantial and firm commitment to build such a partnership. A Universal Solar Access program could provide that certainty.

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Health Care Utilization Patterns of Homeless Individuals in Boston: Preparing for Medicaid Expansion Under the Affordable Care Act

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Several million Americans experience being homeless every year, and the majority of them cannot afford health insurance.¹ These individuals live on the periphery of society, struggling in abject poverty. They must prioritize basic shelter, safety, and food, and therefore often forgo medical care until conditions become urgent or irreversible. Unmanaged and worsening medical conditions can further extend the duration of homelessness and associated economic problems (e.g., unemployment). Additionally, many homeless individuals are held in the grip of addiction and have mental illness.² Given this complex set of circumstances, often compounded by a lack of health insurance coverage, providing medical care for these individuals can be challenging. Care often remains fragmented, taking place in emergency departments (EDs) and multiple inpatient and outpatient settings.

The Medicaid expansion through the Affordable Care Act (ACA) will be an unprecedented opportunity to improve access to health services for poor and homeless individuals around the country. Starting in 2014, individuals with incomes up to 138% of the federal poverty level will be eligible for Medicaid in states that choose to expand their Medicaid program. Given the high uninsured rate and low incomes among homeless people, they stand to benefit immensely from this expansion.

Although expanded coverage will almost certainly increase access to health care for many, little information is available on what types of services homeless patients will use when insurance is available. Homeless individuals have high rates of mental illness (e.g., depression) and certain medical illnesses (e.g., HCV or diabetes mellitus).^{3–5} Previous investigations have shown a high level of health care utilization.^{6–8} For example, in a survey of 2578 homeless patients, Kushel

Objectives. We studied 6494 Boston Health Care for the Homeless Program (BHCHP) patients to understand the disease burden and health care utilization patterns for a group of insured homeless individuals.

Methods. We studied merged BHCHP data and MassHealth eligibility, claims, and encounter data from 2010. MassHealth claims and encounter data provided a comprehensive history of health care utilization and expenditures, as well as associated diagnoses, in both general medical and behavioral health services sectors and across a broad range of health care settings.

Results. The burden of disease was high, with the majority of patients experiencing mental illness, substance use disorders, and a number of medical diseases. Hospitalization and emergency room use were frequent and total expenditures were 3.8 times the rate of an average Medicaid recipient.

Conclusions. The Affordable Care Act provides a framework for reforming the health care system to improve the coordination of care and outcomes for vulnerable populations. However, improved health care coverage alone may not be enough. Health care must be integrated with other resources to address the complex challenges presented by inadequate housing, hunger, and unsafe environments. (*Am J Public Health.* 2013;103:S311–S317. doi:10.2105/AJPH.2013.301421)

et al.⁹ found that 40% of respondents had 1 or more ED visit in the last year, and 7.9% had 3 or more visits in the last year. These previous studies mainly used survey data, relied on self-reported data, or examined medical records of a single clinic, and many of the study populations were uninsured. Although these studies provide important information on the homeless population, the disease profiles obtained this way are not always complete, and there is incomplete information on health care utilization. Furthermore, they do not show utilization patterns for an insured homeless population. With health insurance, homeless individuals may have greater access to medications and preventive care that could reduce use of EDs and inpatient care. In the context of high rates of addiction, mental illness, and cognitive impairment, these crisis-driven utilization patterns may also persist in insured patients while expanding access to a wider range of services.

In Massachusetts, early Medicaid expansions since the 1990s have allowed a high percentage of homeless individuals to be insured under Medicaid, perhaps higher than most states in the country. Although Massachusetts is perhaps best known for its 2006 Medicaid expansion, unaccompanied homeless men and women were most beneficially affected by its 1115 waiver expansion in 1996. This expansion opened MassHealth (Massachusetts Medicaid) to chronically unemployed residents, and doubled the percentage of unaccompanied adults with Medicaid benefits from 30% to 60%. This expanded access to a variety of services for homeless men and women. The 2006 expansion built on this base and increased the percentage of insured homeless men and women; internal Boston Health Care for the Homeless Program (BHCHP) data demonstrated nearly 80% of patients have Medicaid or Medicare coverage.

Therefore, Massachusetts served as a unique environment in which to identify patterns of

medical care utilization in the Medicaid-enrolled homeless population. We examined Massachusetts Medicaid claims data in 2010 for a large cohort of homeless individuals seen at BHCHP. The program provides care to approximately 40% of the homeless population in Massachusetts.¹⁰ Augmenting previous studies, this study provided a unique perspective by analyzing claims data for a large sample of homeless people with health insurance coverage. In addition to providing a comprehensive understanding of the disease burden among homeless individuals, this data set included both behavioral health services for mental illness and substance use disorders (SUDs) and general medical care. This provided an opportunity to understand current service use across these sectors in preparation for the integrated care envisioned in future care models.

METHODS

BHCHP was established in 1985 under a Robert Wood Johnson Foundation grant to improve access to high quality medical care to homeless individuals in and around Boston. Since then, the program has become a federally qualified neighborhood health center and now serves more than 12 000 individuals in an outreach model, at dozens of different sites. The model of care is a person-centered multidisciplinary and culturally competent holistic approach to patients. Clinic visits are a mix of urgent care, episodic care, chronic disease management, and preventive health care. Services include outreach directly to the street, soup kitchens, and adult and family shelters. The program also runs a 104-bed medical respite unit, providing 24-hour medical care for homeless individuals who are too sick for the shelter or street but do not meet criteria for admission into an acute hospital bed. The program is integrated into the medical community, providing critical health care to homeless individuals in Boston.¹¹

We studied merged BHCHP data and MassHealth eligibility, claims, and encounter data from 2010. MassHealth claims and encounter data provided a comprehensive history of health care utilization and expenditures, as well as associated diagnoses, in both general medical and behavioral health services sectors

and across a broad range of health care settings.

Study Population

The final study population included 6494 BHCHP patients with Medicaid in 2010. Although the BHCHP database showed 6846 potential Medicaid recipients, 343 individuals were excluded because they were not eligible for Medicaid and 9 individuals were enrolled in Medicaid managed care programs (Program for All-inclusive Care for Elderly and Senior Care Option); we did not have access to their health care utilization records.

The analysis followed the framework of the Andersen Health Care Utilization model, which classifies variables associated with health care utilization and expenditures into 3 sets of factors: predisposing, enabling, and need factors.¹² We incorporated population characteristics in the domains of predisposing and enabling factors, and included disability and disease burden for need factors. We obtained demographic characteristics information from MassHealth data, including member age, gender, disability status, and Medicare enrollment. Race/ethnicity was derived from BHCHP data, which provided more comprehensive information than MassHealth data. Disability status was determined by the Social Security Administration or Massachusetts Disability Evaluation Services. Major MassHealth coverage types included standard coverage with full Medicaid benefits and basic and essential coverage that were similar to the standard coverage, except for long-term support and services.

Disease Burden

We identified members with mental illness, and selected physical conditions using the *International Classification of Diseases, Ninth Revision, Clinical Modifications*¹³ (ICD-9-CM) diagnosis codes in MassHealth claims and encounter data. The grouping of ICD-9-CM codes for diseases was based on the Clinical Classification Software developed by the Agency for Healthcare Research and Quality.¹⁴

Mental illness diagnoses included schizophrenia and other psychosis, bipolar disorders, depression, anxiety, and other mental illness. SUDs included alcohol abuse or dependence

and drug abuse or dependence. In some instances, behavioral health disorder was used and referred to mental illness or SUDs. Members with co-occurring mental illness and SUDs were identified. We specifically identified patients with several prevalent medical diseases, including HCV, HIV, cirrhosis, asthma or chronic obstructive pulmonary disease (COPD), hypertension, congestive heart failure, ischemic heart disease, and diabetes.

We used the DxCG score to evaluate the overall disease burden for the study population. DxCG is a subsidiary of Verisk Analytics and is a provider of predictive modeling software. The DxCG score is a predictive modeling tool that uses the Diagnostic Cost Group (DCG) methodology and benchmark data to estimate a populations' disease rate.^{15,16} In the DxCG model for the Medicaid population, the DxCG score is set to 1.0 for its original development sample of the general Medicaid population. In other words, DxCG scores greater than 1.0 indicate higher disease burden and scores less than 1.0 indicate that the disease burden is less than the average disease burden.

Health Care Utilization and Expenditures

We based the analysis of health care utilization and expenditures on paid MassHealth fee-for-service claims and those reported in managed care encounter data by MassHealth contracted managed care plans. Medicare services that generated "cross-over" Medicaid claims (for supplementing Medicare services) were included in the analysis. However, Medicare Part D pharmacy utilization and expenditures were not available for this analysis. General medical care and behavioral health services were reported, then analyzed separately and combined. Major health service categories and settings included hospitals, EDs, ambulatory care visits, prescriptions, dental, and outpatient detoxification. Inpatient detoxification was embedded in the overall hospitalization numbers. To assess the distribution of total annual expenditures, we ranked individuals by annual expenditures per person and then classified them into 5 expenditure groups.

Homeless individuals are at increased risk for exposure to HCV, and previous studies have shown increased prevalence rates. Therefore, we included a separate analysis of utilization among patients with HCV.¹⁷

Additionally, previous studies showed that treatment complexity increases for individuals with mental illness and SUDs^{18,19}; therefore, we also conducted a separate analysis of utilization for this group. Finally, we compared the overall health care utilization between those with and without co-occurring mental illness and SUDs and between those with and without HCV. The χ^2 test was used for comparisons for categorical variables, and the *t*-test was used for continuous variables.

All analyses were performed with SAS statistical software, version 9.2 (SAS Institute, Inc., Cary, North Carolina).

RESULTS

We focused on results from the combined analysis for the 6494 BHCHP patients included in the study regardless of their dual eligibility for Medicare and Medicaid. (Data available as a supplement to the online version of this article at <http://www.ajph.org> provide detailed results from separate analyses for dual eligibles and Medicaid-only members.) The majority of BHCHP MassHealth patients were male (71%), and the mean age was 45.5 years. Forty-four percent were non-Latino White, 32% non-Latino African American, and 15% Latino; 58% had disabilities, and 27% were eligible for both Medicare and Medicaid (Table 1). On average, homeless individuals were enrolled in MassHealth for at least 11 months in 2010.

Homeless individuals experienced a high disease burden, including chronic diseases, infections, mental illness, and SUDs (Table 1). More than two thirds of the study population had some form of mental illness, with depression being the most prevalent diagnosis. SUDs were also highly prevalent (60%). Furthermore, almost half of homeless individuals (48%) had co-occurring mental illness and SUDs. The study population also had a high prevalence of several selected medical illnesses. There was a high prevalence of infectious diseases, including HCV (23%) and HIV (6%). Chronic diseases were also prevalent; 37% of the study population had a diagnosis of hypertension, 26% had COPD or asthma, and 18% had diabetes mellitus. The overall disease burden represented by the DxCG score was 3.8, which indicated

TABLE 1—Population Characteristics: Boston Health Care for the Homeless Program (BHCHP) Users With Medicaid, 2010

Characteristic ^a	No. (%) or Mean $\pm$ SD
Age, y	45.5 $\pm$ 13.3
Male	4587 (71)
Race/ethnicity	
Non-Latino White	2868 (44)
Non-Latino African American	2058 (32)
Latino	986 (15)
Others	214 (3)
Unknown	368 (6)
Disability status ^b	3734 (58)
Dually eligible for Medicare and Medicaid	1761 (27)
Behavioral health disorders ^{c,d}	5139 (79)
Any mental illness	4384 (68)
Schizophrenia	1264 (19)
Bipolar disorders	1889 (30)
Depression	3068 (47)
Anxiety	2627 (40)
Others	1765 (27)
Any substance use disorders	3890 (60)
Alcohol use disorder	2628 (40)
Drug use disorder	3118 (48)
Co-occurring mental illness and substance use disorders	3135 (48)
Selected physical conditions ^{c,d}	4177 (64)
HCV	1473 (23)
HIV	410 (6)
Cirrhosis	254 (4)
Asthma/COPD	1712 (26)
Hypertension	2395 (37)
Congestive heart failure	265 (4)
Ischemic heart disease	560 (10)
Diabetes	1191 (18)
Overall disease burden ^e	3.8 $\pm$ 3.8

Note. COPD = chronic obstructive pulmonary disease. The sample size was *n* = 6494.

^aBased on the last segment of MassHealth eligibility or enrollment data in 2010, except for race/ethnicity, which was based on BHCHP data.

^bDetermined by the Social Security Administration or Massachusetts Disability Evaluation Services.

^cBoth MassHealth claims data and managed care encounter data were used for the prevalence analysis; however, laboratory claims and radiology claims were not included.

^dDiseases listed are not mutually exclusive.

^eDisease burden is represented by the DxCG score. A DxCG score of 1 equals average expected expenditures or average disease burden in DxCG's original development sample of the general Medicaid population. Scores > 1 indicate higher than average disease burden and scores < 1 indicate lower than average disease burden. The median disease burden was 2.6.

a substantially higher burden than the general Medicaid population.¹⁶

On average, this homeless population had 10 ambulatory care visits annually. They also used EDs frequently, with an annual average of 4 visits and were hospitalized, on average, at least once a year. Notably, 20% of the

population had 6 or more ED visits and 12% had 3 or more hospitalizations in a year. Moreover, approximate one third of ED visits and half of hospitalizations were attributable to behavioral health disorders (Table 2).

Homeless individuals with co-occurring mental illness and SUDs and those with HCV

TABLE 2—Health Care Utilization: Boston Health Care for the Homeless Program Users With Medicaid, 2010

Types of Health Services ^a	Behavioral Health Services, No. (%) or Mean $\pm$ SD	General Medical Care, No. (%) or Mean $\pm$ SD	Both, No. (%) or Mean $\pm$ SD
Ambulatory care visits	1.0 $\pm$ 3.2	9.0 $\pm$ 10.4	10.0 $\pm$ 11.0
None	4503 (69)	356 (5)	262 (4)
1-2	1394 (21)	1244 (19)	1089 (17)
3-5	320 (5)	1520 (24)	1433 (22)
> 5	277 (4)	3374 (52)	3710 (57)
ED visits	1.3 $\pm$ 4.2	2.7 $\pm$ 4.7	4.0 $\pm$ 7.3
None	4464 (69)	2292 (35)	1990 (31)
1-2	1157 (18)	2126 (33)	1932 (30)
3-5	454 (7)	1139 (18)	1168 (18)
> 5	419 (6)	937 (14)	1404 (21)
Hospitalizations ^b	0.5 $\pm$ 1.5	0.5 $\pm$ 1.6	1.0 $\pm$ 2.4
None	5369 (83)	4958 (76)	4287 (66)
1-2	765 (12)	1143 (18)	1436 (22)
> 2	360 (5)	393 (6)	771 (12)
Hospital length of stay, d ^c	8.0 $\pm$ 12.4	5.7 $\pm$ 9.5	7.0 $\pm$ 11.4
Outpatient detoxification ^d			
None	4952 (76)	NA	4952 (76)
1	391 (6)	NA	391 (6)
≥ 2	1151 (18)	NA	1151 (18)
Mean $\pm$ SD	1.4 $\pm$ 4.6	NA	1.4 $\pm$ 4.6

Note. ED = emergency department. The sample size was $n = 6494$.

^aBased on MassHealth fee-for-service claims and managed care encounter data.

^bIncluding acute inpatient, psychiatric inpatient, semiacute hospitals, chronic inpatient hospital, and state hospitals.

^cFor members with at least 1 hospitalization in 2010. Median hospital length of stay was 4.0 for both behavioral health and general medical care.

^dInpatient detoxifications are included in hospitalizations.

had high health care utilization (Table 3). More than one third of them had 6 or more ED visits and more than 20% of them had 3 or more hospitalizations. Except for hospital length of stay, health care utilization for these 2 groups was substantially higher than among those without these conditions ($P < .001$).

Homeless individuals had high health care expenditures—\$2036 per member per month compared with \$568 per month for all MassHealth members.²⁰ Almost half of total annual expenditures were incurred by 10% of the study population (Table 4). The 2 highest categories of health care expenditure were hospitalizations and ED visits, which represented 40% and 11% of total expenditures, respectively.

DISCUSSION

Medicaid expansion under the ACA could improve access to care for homeless individuals

across the country. This study was a unique analysis of a Medicaid claims database for homeless individuals in Boston, Massachusetts, who already had health insurance. Our findings reinforced the understanding that homeless individuals have a great deal of physical illness, mental illness and addictions. This high disease burden adds to the existing life stress created by unsafe and uncertain housing and the daily search for food and clothing.^{21,22} In this context, conditions that could be managed in stably housed patients become life threatening.

Diabetes mellitus was an example of a disease made much worse by the social circumstances of homelessness, including limited access to nutritious food, an irregular meal schedule, inability to refrigerate insulin, and challenges of carrying needles. The prevalence of diabetes mellitus was extremely high in this population (18%) compared with the

general population (8.3%).²³ HCV was another example of a disease made worse by the social circumstances of homelessness. The prevalence in this cohort was 24% compared with 1.8% of the general population.²⁴ Treatment and management of HCV typically requires access to sophisticated technology and medications and management of multiple medical appointments and procedures. Adherence to treatment regimens are complicated by being homeless. Mental illness and substance use disorders, prevalent in staggering proportions in this group of patients, further complicate management of chronic physical illness. Previous studies showed that these behavioral health disorders are associated with lower quality indicators, lower adherence with prescribed treatment, and higher health care expenditures.^{19,25-27} In this analysis, we found that the presence of HCV resulted in higher utilization of many services, including the ED, hospitals, and outpatient services.

Overall, our findings showed that homeless individuals used the ED 4 times a year on average, and 20% of the cohort had 6 or more ED visits per year. In comparison, only 1% of the general population and 5% of Medicaid recipients used the ED 4 or more times a year.²⁸ Hospitalization rates were also high, with these individuals using the hospital more than domiciled patients. Hospital stays averaged 1 per year with an average length of stay of 7 days. Additionally, 12% of the study population had 3 or more hospitalizations in a year. Previous studies of homeless individuals showed that lack of health insurance was associated with more use of acute hospital facilities and fewer ambulatory services,⁶ but in this insured cohort, rates of ED and hospitalization remained high.

Behavioral health disorders appeared to be a factor associated with higher utilization. One third of ED visits and half of all hospitalizations were attributable to behavioral health disorders. This was consistent with previous studies that showed that behavioral health disorders were associated with increased Medicaid expenditures.¹⁹ High use of the medical system was reflected in health care costs, including a per-member-per-month expenditure of \$2036, of which one third were for services directly related to mental illness or SUDs.

TABLE 3—Overall Health Care Utilization: Subgroups of Boston Health Care for the Homeless Program Users With Medicaid, 2010

Types of Health Services ^a	Co-Occurring Mental Illness and SUDs, ^b No. (%) or Mean $\pm$ SD		HCV, ^c No. (%) or Mean $\pm$ SD	
	With (n = 3135)	Without (n = 3359)	With (n = 1473)	Without (n = 5021)
Ambulatory care visits	11.6 $\pm$ 11.5	8.5 $\pm$ 10.1	13.5 $\pm$ 12.6	9.0 $\pm$ 10.2
None	2	5	1	5
1-2	11	22	9	19
3-5	20	24	17	24
> 5	67	48	73	52
ED visits	6.3 $\pm$ 9.1	1.8 $\pm$ 3.6	6.3 $\pm$ 9.5	3.3 $\pm$ 6.2
None	15	46	19	34
1-2	26	33	23	32
3-5	23	13	23	17
> 5	35	8	35	17
Hospitalizations ^d	1.8 $\pm$ 3.1	0.3 $\pm$ 0.9	2.0 $\pm$ 3.4	0.7 $\pm$ 1.8
None	48	83	45	82
1-2	31	14	30	5
> 2	22	3	25	13
Hospital length of stay, ^e	6.8 $\pm$ 11.0	7.4 $\pm$ 12.7	6.7 $\pm$ 12.4	7.0 $\pm$ 10.9
Outpatient detoxification ^f	2.7 $\pm$ 6.1	0.3 $\pm$ 1.6	2.9 $\pm$ 6.4	1.0 $\pm$ 3.7
None	58	93	58	82
1	10	2	10	5
≥ 2	32	5	32	13

Note. ED = emergency department; SUDs = substance use disorders.

^aBased on MassHealth fee-for-service claims and managed care encounter data.

^bHomeless individuals with co-occurring mental illness and SUDs had significantly higher health care utilization than those without co-occurring mental illness and SUDs ($P < .001$ from the χ^2 test for categorical variables and the t -test for interval variables), except for hospital length of stay.

^cHomeless individuals with HCV had significantly higher health care utilization than those without HCV ($P < 0.0001$ from the χ^2 test for categorical variables and the t -test for interval variables), except for hospital length of stay.

^dIncluding acute inpatient, psychiatric inpatient, semiacute hospitals, chronic inpatient hospital, and state hospitals.

^eFor members with at least 1 hospitalization in 2010.

^fInpatient detoxifications are included in hospitalizations.

Even among this population with higher than average costs, there was a subgroup of very high service users ($n = 650$; 10%) who were responsible for 48% of total expenditures (Table 4). The greater flexibility in payment and service delivery provided by the ACA could be used to provide intensive, targeted services to high need groups.

In implementing the ACA, which is designed to profoundly enhance access to care, states must determine how to incorporate the new recipients of Medicaid into the health care delivery system in the most effective way. Our findings provided a window into the health care utilization patterns of one of the most vulnerable subgroups for Medicaid expansion. There are several implications to these findings.

First of all, states that begin to enroll homeless individuals in Medicaid systems should understand that these individuals will have many unmet needs and require enhanced coordination of services. There might be concern about the costs of medical care for this population. As our findings suggested, the burden of medical and behavioral health needs are high. Therefore, it is not surprising that costs are consequently higher because the burden of disease is up to 4 times that of the general Medicaid population. However, states are already likely to be paying for services for homeless individuals in less effective and fragmented systems. In a recent policy paper from the Kaiser Family Foundation, Holahan et al.²⁹ evaluated the cost of coverage under

ACA Medicaid expansion and found that extending coverage could actually reduce costs, and some states might see a net savings with Medicaid expansion.

Enrolling and caring for this population in an effective manner can be challenging, and health care for the homeless programs can be crucial partners in outreach and engagement efforts. Specialized health care programs, such as BHCHP, work to improve the fragmented use of the medical system by assisting in Medicaid enrollment and providing integrated care that follows the Institute of Medicine's core principles of public health, including identifying community health problems, mobilizing community partners, linking people to needed health services, and promoting health and safety.¹¹ Following this framework has allowed many homeless individuals to start to access the medical care and services that they need in a timelier manner. Furthermore, integration of care under patient-centered and integrated behavioral health and medical service models hold future promise.

Second, as more homeless individuals obtain needed health insurance under the ACA Medicaid expansion, it will be critical for providers to establish care models that take into account the high prevalence of behavioral health disorders. Our findings confirmed that a majority of individuals have mental illness and SUDs, either alone or co-occurring. Better integration of behavioral health services with primary care will be critical. Although BHCHP improved the integration of primary care and behavioral health services through co-location of providers, shared medical records, and shared case conferencing, the development of Health Homes under the ACA could further provide additional funding to better align health care financing and delivery.

Third, our findings showed that, even within this cohort of high users of the medical system, there was a group of super-high users. The top 10% people incurred almost half of health care expenditures for homeless people, and a significant proportion of the study population had frequent ED visits or hospitalizations. This group needs to be targeted with new programs and more efficient payment models based on community outreach and engagement. Current efforts on targeting

TABLE 4—Health Care Expenditures for Boston Health Care for the Homeless Program Users With Medicaid, 2010

Variable	Behavioral Health Services, No. (%) or Mean $\pm$ SD	General Medical Care, No. (%) or Mean $\pm$ SD	Both, No. (%) or Mean $\pm$ SD
Overall expenditures^a			
PMPM, \$	653	1383	2036
Annual expenditures ^b , \$	7355 $\pm$ 15 502	15 579 $\pm$ 31 071	22 934 $\pm$ 36 510,
Distribution of total annual expenditures^b			
Total annual expenditures, \$	47 756 358	101 156 508	148 912 866
Population ranked by annual expenditures per person, \$			
Lowest 25% (n = 1623)	739 (0)	1 310 109 (1)	2 058 769 (1)
25%–50% (n = 1623)	668 020 (1)	5 136 725 (5)	9 737 568 (7)
50%–75% (n = 1623)	6 277 094 (13)	14 654 616 (15)	27 727 537 (19)
75%–90% (n = 974)	12 786 808 (27)	23 631 322 (23)	37 979 192 (26)
90%–100% (n = 650)	28 023 698 (59)	56 423 736 (56)	71 409 801 (48)
Total annual expenditures by type of service			
Hospitalizations	18 797 235 (39.4)	39 412 510 (39.0)	58 209 745 (39.1)
ED visits	3 428 304 (7.2)	12 589 927 (12.4)	16 011 738 (10.8)
Ambulatory care visits	642 807 (1.3)	9 278 497 (9.2)	9 921 304 (6.7)
Outpatient detoxification	6 291 717 (13.2)	NA	6 291 717 (4.2)
Prescription	2 973 794 (6.2)	6 655 325 (6.6)	9 629 119 (6.5)
Dental visits	NA	1 642 729 (1.6)	1 642 729 (1.1)
Others ^c	15 622 501 (33.0)	31 577 520 (31.4)	47 206 514 (31.6)

Note. ED = emergency department; NA = not applicable; PMPM = per member per month. One member was excluded from the calculation because of extremely high payments. The sample size was n = 6493.

^aIncludes MassHealth fee-for-service payments, managed care payment amount to their contracting providers, Medicare payments, third-party payments, and out-of-pocket payments reported in MassHealth fee-for-service claims and managed care encounter data.

^bMedian annual expenditure for both behavioral health and general medical care was 10 172.

^cIncludes expenditures for intensive alcohol or drug services, psychotherapy, crisis intervention, drug screen, methadone treatment, skilled nursing in home health setting, and nonemergent transportation.

high users tend to focus at the practice level and result in improved quality of care but do not address the more systemic issues that require better alignment of incentives and data integration across different sectors of the health care system. The ACA is an important step towards more systemic improvement across the spectrum of health services. As the ACA promotes investigation of alternative models of care, there will need to be a focus on data-driven coordination of care across the medical care system.

Fourth, although out of the scope of this study, it is difficult to address the health care needs and disparities of this population without addressing their housing needs. Studies show that housing homeless individuals results in lower health care utilization and improvement in health.^{4,5,30,31} Housing should be considered

as a benefit that improves health and is a potential cost-saving intervention.

There were several limitations to this study. One limitation was the use of ICD-9-CM codes instead of chart reviews because claims-based ICD-9-CM codes might not capture the entire clinical picture because of underreporting or underdiagnosis.³² The high burden of disease identified might still be understated. Furthermore, these analyses were based on analysis from a single year and did not allow comparisons over a longer period of time. The Massachusetts Medicaid expansion has been a slow process since the 1990s, and made a pre-expansion cohort difficult to discern. Additionally, since 2010, several new interventions have been initiated at BHCHP, including a patient-centered medical home initiative, which might change utilization

patterns. We did not have access to utilization data on the 20% of homeless patients who did not have Medicaid. They might exhibit a different pattern of health care utilization, but we were not able to comment on this. Additionally, because of data availability, this study focused on 1 city in Massachusetts, and therefore, we could not comment on any regional variations. Given these limitations, these baseline data could be used for comparison purposes for future investigations. Future studies should focus on further clarifying the effects of being homeless on health status and risk stratification, as well as controlled trials on the use of housing interventions and integrated care models.

This study demonstrated the clinical characteristics and medical use patterns in a homeless population with Medicaid coverage. Medicaid expansion will provide a unique opportunity and will significantly improve access to care for homeless individuals. However, it will take extensive collaboration across different state offices, provider networks, community and human service organizations to manage the care for this population in a cost-effective manner while ensuring high quality of care. The data provided in our analysis should provide clinicians, administrators, and policymakers with important information on an understudied and vulnerable population with a high burden of illness and need for coordinated, high-quality care. ■

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Contributors

M. Bharel conceptualized the study and developed the article, including writing, statistical analysis, and interpretation. W-C. Lin helped conceptualize the study, led the study design and statistical analysis, and

developed the article together with M. Bharel. J. Zhang conducted the statistical analysis, assisted in data interpretation, and reviewed drafts of the article. E. O'Connell assisted in the statistical analysis and data interpretation, and reviewed drafts of the article. R. E. Clark helped conceptualize the study; supervised and participated in all aspects of the implementation, statistical analysis, and data interpretation; and reviewed drafts of the article. R. Taube helped conceptualize the study, participated in data interpretation, and reviewed drafts of the article.

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Human Participant Protection

The institutional review board at the University of Massachusetts Medical School approved this study and waived the need for informed consent.

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CPIMEDSL Consumer Price Index for All Urban Consumers: Medical Care in U.S. City Average, Index 1982-1984=100, Annual, Seasonally Adjusted

Frequency: Annual

observation_date	CPIMEDSL
1947-01-01	13.542
1948-01-01	14.392
1949-01-01	14.833
1950-01-01	15.100
1951-01-01	15.825
1952-01-01	16.708
1953-01-01	17.292
1954-01-01	17.825
1955-01-01	18.250
1956-01-01	18.900
1957-01-01	19.675
1958-01-01	20.633
1959-01-01	21.492
1960-01-01	22.258
1961-01-01	22.908
1962-01-01	23.525
1963-01-01	24.083
1964-01-01	24.592
1965-01-01	25.183
1966-01-01	26.300
1967-01-01	28.150
1968-01-01	29.867
1969-01-01	31.917
1970-01-01	33.958
1971-01-01	36.133
1972-01-01	37.325
1973-01-01	38.758
1974-01-01	42.367
1975-01-01	47.492
1976-01-01	52.000
1977-01-01	56.975
1978-01-01	61.750
1979-01-01	67.475
1980-01-01	74.858
1981-01-01	82.925
1982-01-01	92.617
1983-01-01	100.658
1984-01-01	106.975

1985-01-01	113.617
1986-01-01	122.167
1987-01-01	130.175
1988-01-01	138.625
1989-01-01	149.250
1990-01-01	162.808
1991-01-01	177.017
1992-01-01	190.058
1993-01-01	201.400
1994-01-01	211.025
1995-01-01	220.450
1996-01-01	228.267
1997-01-01	234.592
1998-01-01	242.125
1999-01-01	250.558
2000-01-01	260.750
2001-01-01	272.767
2002-01-01	285.633
2003-01-01	297.058
2004-01-01	310.142
2005-01-01	323.225
2006-01-01	336.192
2007-01-01	351.065
2008-01-01	364.072
2009-01-01	375.608
2010-01-01	388.423
2011-01-01	400.241
2012-01-01	414.923
2013-01-01	425.133
2014-01-01	435.306
2015-01-01	446.762
2016-01-01	463.678
2017-01-01	475.317
2018-01-01	484.704
2019-01-01	498.402
2020-01-01	518.852
2021-01-01	525.249
2022-01-01	546.532
2023-01-01	549.068
2024-01-01	#N/A

Fiscal Year	Grantee	Percent of Income-Eligible Households Served by Any Type of LIHEAP Assistance	
2001	Michigan	N/A	
2002	Michigan	N/A	
2003	Michigan	N/A	
2004	Michigan	N/A	
2005	Michigan	N/A	
2006	Michigan	N/A	
2007	Michigan	N/A	
2008	Michigan	N/A	
2009	Michigan	N/A	
2010	Michigan	N/A	
2011	Michigan	47.31%	
2012	Michigan	41.50%	
2013	Michigan	39.23%	
2014	Michigan	38.33%	
2015	Michigan	42.48%	
2016	Michigan	38.51%	
2017	Michigan	36.85%	
2018	Michigan	32.47%	
2019	Michigan	32.09%	
2020	Michigan	30.00%	
2021*	Michigan	22.16%	
2022*	Michigan	31.11%	
2023*	Michigan	39.60%	Five year average: 30.99%

Source: LIHEAP Performance Measurement Web Site(<https://liheappm.acf.hhs.gov>)

Fiscal Year	Grantee	State Income-Eligible Households - Total	
2001	Michigan	1,015,505	1,015,505
2002	Michigan	1,110,048	1,110,048
2003	Michigan	442,046	
2004	Michigan	517,152	
2005	Michigan	499,991	
2006	Michigan	506,621	
2007	Michigan	526,177	
2008	Michigan	526,177	
2009	Michigan	602,149	
2010	Michigan	568,604	
2011	Michigan	580,475	
2012	Michigan	580,475	
2013	Michigan	607,768	
2014	Michigan	622,384	
2015	Michigan	617,346	
2016	Michigan	603,886	
2017	Michigan	598,929	
2018	Michigan	575,917	
2019	Michigan	551,897	
2020	Michigan	542,727	
2021*	Michigan	528,387	
2022*	Michigan	497,332	
2023*	Michigan	481,913	Five year average: 520,451

Source: LIHEAP Performance Measurement Web Site(<https://liheappm.acf.hhs.gov>)

Fiscal Year	Grantee	Federally Income-Eligible Households - Total	
2001	Michigan	1,015,505	
2002	Michigan	1,110,048	
2003	Michigan	1,249,438	
2004	Michigan	1,376,703	
2005	Michigan	1,298,359	
2006	Michigan	1,202,113	
2007	Michigan	1,204,341	
2008	Michigan	1,204,341	
2009	Michigan	1,219,874	
2010	Michigan	1,279,202	
2011	Michigan	1,302,893	
2012	Michigan	1,302,893	
2013	Michigan	1,245,264	
2014	Michigan	1,221,328	
2015	Michigan	1,200,571	
2016	Michigan	1,180,137	
2017	Michigan	1,198,808	
2018	Michigan	1,178,417	
2019	Michigan	1,150,627	
2020	Michigan	1,137,840	
2021*	Michigan	1,159,876	
2022*	Michigan	1,145,560	
2023*	Michigan	1,090,396	Five year average: 1,136,860

Source: LIHEAP Performance Measurement Web Site(<https://liheappm.acf.hhs.gov>)

**Table 1. 2022 Summary statistics
Michigan**

	Value	Rank
Primary energy source	Natural Gas	
Net summer capacity (megawatts)	30,538	11
..Electric utilities	22,471	8
..IPP and CHP	8,067	15
Net generation (megawatthours)	117,497,052	11
..Electric utilities	81,577,914	9
..IPP and CHP	35,919,138	13
Emissions (thousand metric tons)		
..Sulfur dioxide (short tons)	53,778	5
..Nitrogen oxide (short tons)	53,786	6
..Carbon dioxide (thousand metric tons)	58,510	6
..Sulfur dioxide (lbs/MWh)	0.9	10
..Nitrogen oxide (lbs/MWh)	0.9	15
..Carbon dioxide (lbs/MWh)	1,096	16
Total sales to ultimate customers (megawatthours)	100,639,262	12
..Full service provider and facility direct sales (megawatthours)	91,766,110	10
..Energy-only provider sales (megawatthours)	8,873,152	10
Direct use (megawatthours)	2,536,443	11
Average price to ultimate customers (cents/kWh)	13.20	14

Sources: U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report. U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report. U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.

**Table 2A. Ten largest plants by capacity, 2022
Michigan**

	Plant	Primary energy source	Operating company	Net summer capacity (MW)
1	Monroe (MI)	Coal	DTE Electric Company	3,080
2	Ludington	Pumped storage	Consumers Energy Co	2,186
3	Donald C Cook	Nuclear	Indiana Michigan Power Co	2,177
4	Midland Cogeneration Venture	Natural gas	Midland Cogeneration Venture	1,865
5	Dan E Karn	Natural gas	Consumers Energy Co	1,689
6	Belle River	Coal	DTE Electric Company	1,508
7	J H Campbell	Coal	Consumers Energy Co	1,400
8	Fermi	Nuclear	DTE Electric Company	1,192
9	Blue Water Energy Center	Natural gas	DTE Electric Company	1,146
10	New Covert Generating Facility	Natural gas	New Covert Generating Company LLC	1,085

Source: U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report.

**Table 2B. Ten largest plants by generation, 2022
Michigan**

	Plant	Primary energy source	Operating company	Generation (MWh)
1	Donald C Cook	Nuclear	Indiana Michigan Power Co	16,621,031
2	Monroe (MI)	Coal	DTE Electric Company	15,349,520
3	J H Campbell	Coal	Consumers Energy Co	7,677,054
4	Midland Cogeneration Venture	Natural gas	Midland Cogeneration Venture	7,411,985
5	New Covert Generating Facility	Natural gas	New Covert Generating Company LLC	7,328,022
6	Belle River	Coal	DTE Electric Company	6,818,124
7	Fermi	Nuclear	DTE Electric Company	6,662,563
8	Dearborn Industrial Generation	Natural gas	Dearborn Industrial Gen Inc	4,803,433
9	Blue Water Energy Center	Natural gas	DTE Electric Company	4,496,030
10	Zeeland Generating Station	Natural gas	Consumers Energy Co	4,316,479

Source: U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.

Table 3. Top five retailers of electricity, with end use sectors, 2022
Michigan

megawatthours

	Entity	Type of provider	All sectors	Residential	Commercial	Industrial	Transportation
1	DTE Electric Company	Investor-owned	40,897,642	15,844,478	16,500,656	8,548,188	4,320
2	Consumers Energy Co	Investor-owned	33,249,141	12,976,844	11,817,172	8,455,125	0
3	Constellation NewEnergy, Inc	Retail power marketer	4,802,062	0	2,980,246	1,821,816	0
4	Indiana Michigan Power Co	Investor-owned	2,619,737	1,175,727	767,758	676,252	0
5	City of Lansing - (MI)	Public	2,027,546	578,323	1,101,975	347,248	0
	Total sales, top five providers		83,596,128	30,575,372	33,167,807	19,848,629	4,320
	Percent of total state sales		83	87	89	70	100

Source: U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Table 4. Electric power industry capacity by primary energy source, 1990 through 2022
Michigan

megawatts

	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007	Year 2006	Year 2005	2022
Electric utilities	22,471.1	22,741.0	22,355.4	22,440.5	22,684.7	22,625.3	22,361.2	23,386.9	22,259.5	22,147.5	22,515.8	22,401.4	21,639.2	21,758.9	21,885.1	21,894.0	22,734.0	23,029.0	
Battery	1.3	1.3	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Coal	6,225.3	7,969.1	8,263.5	8,524.5	9,124.6	9,150.9	9,346.4	10,743.7	10,847.8	10,785.4	10,937.4	11,033.2	11,217.8	11,431.2	11,543.1	11,533.0	11,534.0	11,633.0	
Hydroelectric	246.2	245.6	246.5	244.7	241.2	238.2	234.3	302.2	304.4	302.7	207.3	209.7	208.6	223.0	221.9	221.0	229.0	225.0	
Natural gas	8,145.5	6,785.8	6,532.6	6,674.1	6,640.7	6,758.8	6,384.1	6,219.8	5,085.1	5,170.9	5,488.8	5,463.1	4,618.4	4,445.9	4,446.8	4,461.0	3,695.0	3,669.0	
..Natural gas - CC	2,614.8	1,289.6	1,300.6	1,306.6	1,289.9	1,294.3	1,167.8	1,185.2	621.2	539.4	546.3	552.9	20.5	20.5	22.0	-	-	-	-
..Natural gas - GT	3,154.0	3,106.4	3,104.9	3,108.1	3,129.2	3,224.4	3,231.3	2,696.8	1,898.6	1,960.3	1,975.2	1,965.3	1,653.0	1,424.1	1,423.7	-	-	-	-
..Natural gas - IC	349.4	349.4	350.6	344.4	161.6	180.1	128.0	134.3	121.8	121.8	128.8	135.9	135.9	135.3	135.1	-	-	-	-
..Natural gas - ST	2,027.3	2,040.4	1,776.5	1,915.0	2,060.0	2,060.0	1,857.0	2,203.5	2,443.5	2,549.4	2,838.5	2,809.0	2,809.0	2,866.0	2,866.0	-	-	-	-
Nuclear	3,318.0	3,318.0	3,318.0	3,318.0	3,318.0	3,318.0	3,318.0	3,193.0	3,193.0	3,154.0	3,154.0	3,154.0	3,154.0	3,175.0	3,191.0	3,191.0	4,006.0	3,982.0	
Other gas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Petroleum	420.7	420.7	435.9	441.9	440.1	467.0	475.0	519.6	514.6	518.9	544.1	567.4	568.4	611.8	610.3	616.0	1,397.0	1,647.0	
..Petroleum - GT	214.3	214.3	231.7	231.7	262.7	262.7	300.2	312.2	312.2	314.5	314.5	314.8	319.5	340.0	338.7	-	-	-	-
..Petroleum - IC	206.4	206.4	204.2	210.2	208.4	204.3	212.3	219.4	202.4	204.4	229.6	249.0	248.9	271.8	271.6	-	-	-	-
Pumped storage	2,185.6	2,143.8	2,235.0	2,232.0	2,152.0	2,134.0	2,103.0	1,964.0	1,872.0	1,872.0	1,871.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	
Solar	61.8	62.8	62.5	62.5	62.5	62.5	12.5	2.0	-	-	-	-	-	-	-	-	-	-	-
..Solar- PV	61.8	62.8	62.5	62.5	62.5	62.5	12.5	2.0	-	-	-	-	-	-	-	-	-	-	-
Wind	1,866.7	1,793.9	1,260.4	941.8	704.6	495.9	487.9	442.6	442.6	343.6	313.2	102.0	-	-	-	-	-	-	-
..Wind - Onshore	1,866.7	1,793.9	1,260.4	941.8	704.6	495.9	487.9	442.6	442.6	343.6	313.2	102.0	-	-	-	-	-	-	-
IPP, commercial and industrial	8,066.9	7,399.7	7,247.4	7,016.4	7,035.3	7,009.4	6,721.9	6,675.6	8,175.4	7,980.7	7,815.0	7,500.5	8,186.1	8,543.4	8,527.9	8,411.0	7,456.0	7,393.0	
Coal	65.8	65.8	65.8	65.8	65.8	65.8	67.8	93.8	100.6	161.1	324.4	313.4	313.4	362.3	377.5	378.0	325.0	349.0	
Hydroelectric	17.9	17.9	17.9	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.7	28.1	28.1	28.1	28.1	28.0	28.0	28.0	
Natural gas	5,155.6	4,035.7	4,030.7	4,042.8	4,022.4	4,027.0	4,010.0	3,971.0	5,814.6	5,770.7	5,586.8	5,564.5	6,409.0	6,754.5	6,764.8	6,774.0	6,628.0	6,618.0	
..Natural gas - CC	4,250.0	3,153.0	3,153.0	3,145.3	3,123.7	3,126.7	3,111.3	3,111.3	3,670.4	3,670.7	4,230.7	4,209.4	4,738.9	4,729.4	4,889.7	-	-	-	-
..Natural gas - GT	742.0	742.0	742.0	744.8	744.8	746.4	733.6	731.7	1,658.2	1,654.1	1,344.1	1,348.6	1,663.6	2,018.6	1,868.6	-	-	-	-
..Natural gas - IC	37.2	9.0	4.0	4.0	4.0	4.0	4.0	4.0	0.8	0.8	0.8	-	-	-	-	-	-	-	-
..Natural gas - ST	126.4	131.7	131.7	148.7	149.9	149.9	145.7	124.0	485.2	445.1	11.2	6.5	6.5	6.5	6.5	-	-	-	-
Nuclear	-	795.8	768.5	771.6	804.2	801.8	787.4	783.5	789.0	775.1	782.2	803.4	793.0	778.0	778.0	778.0	-	-	-
Other	3.8	-	-	-	-	-	-	0.9	-	-	-	-	-	7.6	-	8.0	-	-	-
Other biomass	168.4	162.0	170.0	166.0	224.0	221.1	222.5	222.5	215.5	198.8	195.7	182.9	175.9	168.0	168.8	156.0	149.0	157.0	
Other gas	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	12.0	5.0	
Petroleum	66.3	70.1	70.1	70.1	70.6	70.6	70.6	70.6	70.6	70.6	72.0	72.0	72.0	72.0	56.8	57.0	102.0	27.0	
..Petroleum - GT	-	-	-	-	-	-	-	-	-	-	1.4	1.4	1.4	1.4	1.4	-	-	-	-
..Petroleum - IC	19.1	22.9	22.9	22.9	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	-	-	-	-
..Petroleum - ST	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	32.0	-	-	-	-
Solar	645.9	290.5	162.5	39.5	35.7	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-
..Solar- PV	645.9	290.5	162.5	39.5	35.7	10.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Wind	1,372.3	1,373.9	1,373.9	1,243.9	1,195.9	1,195.9	946.9	917.5	917.5	736.7	561.6	272.6	162.6	142.6	123.6	2.0	2.0	1.0	
..Wind - Onshore	1,372.3	1,373.9	1,373.9	1,243.9	1,195.9	1,195.9	-	-	-	-	-	-	-	-	-	-	-	-	-
Wood	320.9	338.0	338.0	338.0	338.0	338.0	338.0	338.0	238.0	239.0	263.6	263.6	232.1	230.3	230.3	231.0	210.0	210.0	
Total electric industry	30,538.0	30,140.7	29,602.8	29,456.9	29,720.0	29,634.7	29,083.1	30,062.5	30,434.9	30,128.2	30,330.8	29,901.9	29,825.3	30,302.3	30,413.0	30,305.0	30,189.0	30,422.0	
Battery	1.3	1.3	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Coal	6,291.1	8,034.9	8,329.3	8,590.3	9,190.4	9,216.7	9,414.2	10,837.5	10,948.4	10,946.5	11,261.8	11,346.6	11,531.2	11,793.5	11,920.6	11,910.0	11,860.0	11,982.0	
Hydroelectric	264.1	263.5	264.4	273.4	269.9	266.9	263.0	330.9	333.1	331.4	236.0	237.8	236.7	251.1	250.0	249.0	257.0	253.0	
Natural gas	13,301.1	10,821.5	10,563.3	10,716.9	10,663.1	10,785.8	10,394.1	10,190.8	10,899.7	10,941.6	11,075.6	11,027.6	11,027.4	11,200.4	11,211.6	11,235.0	10,322.0	10,286.0	
..Natural gas - CC	6,864.8	4,442.6	4,453.6	4,451.9	4,413.6	4,421.0	4,294.5	4,296.5	4,291.6	4,210.1	4,777.0	4,762.3	4,759.4	4,749.9	4,911.7	-	-	-	-
..Natural gas - GT	3,896.0	3,848.4	3,846.9	3,852.9	3,874.0	3,970.8	3,964.9	3,428.5	3,556.8	3,614.4	3,319.3	3,313.9	3,316.6	3,442.7	3,292.3	-	-	-	-
..Natural gas - IC	386.6	358.4	354.6	348.4	165.6	184.1	132.0	138.3	122.6	122.6	129.6	135.9	135.9	135.3	135.1	-	-	-	-
..Natural gas - ST	2,153.7	2,172.1	1,908.2	2,063.7	2,209.9	2,209.9	2,002.7	2,327.5	2,928.7	2,994.5	2,849.7	2,815.5	2,815.5	2,872.5	2,872.5	-	-	-	-
Nuclear	3,318.0	4,113.8	4,086.5	4,089.6	4,122.2	4,119.8	4,105.4	3,976.5	3,982.0	3,929.1	3,936.2	3,957.4	3,947.0	3,953.0	3,969.0	3,969.0	4,006.0	3,982.0	
Other	3.8	-	-	-	-	-	-	0.9	-	-	-	-	-	7.6	-	8.0	-	-	-
Other biomass	168.4	162.0	170.0	166.0	224.0	221.1	222.5	222.5	215.5	198.8	195.7	182.9	175.9	168.0	168.8	156.0	149.0	157.0	
Other gas	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	12.0	5.0	
Petroleum	487.0	490.8	506.0	512.0	510.7	537.6	545.6	590.2	585.2	589.5	616.1	639.4	640.4	683.8	667.1	673.0	1,499.0	1,675.0	
..Petroleum - GT	214.3	214.3	231.7	231.7	262.7	262.7	300.2	312.2	314.5	315.9	319.8	320.9	341.4	340.1	-	-	-	-	-
..Petroleum - IC	225.5	229.3	227.1	233.1	231.8	227.7	235.7	242.8	225.8	227.8	253.0	272.4	272.3	295.2	295.0	-	-	-	-
..Petroleum - ST	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	47.2	32.0	-	-	-	-
Pumped storage	2,185.6	2,143.8	2,235.0	2,232.0	2,152.0	2,134.0	2,103.0	1,964.0	1,872.0	1,872.0	1,871.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	
Solar	707.7	353.3	225.0	102.0	98.2	73.0	12.5	2.0	-	-	-	-	-	-	-	-	-	-	-
..Solar- PV	707.7	353.3	225.0	102.0	98.2	73.0	12.5	2.0	-	-	-	-	-	-	-	-	-	-	-
Wind	3,239.0	3,167.8	2,634.3	2,185.7	1,900.5	1,691.8	1,434.8	1,360.1	1,360.1	1,080.3	874.8	374.6	162.6	142.6	123.6	2.0	2.0	1.0	
..Wind - Onshore	3,239.0	3,167.8	2,634.3	2,185.7	1,900.5	1,691.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Wood	320.9	338.0	338.0	338.0	338.0	338.0	338.0	338.0	238.0	239.0	263.6	263.6	232.1	230.3	230.3	231.0	210.0	210.0	

Year 2004	Year 2003	Year 2002	Year 2001	Year 2000	Year 1999	Year 1998	Year 1997	Year 1996	Year 1995	Year 1994	Year 1993	Year 1992	Year 1991	Year 1990	Percent share 2000	Percent share 2010	Percent share 2020	Percent share 2022
23,310.0	23,345.0	23,575.0	22,833.0	22,757.0	22,378.0	21,948.0	21,916.0	21,990.0	21,986.0	22,396.0	22,395.0	22,347.0	22,258.0	22,298.0	88.3	72.6	75.5	73.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0
11,623.0	11,636.0	11,627.0	11,638.0	11,636.0	11,574.0	11,840.0	11,796.0	11,794.0	11,795.0	11,908.0	11,909.0	11,909.0	11,940.0	11,912.0	45.1	37.6	27.9	20.4
217.0	218.0	231.0	229.0	239.0	243.0	260.0	267.0	265.0	330.0	330.0	330.0	330.0	330.0	333.0	0.9	0.7	0.8	0.8
3,982.0	3,964.0	4,253.0	3,302.0	3,245.0	2,131.0	1,440.0	1,435.0	1,437.0	1,435.0	800.0	800.0	800.0	727.0	703.0	12.6	15.5	22.1	26.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	4.4	8.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.5	10.5	10.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	1.2	1.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	6.0	6.6
3,971.0	3,971.0	3,938.0	3,931.0	3,930.0	3,921.0	3,918.0	3,922.0	3,987.0	3,989.0	3,967.0	3,967.0	3,967.0	3,942.0	4,007.0	15.2	10.6	11.2	10.9
-	-	-	-	-	-	-	-	-	-	272.0	272.0	265.0	265.0	-	-	-	-	-
1,646.0	1,685.0	1,654.0	1,860.0	1,834.0	2,636.0	2,635.0	2,630.0	2,634.0	2,632.0	3,246.0	3,246.0	3,204.0	3,182.0	3,471.0	7.1	1.9	1.5	1.4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	0.8	0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	0.7	0.7
1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	7.3	6.3	7.5	7.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2
-	-	-	-	-	1.0	1.0	1.0	-	-	-	-	-	-	-	-	0.0	4.3	6.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	6.1
7,078.0	7,103.0	6,056.0	4,054.0	3,028.0	3,003.0	2,673.0	2,950.0	2,936.0	2,925.0	2,777.0	2,756.0	2,712.0	2,629.0	2,690.0	11.7	27.4	24.5	26.4
354.0	354.0	354.0	291.0	329.0	362.0	357.0	636.0	661.0	654.0	654.0	643.0	637.0	610.0	677.0	1.3	1.1	0.2	0.2
27.0	27.0	27.0	27.0	28.0	26.0	26.0	26.0	26.0	26.0	26.0	27.0	27.0	20.0	27.0	0.1	0.1	0.1	0.1
6,315.0	6,302.0	5,238.0	2,776.0	2,192.0	2,198.0	1,871.0	1,861.0	1,844.0	1,841.0	1,739.0	1,739.0	1,742.0	1,760.0	1,755.0	8.5	21.5	13.6	16.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.9	10.7	13.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	2.5	2.4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.4	0.4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	2.6	-
-	-	-	494.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
157.0	158.0	176.0	166.0	182.0	148.0	153.0	141.0	141.0	122.0	113.0	103.0	99.0	88.0	85.0	0.7	0.6	0.6	0.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	0.8
15.0	52.0	50.0	11.0	13.0	11.0	8.0	2.0	6.0	2.0	2.0	2.0	3.0	5.0	0.0	0.1	0.2	0.2	0.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	0.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2	0.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	2.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	2.1
1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	-	-	-	0.5	4.6	4.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	4.5
210.0	210.0	211.0	288.0	284.0	258.0	258.0	284.0	258.0	279.0	243.0	243.0	206.0	147.0	147.0	1.1	0.8	1.1	1.1
30,388.0	30,449.0	29,631.0	26,887.0	25,785.0	25,381.0	24,621.0	24,866.0	24,926.0	24,911.0	25,173.0	25,151.0	25,059.0	24,887.0	24,988.0	100.0	100.0	100.0	100.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0
11,976.0	11,989.0	11,981.0	11,929.0	11,965.0	11,936.0	12,197.0	12,432.0	12,455.0	12,449.0	12,563.0	12,552.0	12,545.0	12,551.0	12,588.0	46.4	38.7	28.1	20.6
245.0	245.0	258.0	256.0	267.0	269.0	269.0	286.0	293.0	291.0	356.0	356.0	356.0	349.0	360.0	1.0	0.8	0.9	0.9
10,296.0	10,266.0	9,491.0	6,078.0	5,437.0	4,329.0	3,311.0	3,296.0	3,281.0	3,275.0	2,539.0	2,539.0	2,543.0	2,487.0	2,458.0	21.1	37.0	35.7	43.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.0	15.0	22.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.1	13.0	12.8
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5	1.2	1.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.4	6.4	7.1
3,971.0	3,971.0	3,938.0	3,931.0	3,930.0	3,921.0	3,918.0	3,922.0	3,987.0	3,989.0	3,967.0	3,967.0	3,967.0	3,942.0	4,007.0	15.2	13.2	13.8	10.9
-	-	-	494.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
157.0	158.0	176.0	166.0	182.0	148.0	153.0	141.0	141.0	122.0	113.0	103.0	99.0	88.0	85.0	0.7	0.6	0.6	0.6
-	-	-	-	-	-	-	-	-	-	272.0	272.0	265.0	265.0	-	-	-	0.8	0.8
1,660.0	1,737.0	1,704.0	1,872.0	1,847.0	2,648.0	2,643.0	2,633.0	2,640.0	2,634.0	3,249.0	3,249.0	3,207.0	3,187.0	3,472.0	7.2	2.1	1.7	1.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	0.8	0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9	0.8	0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2	0.2
1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	1,872.0	7.3	6.3	7.5	7.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	2.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	2.3
1.0	1.0	1.0	1.0	1.0	1.0	1.0	-	-	-	-	-	-	-	-	-	0.0	0.5	8.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.9	10.6
210.0	210.0	211.0	288.0	284.0	258.0	258.0	284.0	258.0	279.0	243.0	243.0	206.0	147.0	147.0	1.1	0.8	1.1	1.1

Table 5. Electric power industry generation by primary energy source, 1990 through 2022

Michigan

megawatts	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007	Year 2006	Year 2005
Electric utilities	81,577,914	81,451,708	69,820,694	78,881,966	81,450,131	79,938,707	78,006,408	85,370,227	84,075,322	83,171,310	80,474,999	87,609,471	89,666,874	82,787,341	94,503,953	96,785,842	97,373,706	104,830,689
Battery	-57	-83	-	-79	-24	-3	-	-	-	-	-	-	-	-	-	-	-	-
Coal	34,117,671	36,710,359	27,588,907	36,942,257	41,830,492	41,530,832	39,988,445	52,296,557	52,275,272	55,616,170	52,470,940	58,182,906	64,766,712	65,867,455	68,421,489	69,406,550	66,654,737	69,158,736
Hydroelectric	1,318,287	1,262,346	1,614,106	1,525,746	1,440,799	1,540,019	1,432,762	1,386,571	1,467,606	1,292,863	1,102,691	1,230,678	1,142,977	1,234,066	1,247,663	1,146,788	1,381,242	1,355,963
Natural gas	17,154,284	11,771,750	13,147,485	11,750,643	10,492,640	8,250,504	10,049,701	6,320,409	3,325,070	2,657,548	4,400,766	2,688,135	1,173,481	563,510	784,967	1,079,596	982,534	1,717,091
..Natural gas - CC	12,306,937	6,683,175	6,906,242	7,359,746	6,279,003	5,780,593	6,347,543	4,818,918	2,321,357	1,210,791	2,545,517	1,662,900	4,445	1,322	1,454	1,322	-	-
..Natural gas - GT	3,334,619	3,166,924	4,278,168	2,512,407	3,256,011	1,741,575	3,046,724	1,132,733	601,163	942,292	874,312	423,897	339,065	179,543	158,634	-	-	-
..Natural gas - IC	901,826	964,748	933,140	796,233	83,608	31,361	13,114	3,351	447	2,108	4,114	3,538	2,245	514	1,729	-	-	-
..Natural gas - ST	610,903	956,903	1,029,935	1,082,256	874,018	696,976	642,320	365,407	402,103	502,357	976,823	597,799	827,726	382,000	623,283	-	-	-
Nuclear	23,283,131	27,323,520	24,337,423	26,044,108	25,022,754	26,283,696	24,506,529	23,015,266	25,422,922	22,879,127	22,841,501	26,248,447	23,383,919	15,732,299	24,649,692	25,690,938	29,066,165	32,871,574
Other	0	0	0	0	0	0	11,051	31,920	32,156	14,117	24,546	25,634	27,165	31,676	33,777	40,131	37,278	45,003
Other biomass	-	-	-	-	-	-	-	-	0	-	0	0	0	11	63	54	-	-
Other gas	-	11,678	45,232	153,596	151,018	148,559	144,627	178,326	91,997	68,492	-	-	-	-	105,130	18,854	0	-
Petroleum	1,400,737	994,737	767,319	762,664	1,095,421	960,399	668,813	834,048	323,561	133,951	173,662	195,180	215,189	281,604	445,915	272,106	788,563	-
..Petroleum - GT	1,924	5,027	790	-295	10,777	5,516	8,897	2,508	1,638	674	1,790	5,528	6,010	7,447	7,669	-	-	-
..Petroleum - IC	5,525	9,238	2,957	3,114	1,033	2,386	1,046	-2,420	148	58	4,025	4,575	-12,940	5,777	104	-	-	-
..Petroleum - ST	1,393,287	980,473	763,572	759,845	1,083,611	952,496	658,870	645,724	832,262	322,829	128,137	163,560	202,109	201,965	273,831	-	-	-
Pumped storage	-868,131	-715,146	-845,480	-698,488	-698,455	-674,759	-751,650	-480,821	-700,889	-870,822	-773,280	-945,017	-1,022,559	-856,864	-915,502	-1,129,241	-1,039,210	-1,106,241
Solar	77,910	85,312	89,007	86,608	86,796	62,992	9,235	1,190	-	-	-	-	-	-	-	-	-	-
..Solar - PV	77,910	85,312	89,007	86,608	86,796	62,992	9,235	1,190	-	-	-	-	-	-	-	-	-	-
Wind	5,094,082	4,007,235	3,076,774	2,312,849	2,028,669	1,836,465	1,946,895	1,974,993	1,327,129	1,190,254	273,884	2,818	-	-	-	-	-	-
..Wind - Onshore	5,094,082	4,007,235	3,076,774	2,312,849	2,028,669	1,836,465	-	-	-	-	-	-	-	-	-	-	-	-
Wood	-	-	-	0	0	0	0	4	11	0	0	2,208	-	-	-	-	-	-
IPP, commercial and industrial	35,919,138	34,061,422	36,804,027	37,819,529	34,386,963	32,374,793	34,115,382	27,637,823	22,741,669	22,246,490	27,683,051	21,560,036	21,884,497	18,415,264	20,485,853	22,524,095	15,183,032	16,789,082
Coal	364,516	343,544	372,123	399,232	500,372	489,716	538,427	587,475	624,573	675,283	665,492	765,363	837,663	980,229	1,433,947	1,404,048	1,125,424	1,164,240
Hydroelectric	67,637	77,418	99,235	124,043	128,400	138,938	131,593	112,652	132,416	126,186	104,135	126,630	107,576	137,860	116,515	123,221	139,111	105,745
Natural gas	24,029,500	18,740,968	23,286,354	22,678,883	20,494,251	17,880,154	19,245,452	13,724,388	9,197,767	9,683,844	17,347,592	10,293,919	11,075,781	7,856,040	8,817,609	12,061,388	10,427,421	12,046,801
..Natural gas - CC	19,411,127	14,632,505	18,102,075	17,620,212	16,107,488	14,002,035	15,022,766	10,644,941	6,878,399	7,521,940	16,060,408	9,650,771	10,091,487	7,307,601	8,183,459	-	-	-
..Natural gas - GT	3,622,802	3,085,076	3,949,196	4,107,624	3,651,605	3,185,597	3,592,612	2,567,327	1,941,091	1,723,860	1,011,172	489,175	860,768	460,258	562,408	-	-	-
..Natural gas - IC	50,543	13,195	8,196	9,875	10,002	10,650	11,326	715	1,191	1,806	356	212	137	323	-	-	-	-
..Natural gas - ST	945,027	1,010,193	1,226,893	942,472	725,171	682,520	619,425	500,794	377,561	436,853	274,207	153,617	117,315	88,044	70,879	-	-	-
Nuclear	2,730,230	7,014,799	5,995,123	6,865,167	5,455,940	6,097,496	7,045,181	6,318,520	5,822,926	6,041,696	5,178,213	6,641,020	6,240,661	6,118,710	6,834,736	5,826,015	-	-
Other	147,050	143,091	135,400	173,126	252,315	259,533	290,594	372,882	371,645	298,258	370,117	337,522	304,511	312,862	252,165	262,835	525,244	516,585
Other biomass	784,317	907,355	982,225	915,104	957,467	985,855	972,596	1,038,263	1,055,106	987,688	956,227	827,244	802,376	834,001	739,474	721,767	736,823	716,561
Other gas	1,329,565	1,190,076	923,417	1,542,941	1,446,619	1,503,607	1,469,995	1,034,452	1,027,849	888,173	314,755	269,175	299,005	202,510	264,407	177,284	393,493	372,119
Petroleum	154,150	154,785	166,353	152,524	118,091	156,112	150,166	180,681	217,282	208,920	191,192	169,107	186,849	184,060	175,935	252,610	129,781	88,996
..Petroleum - GT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	-	-	-
..Petroleum - IC	67	85	77	215	65	67	127	123	142	109	302	179	287	217	195	-	-	-
..Petroleum - OTH	356	2,234	1,319	126	344	27	0	51	110	0	0	936	30	85	0	-	-	-
..Petroleum - ST	153,727	152,465	164,956	152,194	117,682	156,018	150,039	180,506	217,030	208,811	190,890	167,992	186,532	183,758	175,733	-	-	-
Solar	781,469	338,493	66,161	56,353	31,357	312	-	-	-	-	-	-	-	-	-	-	-	-
..Solar - PV	781,469	338,493	66,161	56,353	31,357	312	-	-	-	-	-	-	-	-	-	-	-	-
Wind	4,057,097	3,689,652	3,658,318	3,512,856	3,428,583	3,354,808	2,748,888	2,821,905	2,540,989	1,609,370	857,804	453,656	360,340	300,172	141,182	2,723	2,212	1,848
..Wind - Onshore	4,057,097	3,689,652	3,658,318	3,512,856	3,428,583	3,354,808	-	-	-	-	-	-	-	-	-	-	-	-
Wood	1,473,609	1,461,241	1,119,318	1,399,299	1,573,568	1,508,262	1,522,489	1,446,608	1,751,118	1,727,072	1,697,524	1,676,399	1,669,736	1,489,001	1,710,423	1,692,202	1,703,524	1,775,914
Total electric industry	117,497,052	115,513,130	106,624,721	116,701,488	115,837,095	112,313,501	112,121,790	113,008,050	106,816,991	105,417,801	108,158,050	109,169,507	111,551,371	101,202,605	114,989,806	119,309,936	112,556,739	121,619,771
Battery	-57	-83	-79	-24	-3	-	-	-	-	-	-	-	-	-	-	-	-	-
Coal	34,482,187	37,053,903	27,961,029	37,341,489	42,330,864	42,020,548	40,526,872	52										

Year 2004	Year 2003	Year 2002	Year 2001	Year 2000	Year 1999	Year 1998	Year 1997	Year 1996	Year 1995	Year 1994	Year 1993	Year 1992	Year 1991	Year 1990	Percent share 2000	Percent share 2010	Percent share 2020	Percent share 2022
99,608,512	96,634,055	100,451,718	97,067,330	89,572,141	87,874,695	85,146,307	89,564,616	95,155,261	92,478,772	83,720,636	92,250,107	82,679,444	94,567,383	89,058,681	86.0	80.4	65.5	69.4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0
67,253,690	66,448,916	65,389,899	66,931,691	66,980,252	69,118,017	69,142,807	65,552,021	66,097,259	65,425,002	67,538,611	61,558,991	61,434,530	65,138,291	65,295,742	64.3	58.1	25.9	29.0
1,420,178	1,242,987	1,557,942	1,450,093	1,328,083	1,367,296	1,282,471	1,592,707	1,660,109	1,486,539	1,536,190	1,639,359	1,647,175	1,651,742	1,492,822	1.3	1.0	1.5	1.1
735,011	1,098,627	2,336,031	2,362,038	2,441,140	2,448,449	2,152,055	838,412	737,006	1,163,390	656,757	680,194	1,021,751	998,058	665,142	2.3	1.1	12.3	14.6
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	6.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	4.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	1.0
30,561,961	27,953,563	31,087,454	26,710,782	18,882,432	14,590,711	12,494,153	21,913,808	26,829,363	24,448,397	14,144,281	28,525,000	18,848,731	27,021,214	21,610,500	18.1	21.0	22.8	19.8
34,693	23,361	25,185	15,250	-	0	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
1,082	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
714,881	883,847	1,090,767	724,313	993,932	1,282,696	1,005,170	602,053	651,860	687,264	655,860	619,777	498,159	553,863	689,461	1.0	0.2	0.7	1.2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.7	1.2
-1,112,984	-1,017,246	-1,035,560	-1,126,837	-1,053,698	-932,474	-930,349	-934,385	-820,336	-731,820	-811,063	-773,214	-770,902	-795,785	-694,986	-1.0	-0.9	-0.8	-0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1
-	-	-	-	0	0	0	-	-	-	-	-	-	-	-	-	0.0	-	2.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3
18,878,757	14,713,005	17,437,370	14,778,282	14,637,455	15,365,020	15,331,086	17,406,144	17,363,047	14,965,841	14,586,751	14,118,445	12,642,494	11,410,740	11,001,054	14.0	19.6	34.5	30.6
1,352,329	1,328,567	1,309,609	1,331,477	1,286,747	1,286,976	1,329,849	1,892,829	1,774,893	1,775,644	2,233,003	2,400,090	1,912,171	1,739,932	1,771,127	1.2	0.8	0.3	0.3
119,406	142,836	111,310	111,825	99,596	91,037	114,646	119,758	123,421	110,648	124,078	122,483	135,096	99,926	135,096	0.1	0.1	0.1	0.1
13,812,692	10,275,917	13,517,387	10,811,475	10,166,125	11,065,307	10,933,126	12,549,899	12,277,609	10,411,464	9,779,791	9,340,020	8,506,888	7,501,019	7,172,814	9.8	9.9	21.8	20.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	17.0	16.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	3.7	3.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	1.2	0.8
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6	5.6	2.3
256,688	285,751	256,232	130,653	64,276	90,414	62,903	41,037	31,390	25,394	23,986	47,857	32,283	28,222	-	0.1	0.3	0.1	0.1
689,936	727,314	745,124	661,120	1,034,570	888,984	958,814	918,717	891,240	671,429	534,523	476,658	329,409	504,978	310,842	1.0	0.7	0.9	0.7
597,665	2,193	10,108	5,614	-	-	-	579	238,393	582	595	898	243,754	217,824	340,949	-	0.3	0.9	1.1
181,528	180,046	12,718	25,577	195,332	201,810	171,785	155,980	180,913	168,838	173,702	144,271	130,608	104,709	172,263	0.2	0.2	0.2	0.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.2	0.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.7
1,875	2,660	329	280	-	-	-	-	-	-	-	-	-	-	-	-	0.3	3.4	3.5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	3.5
1,866,638	1,767,721	1,474,552	1,700,261	1,790,809	1,740,491	1,759,962	1,727,344	1,845,188	1,801,843	1,717,073	1,586,167	1,352,286	1,214,131	1,097,962	1.7	1.5	1.0	1.3
118,487,269	111,347,060	117,889,087	111,845,612	104,209,597	103,239,715	100,477,393	106,970,760	112,518,309	107,444,613	98,307,387	106,368,552	95,321,938	105,978,123	100,059,735	100.0	100.0	100.0	100.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0
68,606,019	67,777,483	66,699,508	68,263,168	68,266,999	70,404,993	70,472,656	67,444,850	67,872,152	67,200,646	69,771,614	63,959,081	63,346,701	66,878,223	67,066,869	65.5	58.8	26.2	29.3
1,539,584	1,385,823	1,669,252	1,561,918	1,427,679	1,458,333	1,397,117	1,712,465	1,783,530	1,597,187	1,660,268	1,761,842	1,782,271	1,751,668	1,627,918	1.4	1.1	1.6	1.2
14,547,703	11,374,544	15,853,418	13,173,513	12,607,265	13,513,756	13,085,181	13,388,311	13,014,615	11,574,854	10,436,548	10,020,214	9,528,639	8,499,077	7,837,956	12.1	11.0	34.2	35.1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	23.5	27.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	7.7	5.9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.9	0.8
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8	2.1	1.3
30,561,961	27,953,563	31,087,454	26,710,782	18,882,432	14,590,711	12,494,153	21,913,808	26,829,363	24,448,397	14,144,281	28,525,000	18,848,731	27,021,214	21,610,500	18.1	26.6	28.4	22.1
291,381	309,112	281,417	145,903	64,276	90,414	62,903	41,037	31,390	25,394	23,986	47,857	32,283	28,222	-	0.1	0.3	0.1	0.1
689,936	727,314	745,124	661,120	1,034,570	888,984	958,814	918,717	891,240	671,429	534,523	476,658	329,409	504,978	310,842	1.0	0.7	0.9	0.7
598,747	2,193	10,108	5,614	-	-	-	579	238,393	582	595	898	243,754	217,824	340,949	-	0.3	0.9	1.1
896,409	1,063,893	1,103,485	749,890	1,189,264	1,484,506	1,176,955	758,033	832,773	856,102	829,562	764,048	628,767	658,572	861,724	1.1	0.3	0.9	1.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0	0.0
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.9	1.3
-1,112,984	-1,017,246	-1,035,560	-1,126,837	-1,053,698	-932,474	-930,349	-934,385	-820,336	-731,820	-811,063	-773,214	-770,902	-795,785	-694,986	-1.0	-0.9	-0.8	-0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.7
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.7
1,875	2,660	329	280	0	0	0	-	-	-	-	-	-	-	-	-	0.0	0.3	6.3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.3	7.8
1,866,638	1,767,721	1,474,552	1,700,261	1,790,809	1,740,491	1,759,962	1,727,344	1,845,188	1,801,843	1,717,073	1,586,167	1,352,286	1,214,131	1,097,962	1.7	1.5	1.0	1.3

Table 6. Electric power delivered fuel prices and quality for coal, petroleum, natural gas, 1990 through 2022

Michigan

	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014
Coal (dollars per million Btu)	2.39	2.07	2.05	2.11	2.14	2.19	2.26	2.40	2.62
Average heat value (Btu per pound)	9,427	9,465	9,496	9,379	9,343	9,303	9,419	9,412	9,528
Average sulfur content (percent)	0.53	0.56	0.57	0.50	0.48	0.47	0.55	0.49	0.52
Petroleum (dollars per million Btu)	2.43	2.44	2.04	2.81	2.31	2.16	2.41	3.03	3.44
Average heat value (Btu per gallon)	131,743	131,434	130,623	132,606	130,524	128,654	129,371	128,482	132,396
Average sulfur content (percent)	5.57	5.53	5.50	5.53	5.61	5.58	5.72	5.62	4.77
Natural gas (dollars per million Btu)	6.52	4.01	2.07	2.63	3.27	3.21	2.75	3.16	6.51
Average heat value (Btu per cubic foot)	1,049	1,052	1,052	1,055	1,045	1,035	1,034	1,027	1,023

Petroleum includes petroleum liquids and petroleum coke.

Note: Due to different reporting requirements between the Form EIA-923 and historical FERC Form 423, the receipts data from 2008 and on are not directly comparable to prior years. There may be a notable ir

Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007	Year 2006	Year 2005	Year 2004	Year 2003	Year 2002	Year 2001
2.68	2.79	2.68	2.12	2.07	1.97	1.72	1.68	1.58	1.39	1.34	1.32	1.27
9,387	9,513	9,731	9,753	9,751	9,902	9,920	9,975	10,021	9,967	10,123	10,255	10,235
0.46	0.52	0.57	0.57	0.49	0.54	0.54	0.56	0.56	0.53	0.57	0.57	0.57
6.67	13.17	8.28	5.90	5.31	10.57	8.15	7.96	6.91	4.75	4.13	2.74	3.98
132,355	138,138	134,962	135,158	138,974	138,423	144,798	144,829	145,714	146,540	146,845	144,917	148,810
5.64	5.03	4.05	4.04	3.38	3.28	1.84	1.74	1.74	1.45	1.67	1.88	1.37
4.48	3.18	4.70	4.92	4.53	8.61	6.56	6.01	5.56	4.36	3.86	3.52	3.83
1,020	1,016	1,014	1,014	1,015	1,013	1,014	1,009	1,013	1,018	1,015	1,007	990

increase in fuel receipts beginning with 2008. For more information, please see the Technical Notes in the Electric Power Annual.

Year 2000	Year 1999	Year 1998	Year 1997	Year 1996	Year 1995	Year 1994	Year 1993	Year 1992	Year 1991	Year 1990
1.30	1.31	1.33	1.37	1.40	1.45	1.51	1.53	1.56	1.59	1.60
10,425	10,487	10,563	10,566	10,504	10,677	10,925	10,853	10,995	11,052	11,131
0.59	0.62	0.67	0.67	0.63	0.63	0.68	0.68	0.69	0.70	0.70
3.68	2.57	2.41	3.09	3.13	2.88	2.93	3.06	2.97	2.86	3.20
136,583	136,595	130,455	135,205	138,114	146,081	145,440	147,226	147,079	146,467	146,012
1.49	1.44	1.56	1.32	1.15	0.81	0.74	0.72	0.73	0.70	0.72
3.90	2.52	2.32	2.56	2.69	2.00	2.40	2.42	1.95	1.96	2.11
710	608	542	310	274	365	403	379	414	389	224

Table 7. Electric power industry emissions estimates, 1990 through 2022

Michigan

Emission type	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014
Sulfur dioxide (short tons)									
Coal	43,019	53,193	34,075	51,156	66,017	65,244	84,667	135,577	156,939
Natural gas	368	329	422	307	285	304	254	134	104
Other	6,390	6,728	6,609	7,359	7,417	8,120	7,385	7,316	7,667
Petroleum	4,001	4,051	3,725	23,088	8,202	9,998	9,644	7,579	8,809
Total	53,778	64,301	44,831	81,910	81,921	83,666	101,950	150,606	173,519
Nitrogen oxide (short tons)									
Coal	19,566	23,849	16,346	23,269	31,350	31,168	32,408	44,293	52,728
Natural gas	20,818	20,695	33,729	19,838	11,633	9,340	10,617	7,682	7,798
Other	11,707	11,833	13,193	12,207	13,119	13,657	13,653	14,484	14,701
Petroleum	1,695	1,907	1,172	1,213	1,300	1,339	1,141	1,236	1,929
Total	53,786	58,284	64,440	56,527	57,402	55,504	57,819	67,695	77,156
Carbon dioxide (thousand metric tons)									
Coal	36,426	37,095	28,760	37,865	43,155	42,524	41,425	54,415	54,456
Natural gas	19,439	15,760	22,511	17,419	15,968	13,499	15,041	10,593	7,425
Other	233	227	203	320	578	617	690	701	681
Petroleum	2,412	1,963	1,709	1,628	1,734	1,775	1,488	1,411	1,701
Total	58,510	55,045	53,183	57,232	61,435	58,414	58,644	67,119	64,264
Total emission rate (lbs/MWh)									
Sulfur dioxide	0.9	1.1	0.8	1.4	1.4	1.5	1.8	2.7	3.2
Nitrogen oxide	0.9	1.0	1.2	1.0	1.0	1.0	1.0	1.2	1.4
Carbon dioxide	1,096	1,048	1,097	1,079	1,167	1,144	1,151	1,307	1,324

Source: Calculations made by the Electric Power Systems and Reliability Team; Office of Electricity, Renewables, and Uranium Statistics; U.S. Energy Information Administration.

Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007	Year 2006	Year 2005	Year 2004	Year 2003	Year 2002
200,702	203,862	230,553	252,711	294,301	362,918	358,465	346,823	362,690	354,593	369,039	358,670
96	140	64	71	48	24	47	32	31	35	28	35
7,893	7,950	8,395	7,910	6,996	6,172	6,112	6,388	6,382	6,386	6,378	8,907
28,397	25,022	20,403	19,098	16,583	13,950	24,934	6,684	28,171	25,957	26,455	25,947
237,088	236,974	259,415	279,790	317,928	383,064	389,508	359,912	397,265	386,930	401,785	393,513
62,657	63,718	70,387	79,144	82,646	107,692	108,816	106,182	114,271	116,307	126,560	134,922
5,830	8,474	5,040	4,943	3,890	4,831	5,462	5,040	5,745	5,050	6,228	17,264
14,920	14,088	12,502	11,348	11,748	12,213	12,560	13,126	12,641	12,765	12,366	13,159
1,848	2,814	2,436	2,523	2,324	2,173	3,939	1,475	4,470	4,189	3,997	3,732
85,255	89,094	90,365	97,958	100,608	126,909	129,473	124,658	136,048	136,977	147,710	167,605
58,267	55,291	61,137	66,569	67,345	70,823	71,516	68,456	70,913	68,971	66,103	65,258
7,134	10,973	6,669	6,454	4,789	5,275	6,919	7,212	7,488	7,613	6,004	8,306
631	725	699	612	651	578	559	559	548	555	592	584
1,160	887	797	845	803	791	1,234	490	908	1,433	1,494	1,078
67,193	67,877	69,301	74,480	73,589	77,468	80,228	76,718	79,856	78,572	74,192	75,225
4.5	4.4	4.8	5.0	6.3	6.7	6.5	6.4	6.5	6.5	7.2	6.7
1.6	1.6	1.7	1.8	2.0	2.2	2.2	2.2	2.2	2.3	2.7	2.8
1,402	1,381	1,397	1,469	1,600	1,482	1,479	1,500	1,445	1,459	1,466	1,404

Year 2001	Year 2000	Year 1999	Year 1998	Year 1997	Year 1996	Year 1995	Year 1994	Year 1993	Year 1992	Year 1991	Year 1990
370,730	396,468	406,682	453,444	439,598	409,709	388,720	425,868	392,676	374,114	405,484	400,043
35	31	31	34	41	39	36	35	33	28	31	30
6,886	8,282	8,008	6,800	6,539	6,317	5,650	4,569	4,971	5,002	4,689	4,476
28,399	23,543	27,181	25,915	20,669	22,188	24,068	16,517	14,407	11,402	15,781	17,348
406,006	428,323	441,905	486,196	466,848	438,252	418,478	446,989	412,086	390,546	425,983	421,898
149,430	166,900	184,280	215,592	190,508	185,874	164,027	333,094	325,794	308,452	327,211	325,650
18,942	16,874	18,834	18,964	21,133	20,265	21,076	13,493	11,761	11,645	11,287	11,681
11,621	12,360	11,547	11,576	11,327	11,788	10,623	4,163	3,892	3,191	2,845	2,647
3,957	4,243	6,264	7,534	4,109	4,200	4,069	2,297	2,050	1,779	1,866	2,366
182,584	200,376	220,927	253,678	227,081	222,119	199,795	353,048	343,496	325,067	343,210	342,342
69,374	68,743	70,221	71,428	67,418	67,704	66,146	67,614	62,561	61,525	65,335	65,193
7,540	7,822	8,713	8,559	8,247	8,141	7,292	6,011	5,812	5,830	5,417	5,278
252	526	527	475	503	463	389	387	395	387	373	263
798	1,767	2,010	1,672	1,240	1,352	1,347	1,220	1,007	866	899	1,022
77,964	78,857	81,471	82,135	77,409	77,660	75,173	75,232	69,775	68,609	72,024	71,755
7.3	8.2	8.6	9.7	8.7	7.8	7.8	9.1	7.7	8.2	8.0	8.4
3.3	3.8	4.3	5.0	4.2	3.9	3.7	7.2	6.5	6.8	6.5	6.8
1,534	1,665	1,736	1,798	1,592	1,518	1,539	1,684	1,443	1,583	1,495	1,578

Table 8. Sales to ultimate customers, revenue, and average price by sector, 1990 through 2022

Michigan

Sector	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016
Sales (megawatthours)							
Residential	35,034,971	35,868,100	35,862,912	33,495,725	35,131,422	32,977,374	34,543,262
Commercial	37,114,401	36,860,868	35,490,797	37,860,783	38,925,268	38,325,322	38,985,906
Industrial	28,485,570	27,081,082	25,654,081	29,886,432	30,806,023	30,590,574	30,934,422
Other	NA	NA	NA	NA	NA	NA	NA
Transportation	4,320	3,231	4,116	6,353	6,783	5,823	4,223
Total	100,639,262	99,813,281	97,011,906	101,249,293	104,869,496	101,899,093	104,467,813
Revenue (thousand dollars)							
Residential	6,255,971	6,289,783	5,831,461	5,273,119	5,426,835	5,078,011	5,258,083
Commercial	4,657,585	4,537,108	4,156,478	4,313,039	4,339,291	4,217,018	4,146,763
Industrial	2,372,266	2,082,727	1,858,134	2,114,082	2,187,188	2,200,758	2,137,716
Other	NA	NA	NA	NA	NA	NA	NA
Transportation	534	398	469	671	730	698	491
Total	13,286,355	12,910,015	11,846,542	11,700,911	11,954,044	11,496,486	11,543,053
Customers							
Residential	4,475,317	4,458,038	4,423,595	4,384,305	4,365,529	4,344,321	4,311,008
Commercial	554,487	550,701	546,115	544,690	543,261	542,959	538,677
Industrial	5,689	5,706	5,580	5,726	5,972	6,196	6,191
Other	NA	NA	NA	NA	NA	NA	NA
Transportation	2	2	2	2	2	2	1
Total	5,035,495	5,014,447	4,975,292	4,934,723	4,914,764	4,893,478	4,855,877
Average price to ultimate customers (cents/kWh)							
Residential	17.86	17.54	16.26	15.74	15.45	15.40	15.22
Commercial	12.55	12.31	11.71	11.39	11.15	11.00	10.64
Industrial	8.33	7.69	7.24	7.07	7.10	7.19	6.91
Other	NA	NA	NA	NA	NA	NA	NA
Transportation	12.35	12.30	11.39	10.56	10.76	11.99	11.63
Total	13.20	12.93	12.21	11.56	11.40	11.28	11.05

U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007	Year 2006	Year 2005
33,357,876	33,514,991	34,013,168	34,461,140	34,811,337	34,680,715	32,854,122	34,297,438	35,366,081	34,622,099	36,094,954
38,440,734	37,348,927	37,697,520	38,514,266	38,612,718	38,123,171	37,870,363	38,974,426	40,046,871	39,298,995	39,599,845
30,677,019	32,445,935	31,321,534	31,835,905	31,624,220	30,840,513	27,391,101	32,504,511	33,878,817	34,092,935	34,744,739
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,292	4,245	6,083	6,880	5,283	4,820	5,428	4,896	4,980	3,668	5,025
102,479,921	103,314,098	103,038,305	104,818,191	105,053,558	103,649,219	98,121,014	105,781,271	109,296,749	108,017,697	110,444,563
4,810,815	4,846,496	4,962,369	4,871,034	4,621,167	4,320,775	3,812,658	3,685,390	3,611,793	3,381,935	3,032,824
4,057,255	4,060,031	4,170,783	4,211,356	3,988,981	3,740,718	3,500,740	3,575,202	3,513,901	3,344,517	3,104,565
2,154,662	2,491,113	2,416,682	2,427,143	2,315,040	2,183,317	1,912,766	2,186,015	2,192,100	2,061,249	1,849,998
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
491	400	533	556	451	513	586	579	486	369	657
11,023,223	11,398,040	11,550,367	11,510,089	10,925,638	10,245,323	9,226,749	9,447,186	9,318,280	8,788,070	7,988,044
4,282,858	4,273,126	4,265,264	4,250,620	4,249,136	4,245,158	4,253,786	4,290,313	4,298,455	4,299,273	4,284,083
532,858	522,422	520,327	521,091	521,322	520,233	520,551	518,776	518,058	514,049	509,964
6,041	13,289	13,419	13,074	12,961	12,827	13,065	12,776	13,227	13,317	13,390
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1	2	1	1	1	1	1	1	1	1	1
4,821,758	4,808,839	4,799,011	4,784,786	4,783,420	4,778,219	4,787,403	4,821,866	4,829,741	4,826,640	4,807,438
14.42	14.46	14.59	14.13	13.27	12.46	11.60	10.75	10.21	9.77	8.40
10.55	10.87	11.06	10.93	10.33	9.81	9.24	9.17	8.77	8.51	7.84
7.02	7.68	7.72	7.62	7.32	7.08	6.98	6.73	6.47	6.05	5.32
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11.44	9.43	8.77	8.08	8.53	10.65	10.79	11.83	9.76	10.06	13.07
10.76	11.03	11.21	10.98	10.40	9.88	9.40	8.93	8.53	8.14	7.23

Year 2004	Year 2003	Year 2002	Year 2001	Year 2000	Year 1999	Year 1998	Year 1997	Year 1996	Year 1995	Year 1994
33,103,586	33,669,474	34,336,161	32,304,798	30,707,267	30,661,187	29,807,978	28,726,279	28,901,473	28,622,895	27,174,208
38,632,100	35,391,365	35,880,320	35,025,499	35,867,003	35,095,922	33,839,513	32,410,931	32,037,663	31,305,837	30,411,630
34,867,337	39,812,955	33,537,474	34,174,112	37,267,697	37,275,750	35,983,417	35,429,624	34,499,412	33,920,578	32,716,794
NA	NA	959,565	904,938	930,249	948,147	875,287	823,826	863,018	851,824	857,355
3,017	3,399	NA	NA	NA	NA	NA	NA	NA	NA	NA
106,606,040	108,877,193	104,713,520	102,409,347	104,772,216	103,981,006	100,506,195	97,390,660	96,301,566	94,701,134	91,159,987
2,758,552	2,813,077	2,844,554	2,667,172	2,617,706	2,676,360	2,584,189	2,461,915	2,448,299	2,387,301	2,249,213
2,925,172	2,671,529	2,794,428	2,640,082	2,832,471	2,755,186	2,641,974	2,539,696	2,543,091	2,462,154	2,410,662
1,716,747	1,975,944	1,684,308	1,737,746	1,898,271	1,873,483	1,809,150	1,760,605	1,750,987	1,738,782	1,716,262
NA	NA	100,088	93,912	100,192	96,410	93,997	89,653	93,570	91,230	90,379
238	279	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,400,709	7,460,829	7,423,378	7,138,912	7,448,640	7,401,439	7,129,310	6,851,869	6,835,947	6,679,467	6,466,516
4,248,920	4,216,573	4,188,117	4,147,897	4,099,153	4,058,091	4,024,218	3,975,175	3,914,312	3,867,468	3,817,961
504,754	483,168	471,509	465,622	461,175	450,754	440,794	432,196	423,876	417,807	410,810
14,322	14,224	13,442	13,805	13,670	13,531	13,214	13,137	13,186	13,085	12,560
NA	NA	9,410	9,002	9,856	11,873	8,421	7,721	16,814	17,771	16,442
1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,767,997	4,713,966	4,682,478	4,636,326	4,583,854	4,534,249	4,486,647	4,428,229	4,368,188	4,316,131	4,257,773
8.33	8.35	8.28	8.26	8.52	8.73	8.67	8.57	8.47	8.34	8.28
7.57	7.55	7.79	7.54	7.90	7.85	7.81	7.84	7.94	7.86	7.93
4.92	4.96	5.02	5.08	5.09	5.03	5.03	4.97	5.08	5.13	5.25
NA	NA	10.43	10.38	10.77	10.17	10.74	10.88	10.84	10.71	10.54
7.89	8.21	NA	NA	NA	NA	NA	NA	NA	NA	NA
6.94	6.85	7.09	6.97	7.11	7.12	7.09	7.04	7.10	7.05	7.09

Year 1993	Year 1992	Year 1991	Year 1990	Percent share 2000	Percent share 2010	Percent share 2020	Percent share 2022
26,770,174	25,670,669	26,759,510	25,318,849	29.3	33.5	37.0	34.8
28,930,387	21,208,468	21,454,734	20,609,561	34.2	36.8	36.6	36.9
30,571,544	35,656,772	35,006,636	35,062,022	35.6	29.8	26.4	28.3
1,316,497	1,304,316	1,297,663	1,376,437	0.9	0.0	0.0	0.0
NA	NA	NA	NA	0.0	0.0	0.0	0.0
87,588,602	83,840,225	84,518,543	82,366,869	100.0	100.0	100.0	100.0
2,184,506	2,081,705	2,157,926	1,982,483	35.1	42.2	49.2	47.1
2,319,009	1,755,746	1,756,557	1,678,553	38.0	36.5	35.1	35.1
1,632,454	2,103,854	2,061,464	2,051,268	25.5	21.3	15.7	17.9
120,411	121,257	118,905	137,348	1.3	0.0	0.0	0.0
NA	NA	NA	NA	0.0	0.0	0.0	0.0
6,256,380	6,062,562	6,094,852	5,849,652	100.0	100.0	100.0	100.0
3,781,048	3,745,401	3,715,552	3,661,732	89.4	88.8	88.9	88.9
404,806	397,213	392,114	384,526	10.1	10.9	11.0	11.0
12,397	14,513	14,367	14,653	0.3	0.3	0.1	0.1
17,506	18,128	17,684	17,310	0.2	0.0	0.0	0.0
NA	NA	NA	NA	0.0	0.0	0.0	0.0
4,215,757	4,175,255	4,139,717	4,078,221	100.0	100.0	100.0	100.0
8.16	8.11	8.06	7.83				
8.02	8.28	8.19	8.14				
5.34	5.90	5.89	5.85				
9.15	9.30	9.16	9.98				
NA	NA	NA	NA				
7.14	7.23	7.21	7.10				

Table 9. Sales to ultimate customers statistics, 2022

Michigan

Item	Full service providers					Other providers		Total
	Investor owned	Public	Federal	Cooperative	Non-utility	Energy	Delivery	
Number of entities	7	40	NA	10	2	10	5	
Number of customers	4,379,686	314,788	NA	335,375	3	5,643	NA	5,035,495
Retail (megawatthours)	79,668,552	7,358,821	NA	4,323,883	414,854	8,873,152	NA	100,639,262
Percentage of sales	79.2	7.3	NA	4.3	0.4	8.8	NA	100.0
Revenue from sales (thousand dollars)	10,997,439.4	869,138.8	NA	624,941.8	24,590.0	638,574.4	131,670.6	13,286,355.0
Percentage of revenue	82.8	6.5	NA	4.7	0.2	4.8	1.0	100.0
Average price to ultimate customers (cents/kWh)	13.80	11.81	NA	14.45	5.93	7.20	1.48	13.20

Notes: Data are shown for All Sectors. Full Service Providers sell bundled electricity services (e.g., both energy and delivery) to end users. Full Service Providers may purchase electricity from others (such as independent Power Producers or other full service providers) prior to delivery. Other Providers sell either the energy or the delivery services, but not both. Sales volumes and customer counts shown for Other Providers refer to delivered electricity, which is a joint activity of both energy and delivery providers; for clarity, they are reported only in the Energy column in this table. The revenue shown under Other Providers represents the revenue realized from the sale of the energy and the delivery services distinctly. "Public" entities include municipalities, State power agencies, and municipal marketing authorities. Federal entities are either owned or financed by the Federal Government. "Cooperatives" are electric utilities legally established to be owned by and operated for the benefit of those using its services. The cooperative will generate, transmit and/or distribute supplies of electric energy to a specified area not being serviced by another utility. "Non-utility" sales represent direct electricity transactions from independent generators to end use consumers. Totals may not equal sum of components because of independent rounding.

Total number of entities are not summed for the state to prevent possible duplication.

Source: U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Table 10. Supply and disposition of electricity, 1990 through 2022

Michigan

megawatthours

Category	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014
Supply									
Generation									
..Electric utilities	81,577,914	81,451,708	69,820,694	78,881,960	81,450,131	79,938,707	78,006,408	85,370,227	84,075,322
..Independent power producers	19,758,870	19,924,161	18,626,790	19,735,665	17,612,759	17,593,600	17,619,977	14,418,920	12,787,845
..Combined heat and power, electric	14,048,436	12,062,068	16,361,003	15,951,611	14,582,738	12,629,847	14,326,924	10,925,817	7,631,138
Electric power sector generation subtotal	115,385,220	113,437,937	104,808,487	114,569,235	113,645,628	110,162,154	109,953,309	110,714,964	104,494,305
..Combined heat and power, commercial	749,820	676,502	662,180	728,986	867,486	831,057	881,083	1,012,742	971,778
..Combined heat and power, industrial	1,362,012	1,398,691	1,154,054	1,403,267	1,323,981	1,320,290	1,287,397	1,280,344	1,350,907
Industrial and commercial generation subtotal	2,111,832	2,075,193	1,816,234	2,132,253	2,191,467	2,151,347	2,168,481	2,293,086	2,322,686
Total net generation	117,497,052	115,513,130	106,624,721	116,701,488	115,837,095	112,313,501	112,121,790	113,008,050	106,816,991
Total international imports	5,237,898	5,282,204	5,790,141	6,047,749	6,540,049	5,734,967	7,837,006	8,481,253	6,175,525
Net interstate imports	0	0	0	0	0	0	0	0	0
Total supply	122,734,950	120,795,334	112,414,862	122,749,237	122,377,144	118,048,468	119,958,796	121,489,303	112,992,516
Disposition									
Sales to ultimate customers									
..Full service providers	91,351,256	90,795,892	88,672,937	91,921,848	95,568,004	92,588,972	94,935,158	92,569,534	91,446,084
..Energy-only providers	8,873,152	8,639,559	7,945,332	8,911,569	8,870,771	8,906,962	9,116,127	9,305,012	11,451,880
..Facility direct sales	414,854	377,830	393,637	415,876	430,721	403,159	416,528	605,375	416,134
Total electric industry sales	100,639,262	99,813,281	97,011,906	101,249,293	104,869,496	101,899,093	104,467,813	102,479,921	103,314,098
Direct use	2,536,443	2,380,982	2,142,041	2,340,308	2,528,022	2,399,105	2,412,215	2,090,106	2,333,108
Total international exports	3,492,772	3,093,884	4,083,510	3,402,327	53,295	29,468	30,268	190,098	331,263
Estimated losses	5,443,725	4,695,863	5,403,007	5,490,130	5,408,922	5,543,151	5,452,288	5,112,277	5,379,559
Unaccounted	-181,850	637,479	-145,736	252,773	655,603	710,136	1,296,279	1,597,213	1,335,822
Net interstate exports	10,804,598	10,173,844	3,920,134	10,014,406	8,861,806	7,467,515	6,299,933	10,019,688	298,666
Total disposition	122,734,950	120,795,334	112,414,862	122,749,237	122,377,144	118,048,468	119,958,796	121,489,303	112,992,516
Net interstate trade	10,804,598	10,173,844	3,920,134	10,014,406	8,861,806	7,467,515	6,299,933	10,019,688	298,666
Net trade index (ratio)	1.1	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.0

Net Interstate Trade = Total Supply - (Total Electric Industry Sales + Direct Use + Total International Exports (if applies) + Estimated Losses).

Net Trade Index is the sum of Total Supply / (Total Disposition - Net Interstate Trade).

A negative Net Interstate Trade value indicates a net import of electric power.

Notes: Totals may not equal sum of components because of independent rounding. Estimated Losses are reported at the utility level, and then allocated to States based on the utility's sales to ultimate customers by State. Report Beginning with publication year 2010, Total disposition has been reorganized to include Net Interstate Trade. Therefore, Total Disposition equals Total Supply.

Sources: U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms. U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report. U.S. Energy Inform

Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007	Year 2006	Year 2005	Year 2004	Year 2003	Year 2002	Year 2001
83,171,310	80,474,999	87,609,471	89,666,874	82,787,341	94,503,953	96,785,842	97,373,706	104,830,689	99,608,512	96,634,055	100,451,718	97,067,330
12,560,766	14,300,177	12,184,173	12,569,865	10,449,447	10,953,505	11,027,611	3,859,411	4,337,023	2,560,189	2,302,109	5,030,864	2,399,126
7,312,667	11,051,885	7,347,404	7,474,970	6,203,600	7,349,933	9,327,166	9,077,221	10,161,162	13,904,316	9,917,144	10,137,521	10,501,594
103,044,743	105,827,061	107,141,047	109,711,709	99,440,389	112,807,391	117,140,618	110,310,338	119,328,874	116,073,017	108,853,308	115,620,103	109,968,049
861,283	967,956	788,951	624,181	603,624	535,131	627,216	515,407	534,676	536,342	503,966	477,004	239,307
1,511,775	1,363,033	1,239,509	1,215,481	1,158,593	1,647,284	1,542,101	1,730,994	1,756,221	1,877,911	1,989,785	1,791,980	1,638,255
2,373,058	2,330,989	2,028,459	1,839,663	1,762,216	2,182,415	2,169,318	2,246,400	2,290,897	2,414,252	2,493,752	2,268,984	1,877,562
105,417,801	108,158,050	109,169,507	111,551,371	101,202,605	114,989,806	119,309,936	112,556,738	121,619,771	118,487,269	111,347,060	117,889,087	111,845,612
6,032,954	4,572,066	4,525,243	6,117,627	7,576,434	6,305,172	1,681,860	357,046	1,681,055	2,054,387	1,253,352	240,232	74,012
1,251,369	2,227,684	899,647	0	204,074	0	1,857,500	9,749,351	4,207,616	4,401,794	13,442,948	2,644,718	3,595,157
112,702,124	114,957,800	114,594,397	117,668,998	108,983,113	121,294,978	122,849,296	122,663,135	127,508,442	124,943,450	126,043,360	120,774,037	115,514,781
92,605,231	95,173,582	95,230,803	94,564,763	93,654,152	102,320,575	104,526,113	101,899,292	98,602,601	92,097,202	96,659,455	100,213,318	101,776,743
9,992,639	9,198,981	9,361,428	9,083,972	4,046,710	2,999,260	4,292,693	5,619,061	11,333,864	13,991,287	10,112,012	4,500,202	632,604
440,435	445,628	461,327	484	420,152	461,436	477,943	499,344	508,098	517,551	2,105,726	1,565,547	0
103,038,305	104,818,191	105,053,558	103,649,219	98,121,014	105,781,271	109,296,749	108,017,697	110,444,563	106,606,040	108,877,193	106,279,067	102,409,347
2,359,430	2,368,855	1,927,006	1,899,233	1,792,173	2,144,060	2,005,136	2,353,796	2,584,479	2,922,287	2,919,243	2,882,639	2,821,309
214,848	302,005	456,671	2,553,774	1,939,287	4,000,591	2,887,818	2,473,613	4,411,246	5,258,329	4,817,768	2,474,343	2,175,612
5,535,180	5,676,320	6,491,641	6,403,217	6,246,131	6,738,319	6,917,662	7,003,745	7,381,644	7,811,664	7,994,648	7,971,953	8,008,765
1,554,360	1,792,429	665,520	909,497	884,508	1,381,430	1,741,932	.	.	.	.	.	.
0	0	0	2,254,058	0	1,249,307	0	0	0	0	0	0	0
112,702,124	114,957,800	114,594,397	117,668,998	108,983,113	121,294,978	122,849,296	122,663,135	127,508,442	124,943,450	126,043,360	120,774,037	115,514,781
-1,251,369	-2,227,684	-899,647	2,254,058	-204,074	1,249,307	-1,857,500	-9,749,351	-4,207,616	-4,401,794	-13,442,948	-2,644,718	-3,595,157
1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	0.9	1.0	1.0

ted losses may include electricity unaccounted for by the utility. Direct use is commercial or industrial use of electricity that (1) is self-generated (2) is produced by either the same entity that consumes the power or an affiliate, and (3) is not sold to another entity. For more information, see the U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report. Form EIA-111, Quarterly Imports and Exports Report.

Year 2000	Year 1999	Year 1998	Year 1997	Year 1996	Year 1995	Year 1994	Year 1993	Year 1992	Year 1991	Year 1990
89,572,141	87,874,695	85,146,307	89,564,616	95,155,261	92,478,772	83,720,636	92,250,107	82,679,444	94,567,383	89,058,681
1,751,367	1,723,457	1,746,821	1,679,487	1,777,210	1,456,350	1,343,056	1,185,746	868,192	693,687	638,996
10,476,171	11,079,892	11,014,262	12,287,614	12,044,779	9,611,129	9,221,499	8,905,594	7,907,290	6,702,210	6,353,648
101,799,678	100,678,044	97,907,390	103,531,717	108,977,250	103,546,251	94,285,190	102,341,447	91,454,926	101,963,280	96,051,325
622,156	683,703	638,193	635,704	625,592	562,902	471,502	452,436	331,497	578,313	411,321
1,787,762	1,877,968	1,931,810	2,803,340	2,915,466	3,335,459	3,550,695	3,574,668	3,535,515	3,436,529	3,597,089
2,409,918	2,561,671	2,570,003	3,439,043	3,541,058	3,898,362	4,022,196	4,027,104	3,867,012	4,014,843	4,008,411
104,209,596	103,239,715	100,477,393	106,970,760	112,518,308	107,444,613	98,307,387	106,368,552	95,321,938	105,978,123	100,059,735
1,328,760	889,216	2,027,472	3,384,292	2,125,829	5,800,588	6,910,227	2,419,866	83,476	107,629	39,599
13,581,288	13,892,710	13,319,056	806,667	0	0	0	0	0	0	3,135,880
119,119,644	118,021,641	115,823,921	111,161,719	114,644,137	113,245,201	105,217,614	108,788,418	95,405,414	106,085,752	103,235,214
104,370,569	103,479,677	100,506,195	97,390,660	96,301,566	94,701,134	91,159,987	87,588,602	83,840,225	84,518,543	82,366,869
401,647	501,329	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0
104,772,216	103,981,006	100,506,195	97,390,660	96,301,566	94,701,134	91,159,987	87,588,602	83,840,225	84,518,543	82,366,869
2,887,280	2,973,171	2,872,197	4,098,164	4,026,079	4,436,534	4,541,485	4,557,801	4,466,876	4,371,282	4,347,354
1,656,102	1,108,301	3,561,049	2,004,494	219,123	40,982	1,172	28,736	314,833	553,719	10,957,882
8,149,525	8,157,531	7,146,765	7,342,958	7,475,091	7,228,086	6,925,090	7,010,035	6,627,887	6,489,739	6,253,358
.	.	.	.	.	.	.	.	.	.	.
0	0	0	0	6,249,131	6,602,996	2,971,852	10,072,794	740,387	10,864,462	0
119,119,644	118,021,641	115,823,921	111,161,719	114,644,137	113,245,201	105,217,614	108,788,418	95,405,414	106,085,752	103,235,214
-13,581,288	-13,892,710	-13,319,056	-806,667	6,249,131	6,602,996	2,971,852	10,072,794	740,387	10,864,462	-3,135,880
0.9	0.9	0.9	1.0	1.1	1.1	1.1	1.0	1.1	1.0	1.0

id (3) is used in direct support of a service or industrial process located within the same facility or group of facilities that houses the generating equipment. Direct use is exclusive of station use.

Table 11. Net metering, 2010 through 2022
Michigan

Technology by sector	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010
Photovoltaic													
Capacity (MW)	152.685	119.795	94.225	66.458	44.215	28.544	22.256	16.972	13.915	11.493	8.690	5.540	3.420
Residential	112.645	84.950	65.447	46.870	28.192	17.144	12.545	9.715	7.853	6.351	4.860	3.581	2.837
Commercial	38.658	33.361	27.414	18.507	15.006	10.778	9.199	6.745	5.551	4.630	3.724	1.913	0.540
Industrial	1.382	1.484	1.365	1.081	1.017	0.622	0.512	0.512	0.511	0.512	0.103	0.047	0.033
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Customers	18,441	14,451	11,554	8,387	4,937	3,246	2,375	1,958	1,612	1,299	996	769	383
Residential	17,237	13,372	10,598	7,643	4,342	2,738	1,944	1,589	1,299	1,032	807	624	331
Commercial	1,163	1,036	912	705	565	486	418	356	300	254	184	142	48
Industrial	41	43	44	39	30	22	13	13	13	13	5	3	4
Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0
Storage													
Capacity (MW)	8.452	5.013	0.072	0.044	0.014	0.014	0.014	.	.	.	.	.	.
Residential	8.097	4.897	0.042	0.014	0.014	0.014	0.014	.	.	.	.	.	.
Commercial	0.355	0.092	0.030	0.030	0.000	0.000	0.000	.	.	.	.	.	.
Industrial	0.000	0.024	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Customers	1,258	917	11	3	2	2	2	.	.	.	.	.	.
Residential	1,245	902	10	2	2	2	2	.	.	.	.	.	.
Commercial	13	11	1	1	0	0	0	.	.	.	.	.	.
Industrial	0	4	0	0	0	0	0	.	.	.	.	.	.
Transportation	0	0	0	0	0	0	0	.	.	.	.	.	.
Virtual PV (1MW and over)													
Capacity (MW)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.	.	.	.	.	.
Residential	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Commercial	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Industrial	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Customers	0	0	0	0	0	0	0	.	.	.	.	.	.
Residential	0	0	0	0	0	0	0	.	.	.	.	.	.
Commercial	0	0	0	0	0	0	0	.	.	.	.	.	.
Industrial	0	0	0	0	0	0	0	.	.	.	.	.	.
Transportation	0	0	0	0	0	0	0	.	.	.	.	.	.
Virtual PV (under 1MW)													
Capacity (MW)	0.469	0.442	0.408	0.391	0.196	0.153	0.0	.	.	.	.	.	.
Residential	0.433	0.414	0.381	0.363	0.127	0.104	0.000	.	.	.	.	.	.
Commercial	0.036	0.028	0.027	0.028	0.069	0.049	0.000	.	.	.	.	.	.
Industrial	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	.	.	.	.	.
Customers	424	378	379	369	135	115	0	.	.	.	.	.	.
Residential	418	371	372	362	126	108	0	.	.	.	.	.	.
Commercial	6	7	7	7	9	7	0	.	.	.	.	.	.
Industrial	0	0	0	0	0	0	0	.	.	.	.	.	.
Transportation	0	0	0	0	0	0	0	.	.	.	.	.	.
Wind													
Capacity (MW)	1.535	1.684	1.70	1.767	1.805	1.775	2.029	1.980	2.115	1.811	2.461	1.385	40.585
Residential	1.056	1.087	1.101	1.164	1.189	1.157	1.190	1.139	1.048	0.997	1.677	0.892	40.523
Commercial	0.474	0.592	0.594	0.598	0.611	0.613	0.826	0.828	1.054	0.802	0.772	0.486	0.052
Industrial	0.005	0.005	0.005	0.005	0.005	0.005	0.013	0.013	0.013	0.012	0.012	0.007	0.010
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Customers	308	318	321	340	344	343	344	345	336	327	318	284	219
Residential	244	253	255	273	274	271	269	270	265	257	258	238	204
Commercial	63	64	65	66	69	71	73	73	69	68	58	45	14

Table 11. Net metering, 2010 through 2022
Michigan

Technology by sector	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010
Industrial	1	1	1	1	1	1	2	2	2	2	2	1	1
Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0
Other													
Capacity (MW)	2.052	2.042	2.040	2.041	1.482	1.462	1.368	1.188	1.176	1.176	0.613	0.602	0.031
Residential	0.037	0.027	0.025	0.026	0.025	0.022	0.003	0.013	0.003	0.003	0.007	0.006	0.026
Commercial	1.365	1.365	1.365	1.365	0.807	0.790	0.775	0.775	0.773	0.773	0.606	0.596	0.005
Industrial	0.650	0.650	0.650	0.650	0.650	0.650	0.590	0.400	0.400	0.400	0.000	0.000	0.000
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Customers	20	19	18	19	15	13	8	8	7	7	10	9	3
Residential	6	5	4	5	4	3	1	2	1	1	2	2	1
Commercial	11	11	11	11	8	7	5	5	5	5	8	7	2
Industrial	3	3	3	3	3	3	2	1	1	1	0	0	0
Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0
All technologies													
Capacity (MW)	156.741	123.963	98.373	70.657	47.698	31.934	25.653	20.140	17.206	14.480	11.761	7.528	44.026
Residential	114.171	86.478	66.954	48.423	29.533	18.427	13.738	10.867	8.904	7.351	6.544	4.479	43.386
Commercial	40.533	35.346	29.400	20.498	16.493	12.230	10.800	8.348	7.378	6.205	5.102	2.995	0.597
Industrial	2.037	2.139	2.020	1.736	1.672	1.277	1.115	0.925	0.924	0.924	0.115	0.054	0.043
Transportation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Customers	19,193	15,166	12,272	9,115	5,431	3,717	2,727	2,311	1,955	1,633	1,324	1,062	605
Residential	17,905	14,001	11,229	8,283	4,746	3,120	2,214	1,861	1,565	1,290	1,067	864	536
Commercial	1,243	1,118	995	789	651	571	496	434	374	327	250	194	64
Industrial	45	47	48	43	34	26	17	16	16	16	7	4	5
Transportation	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Table 12. Advanced metering, 2007 through 2022
Michigan

Technology by sector	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016
AMR meters	151,851	274,777	303,756	322,578	316,951	322,771	324,508
Residential	124,257	232,969	259,288	274,155	271,079	276,627	277,454
Commercial	27,385	40,872	43,317	47,134	44,718	44,879	45,759
Industrial	209	936	1,151	1,289	1,154	1,265	1,295
Transportation	0	0	0	0	0	0	0
AMI meters	5,174,298	4,988,939	4,912,650	4,807,606	4,671,367	4,647,128	3,977,236
Residential	4,638,043	4,489,617	4,427,343	4,336,436	4,213,368	4,192,689	3,628,725
Commercial	531,422	497,170	483,791	469,854	456,725	453,209	347,417
Industrial	4,827	2,146	1,510	1,310	1,272	1,228	1,092
Transportation	6	6	6	6	2	2	2
Standard meters	61,633	101,719	124,662	186,992	264,535	266,845	813,671
Residential	48,758	79,989	98,792	153,543	222,900	224,353	671,188
Commercial	11,057	17,908	22,057	29,409	37,457	38,197	138,612
Industrial	1,818	3,822	3,813	4,040	4,178	4,295	3,871
Transportation	0	0	0	0	0	0	0
All meters	5,387,782	5,365,435	5,341,068	5,317,176	5,252,853	5,236,744	5,115,415
Residential	4,811,058	4,802,575	4,785,423	4,764,134	4,707,347	4,693,669	4,577,367
Commercial	569,864	555,950	549,165	546,397	538,900	536,285	531,788
Industrial	6,854	6,904	6,474	6,639	6,604	6,788	6,258
Transportation	6	6	6	6	2	2	2

AMI- Advanced Meter Infrastructure.

Prior to 2010, the count was the number of customers, not number of meters.

Starting in 2013 Standard (Non-AMR/AMI) meter data was collected on the EIA-861. This data is not collected on the EIA-861S.

Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008	Year 2007
358,438	354,444	337,976	324,455	314,211	359,361	333,902	272,851	189,606
308,879	306,626	292,051	283,561	272,718	318,011	299,426	246,630	174,020
48,007	46,331	44,463	41,134	40,083	38,141	32,779	24,761	14,476
1,552	1,487	1,462	1,390	1,410	3,209	1,697	1,460	1,110
0	0	0	0	0	0	0	0	0
3,196,371	2,217,307	1,351,082	947,546	735,450	334,065	198,442	200,415	187,349
2,958,495	2,055,628	1,248,046	872,991	683,314	309,329	179,593	178,219	165,862
237,180	160,837	102,433	74,392	51,983	24,588	18,709	21,914	21,284
694	842	603	163	153	148	140	282	203
2	0	0	0	0	0	0	0	0
1,336,889	1,602,535	1,674,628						
1,085,191	1,381,688	1,462,693						
247,970	211,749	202,522						
3,728	9,097	9,381						
0	1	32						
4,891,698	4,174,286	3,363,686						
4,352,565	3,743,942	3,002,790						
533,157	418,917	349,418						
5,974	11,426	11,446						
2	1	32						

Table 13. Energy efficiency, 2013 through 2022
Michigan

Technology by sector	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014	Year 2013
Reporting year incremental										
Savings - energy (MWh)	1,564,184	1,643,381	1,478,825	1,393,370	1,409,038	1,415,547	1,116,333	1,073,961	1,267,525	1,189,290
Residential	469,232	503,957	508,835	546,444	540,411	626,410	491,442	481,975	576,137	580,319
Commercial	964,825	998,548	799,036	739,803	754,568	684,720	557,073	527,060	611,866	529,368
Industrial	130,126	140,876	170,954	107,124	114,059	104,416	67,818	64,926	79,522	79,603
Transportation	0	0	0	0	0	0	0	0	0	0
Savings - peak demand (MW)	282.7	304.9	280.3	292.1	259.5	163.6	125.2	144.4	160.4	153.5
Residential	78.3	92.8	131.5	104.0	74.7	59.6	47.6	55.4	55.5	62.9
Commercial	183.8	189.1	125.3	171.0	155.1	89.6	71.5	80.0	94.9	80.6
Industrial	20.7	22.9	23.5	17.1	29.7	14.5	6.1	9.0	10.0	10.0
Transportation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Costs - customer incentive (thousand dollars)	100,731	92,765	80,511	72,620	72,223	69,034	46,686	41,692	42,461	40,771
Residential	34,463	28,060	24,939	21,745	20,856	20,753	21,419	17,264	16,676	14,620
Commercial	50,379	48,157	35,495	38,780	38,924	36,556	19,237	18,486	19,402	19,974
Industrial	15,889	16,549	20,077	12,094	12,444	11,724	6,030	5,942	6,383	6,177
Transportation	0	0	0	0	0	0	0	0	0	0
Costs - all other costs (thousand dollars)	241,452	243,839	179,230	173,623	173,575	157,089	137,746	138,745	132,075	117,440
Residential	114,492	109,533	91,395	84,338	87,973	79,298	74,596	73,098	78,099	57,259
Commercial	117,984	125,873	78,738	78,809	75,807	68,667	57,353	59,742	51,040	55,226
Industrial	8,976	8,432	9,096	10,476	9,795	9,124	5,797	5,905	2,936	4,955
Transportation	0	0	0	0	0	0	0	0	0	0
Incremental life cycle										
Savings - energy (MWh)	16,022,225	18,191,355	56,664,033	56,483,779	55,772,616	47,258,192	39,797,196	10,249,004	23,928,770	7,501,796
Residential	2,899,258	3,025,314	23,134,367	22,880,439	22,255,390	18,846,063	16,923,563	4,332,044	11,103,189	3,190,024
Commercial	11,577,447	13,340,599	31,980,628	32,101,777	32,034,234	26,950,129	21,407,154	4,930,332	11,746,598	3,529,233
Industrial	1,545,520	1,825,442	1,549,037	1,501,562	1,482,993	1,462,000	1,466,479	986,628	1,078,983	782,539
Transportation	0	0	0	0	0	0	0	0	0	0
Savings - peak demand (MW)	261.7	287.4	263.5	262.6	239.9	162.4	147.9	152.0	156.3	10.2
Residential	65.9	86.3	125.2	112.4	77.5	55.5	56.7	56.5	57.7	4.4
Commercial	175.0	178.1	114.8	133.1	146.0	92.4	82.7	86.5	88.6	5.8
Industrial	20.8	23.0	23.6	17.1	16.3	14.5	8.5	9.0	10.0	0.0
Transportation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Costs - customer incentive (thousand dollars)	100,731	92,765	80,511	72,620	72,223	69,034	46,686	42,990	55,302	58,771
Residential	34,463	28,060	24,939	21,745	20,856	20,753	21,419	17,801	24,277	21,972
Commercial	50,379	48,157	35,495	38,780	38,924	36,556	19,237	19,247	24,647	30,173
Industrial	15,889	16,549	20,077	12,094	12,444	11,724	6,030	5,942	6,378	6,626
Transportation	0	0	0	0	0	0	0	0	0	0
Costs - all other costs (thousand dollars)	241,452	243,839	1,010,980	896,229	789,552	679,833	571,799	487,511	411,053	323,615
Residential	114,492	109,533	551,626	481,238	423,463	361,246	306,280	258,355	228,506	174,070
Commercial	117,984	125,873	450,258	404,515	356,294	309,463	259,707	223,252	179,577	143,808
Industrial	8,976	8,432	9,096	10,476	9,795	9,124	5,812	5,905	2,972	5,737
Transportation	0	0	0	0	0	0	0	0	0	0

NOTE 1- Data withheld pending EIA review.

Source: U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Table 14. Capacity and usage factors by month, 2022

Michigan

Technology	Year end capacity (MW)	Time adjusted capacity (MW)	Annual	January	February	March	April	May
Capacity Factors								
Nuclear	3,318.0	3,635.9	81.7	91.0	78.4	75.3	49.8	56.3
Other, Gas	250.0	250.0	74.3	71.8	65.0	66.3	63.1	78.1
Hydroelectric	264.1	264.1	59.9	60.2	55.1	62.4	62.8	64.9
Wood	320.9	326.7	59.6	55.6	54.5	58.1	59.0	62.5
Natural Gas - CC	6,864.8	5,620.7	58.7	74.3	68.0	62.1	55.4	48.4
Other, Biomass	168.4	168.4	56.7	57.1	67.5	62.9	60.0	59.9
Coal	6,291.1	7,847.3	52.5	55.1	45.9	38.6	42.9	61.7
Other, not Biomass or Gas	3.8	3.8	45.8	44.5	40.2	37.2	33.8	30.9
Petroleum - ST	47.2	47.2	40.5	35.6	43.0	27.7	35.5	45.8
Wind - Onshore	3,239.0	3,232.8	32.2	36.6	43.0	38.0	34.8	30.4
Natural Gas - IC	386.6	382.0	28.3	28.4	25.7	22.8	21.1	19.2
Solar - PV	472.7	455.3	21.2	9.0	13.1	19.2	21.9	27.7
Natural Gas - GT	3,896.0	3,884.6	20.4	25.9	16.4	12.1	12.8	19.1
Natural Gas - ST	2,153.7	2,153.7	4.3	3.7	4.9	2.1	2.8	3.1
Petroleum - IC	225.5	228.0	0.3	0.2	0.3	0.2	0.5	0.4
Petroleum - GT	214.3	214.3	0.2	0.2	0.2	0.2	0.2	0.2
Usage Factors								
Pumped Storage	2,185.6	2,175.6	12.6	8.3	7.7	9.8	6.8	7.8
Battery	1.3	1.3	0.6	0.5	0.6	0.5	0.4	0.5
All Sources	30,303.0	30,891.8						

Time adjusted capacity for the month is the summer capacity of generators in operation for the entire month; units that began operation during the month or that retired during the month are included in the capacity factor calculation.

Sources: U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report. and U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report.

June	July	August	September	October	November	December
96.1	98.5	95.5	93.3	66.7	88.3	103.8
76.4	87.8	67.4	84.8	75.9	75.1	79.4
67.5	51.8	58.4	59.1	47.8	66.2	62.7
64.7	57.9	59.7	56.6	60.6	60.4	66.1
60.7	65.0	69.3	58.0	55.7	45.8	49.1
57.2	46.7	45.1	56.9	58.5	64.9	45.2
55.5	61.8	54.3	55.6	58.6	39.5	61.6
50.1	64.8	59.2	54.0	50.8	35.7	47.1
30.4	41.8	44.7	44.8	48.3	48.8	39.5
25.4	21.3	17.6	21.1	36.5	43.7	39.3
30.7	39.4	36.5	32.9	31.7	22.3	28.4
35.8	32.8	30.1	23.3	20.1	12.8	5.3
25.8	29.4	22.9	21.2	17.0	18.4	23.5
8.4	8.9	5.8	3.9	2.0	2.0	4.2
0.5	0.1	0.2	0.1	0.2	0.3	0.3
0.4	0.2	0.3	0.2	0.2	0.2	0.3
16.7	20.3	21.8	16.9	8.1	13.9	12.6
0.7	0.5	0.5	0.5	0.5	0.6	0.6

are excluded. Time adjusted capacity is the capacity of all the generators that were included in the time

rt

Table 15. Capacity and usage factors, 2008 through 2022
Michigan

Generation technology	2022 Time adjusted capacity (MW)	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016
Capacity Factors								
Nuclear	3,635.9	81.7	95.3	84.6	91.9	84.4	89.7	87.5
Other, Gas	250.0	74.3	66.5	71.5	80.7	75.0	77.3	74.6
Hydroelectric	264.1	59.9	58.0	73.1	68.9	66.4	71.8	66.9
Wood	326.7	59.6	57.2	48.3	56.2	62.4	59.8	60.9
Natural Gas - CC	5,620.7	58.7	54.8	63.9	64.3	57.9	51.6	56.7
Other, Biomass	168.4	56.7	65.4	69.7	63.1	55.1	57.4	57.0
Coal	7,847.3	52.5	53.8	39.1	50.5	54.4	52.9	48.2
Other, not Biomass or Gas	3.8	45.8						
Petroleum - ST	47.2	40.5	39.8	42.8	41.3	38.0	40.4	44.3
Wind - Onshore	3,232.8	32.2	29.5	32.6	32.5	32.7	37.3	
Natural Gas - IC	382.0	28.3	31.4	30.1	28.3	6.5	3.0	2.0
Solar - PV	455.3	21.2	19.8	17.0	16.3	15.3	16.3	14.7
Natural Gas - GT	3,884.6	20.4	18.5	24.3	19.5	19.8	14.2	20.1
Natural Gas - ST	2,153.7	4.3	6.5	7.9	7.8	5.9	5.0	4.3
Petroleum - IC	228.0	0.3	0.3	0.1	0.1	0.1	0.1	0.1
Petroleum - GT	214.3	0.2	0.3	0.1	0.0	0.6	0.3	0.4
Wind								39.1
Usage Factors								
Pumped Storage	2,175.6	12.6	10.3	12.2	9.8	9.5	9.3	10.3
Battery	1.3	0.6	0.8	1.0	1.2	0.5		
All Sources	30,891.8							

Note: Time adjusted capacity for the year is the capacity of all the generators that were included in the capacity factor calculation.

Sources: U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report. and U.S. Energy Information Administration, Form EIA-923, Power Plant

Year 2015	Year 2014	Year 2013	Year 2012	Year 2011	Year 2010	Year 2009	Year 2008
84.2	89.6	84.0	81.1	94.9	85.7	63.2	90.3
53.6							
51.7	54.8	48.9	57.8	64.7	59.9	61.9	61.7
58.0	68.3	67.3	66.7	71.4	71.5	65.0	71.7
41.1	24.5	23.7	45.1	27.8	24.9	18.1	19.6
63.0	65.6	64.2	66.5	61.4	59.3	66.1	59.8
56.9	56.4	59.4	55.1	60.2	65.9	64.9	67.6
	52.5						
47.1	42.9	45.3	48.7	46.2	42.3	40.9	51.5
1.3	0.1	0.4	0.5	0.4	0.2	0.1	0.2
12.1							
12.3	8.2	8.4	6.5	3.1	4.1	2.1	2.5
2.3	8.8	8.0	3.8	1.8	2.7	1.1	2.1
0.0	0.1	0.1	0.3	0.3	0.2	0.4	0.2
0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.3
40.3	37.4	34.4	30.5	27.7	25.3	26.6	26.2
6.8	10.1	12.8					

ant Operations Report

Table 16. Distributed generators, capacity, 2016 through 2022

Michigan

megawatts

Technology by sector	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016
Photoelectric	37.993	32.508	28.488	27.730	27.689	22.639	27.252
Residential	4.656	2.717	2.715	2.715	3.174	3.152	9.153
Commercial	15.446	13.018	11.007	10.910	9.958	7.028	4.854
Industrial	2.444	2.703	1.544	1.544	1.870	0.995	0.055
Transportation	0.000						
Direct Connected	15.447	14.069	13.222	12.561	12.687	11.464	13.190
Storage	1.850	1.850	0.000	0.000			1.000
Residential	0.000						
Commercial	0.600	0.600					
Industrial	0.250	0.250					
Transportation	0.000						
Direct Connected	1.000	1.000					1.000
Wind	0.394	0.371	0.371	0.371	0.362	0.365	0.803
Residential	0.108	0.088	0.088	0.088	0.076	0.079	0.067
Commercial	0.285	0.283	0.283	0.283	0.286	0.286	0.736
Industrial	0.000						
Transportation	0.000						
Direct Connected	0.001						
Hydroelectric	4.144	4.159	4.089	4.594	3.978	3.978	3.978
Residential	0.000			0.400			
Commercial	0.050	0.050	0.050	0.050	0.050	0.050	0.050
Industrial	0.000						
Transportation	0.000						
Direct Connected	4.094	4.109	4.039	4.144	3.928	3.928	3.928
Fuel Cell	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Residential	0.000						
Commercial	0.250	0.250	0.250	0.250	0.250	0.250	0.250
Industrial	0.000						
Transportation	0.000						
Direct Connected	0.000						
Internal Combustion	12.461	11.821	11.821	12.821	8.421	8.061	7.935
Residential	0.000						

Table 16. Distributed generators, capacity, 2016 through 2022

Michigan

megawatts

Commercial	2.540	1.900	1.900	1.900	1.900	1.540	0.590
Industrial	2.906	2.906	2.906	2.906	2.906	2.906	3.730
Transportation	0.000						
Direct Connected	7.015	7.015	7.015	8.015	3.615	3.615	3.615
Gas Turbine	0.000	0.000	0.000	0.000			0.600
Residential	0.000						
Commercial	0.000						
Industrial	0.000						0.600
Transportation	0.000						
Direct Connected	0.000						
Steam	0.672	0.000	0.000	0.000			
Residential	0.000						
Commercial	0.672						
Industrial	0.000						
Transportation	0.000						
Direct Connected	0.000						
Other	4.060	4.060	2.145	2.145	2.145	2.145	0.945
Residential	0.000						
Commercial	1.600	1.600	0.945	0.945	0.945	0.945	0.045
Industrial	2.460	2.460	1.200	1.200	1.200	1.200	0.900
Transportation	0.000						
Direct Connected	0.000						
Total	61.824	55.019	47.164	47.911	42.845	37.438	42.763
Residential	4.764	2.805	2.803	3.203	3.250	3.231	9.220
Commercial	21.443	17.701	14.435	14.338	13.389	10.099	6.525
Industrial	8.060	8.319	5.650	5.650	5.976	5.101	5.285
Transportation	0.000	0.000	0.000	0.000			
Direct Connected	27.557	26.193	24.276	24.720	20.230	19.007	21.733

Source: U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Table 17. Reliability, 2013 through 2022
Michigan

Metric	Year 2022	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017	Year 2016	Year 2015	Year 2014	Year 2013
IEEE only										
Reporting statistics										
Total utilities	57	57	57	58	58	58	58	58	59	59
Utilities reported	19	21	21	21	18	17	17	16	15	14
Percent reporting	94	93	93	94	93	93	93	93	94	94
All events										
SAIDI	520.7	890.9	416.7	570.2	450.2	802.2	268.4	374.5	592.5	791.0
SAIFI	1.340	1.647	1.375	1.542	1.374	1.413	1.130	1.151	1.230	1.531
CAIDI	388.7	540.8	303.1	369.7	327.6	567.8	237.5	325.4	481.9	516.5
Without major event days										
SAIDI	166.8	178.6	168.3	213.9	186.4	180.1	194.2	183.4	183.3	199.1
SAIFI	1.016	1.017	1.069	1.162	1.054	0.984	1.004	0.979	0.898	0.913
CAIDI	164.2	175.6	157.5	184.1	176.8	183.0	193.5	187.3	204.2	218.0
Loss of supply removed										
SAIDI	519.9	882.1	414.3	565.5	448.0	798.2	262.6	363.7	589.0	793.9
SAIFI	1.326	1.615	1.339	1.505	1.346	1.388	1.105	1.119	1.199	1.504
CAIDI	391.9	546.2	309.5	375.8	332.7	574.9	237.7	324.9	491.4	527.9
Any method										
Reporting statistics										
Total utilities	57	57	57	58	58	58	58	58	59	59
Utilities reported	24	29	29	29	25	25	25	23	21	19
Percent reporting	97	97	97	98	98	98	98	98	97	96
All events										
SAIDI	513.1	873.3	410.7	554.9	442.9	778.8	267.8	363.4	574.7	782.3
SAIFI	1.339	1.656	1.384	1.535	1.373	1.414	1.146	1.141	1.213	1.523
CAIDI	383.2	527.5	296.8	361.5	322.6	550.9	233.6	318.5	473.8	513.6
Without major events										
SAIDI	166.0	178.4	167.2	211.1	185.0	179.4	193.1	178.8	180.0	198.6
SAIFI	1.015	1.033	1.082	1.162	1.055	0.989	1.012	0.967	0.893	0.915
CAIDI	163.6	172.6	154.6	181.7	175.4	181.5	190.8	184.8	201.5	217.1

Source: U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report.

Any method equals IEEE plus Other.

Percent Reporting is an approximate estimate of how many customers are covered by these metrics. The numerator is reported number of meters used on the reliability schedule, while the denominator is the number of customers reported on the sales to ultimate customers schedule.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the application of **DTE
ELECTRIC COMPANY** for authority to
increase its rates, amend its rate schedules
and rules governing the distribution and
supply of electric energy, and for
miscellaneous accounting authority

Case No. U-21534

ALJ Sally Wallace

PROOF OF SERVICE

I, Mark N. Templeton, certify that an electronic copy of the Official Exhibits DAO-251 to DAO-263 sponsored by Arjun Makhijani (Part 7 of 10) on Behalf of Soulardarity and We Want Green, Too was served on the following on September 12, 2024.

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The statements above are true to the best of my knowledge, information, and belief.

UNIVERSITY OF CHICAGO LAW SCHOOL
ABRAMS ENVIRONMENTAL LAW CLINIC
Counsel for Soulardarity and
We Want Green, Too

Date: September 12, 2024

Sincerely,



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