



THE UNIVERSITY OF CHICAGO
THE LAW SCHOOL
Abrams Environmental
Law Clinic

November 13, 2025

Via E-Filing

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

RE: MPSC Case No. U-21870

Dear Ms. Felice:

Please find enclosed the Official Exhibits of Sergio Cira-Reyes on Behalf of Urban Core Collective, UCC-9 to UCC-26 (Part 2 of 6), along with proof of service, for electronic filing in the above-referenced matter.

Please do not hesitate to contact my office 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-21870

STATE OF MICHIGAN
DEPARTMENT OF LICENSING & REGULATORY AFFAIRS

MICHIGAN PUBLIC SERVICE COMMISSION

7109 W. Saginaw Hwy.

Lansing, Michigan 48917

Telephone: (517) 284-8090

Email Address: mpscedockets@michigan.gov

Website: www.michigan.gov/mpsc

Case Number U-21870

Case Detail

Case Number	Description	On Behalf of Company	On Behalf of Company 2	On Behalf of Company 3	Industry	Open Date
U-21870	In the matter of the application of Consumers Energy Company for authority to increase its rates for the generation and distribution of electricity and for other relief.	Consumers Energy Company			Electric	03/28/25

Case Comment Detail

Case Comment #	Created Date	Initial Comment Submitter	Number of Comment Submitters	Comment
File Link				
U-21870-0077-CC	09/10/25	Amela O'Gorman	1	Please see attached letter.
https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/068cs00001A03FnAAJ				
U-21870-0076-CC	09/09/25	Mary Taylor	1	I am filing a complaint about the increase in my electric bill. I am a Consumer's Energy customer. I had noticed my bill going up since May of this year. It was about \$10 each month, until August and September. In August I had a 20 dollar increase and September there was a \$30 increase. I went back three years to see what had been going on and found that my bill ranged between \$100 and \$135 until June of this year. That is when the increase went into effect. I was looking at my usage, but that was pretty consistent. Our home doesn't have air-conditioning and we are not on electronics all day every day. I can understand when my bill went from \$132 to \$143, but \$193? My usage has not changed. Consumers Energy has 6 million users. We are all paying approximately \$1 for a low income fund, which is 6 million a month. If you do the math the is seven two million per year. Can we not offset the bills of those actually paying with some of that money? Another option would be to stop with the green energy that is politically forced on everyone. It is proven that wind farms and solar panel farms are not as effective as stated, but here we are buying property

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				to put more up. Consumers also closed the Palisades plant (a political move) and now reopening it to the tune of millions. Here is another suggestion, as a former teacher I know that the state did away with teacher pensions several years ago, maybe consumers could cut all or part of the pensions of their workers? Money is scarce for the average michigander, my [REDACTED] year old mom, my small business owner daughter, we are seeing increases in everything. I understand the company is as well, but could the company try to think of other ways to cut before asking the customers to pay for political investments in green energy, low income funds, etc. I don't have a choice where I can go for electricity, Consumers is my only option at this point. Will the increases ever end with that in mind?
U-21870-0075-CC	08/27/25	John Zang	1	See attached PDF. https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/068cs000017ftbzAAA
U-21870-0074-CC	08/27/25	Kevin Daup	1	Opposition to Consumers Energy's Proposed Rate Increase Dear Commissioners, I am writing to strongly oppose Consumers Energy's proposed \$436 million electric rate increase (Case U-21870). My wife and I are both disabled and live on a low fixed income. Our monthly energy bill is already difficult to manage, and the recent rate hike this year has added even more strain to our household budget. If this new increase is approved, it will raise our bill by nearly \$50 more per month. That is money we simply do not have. For families like ours, every dollar matters — and this kind of increase could force impossible choices between paying for electricity, food, or medicine. I understand the need for system improvements, but the burden of constant and repeated rate hikes is unfairly placed on customers who have no alternative energy provider. Utilities should prioritize affordability and reliability, not corporate profits at the expense of vulnerable residents. I urge the Commission to reject or significantly reduce this proposal and to protect Michigan families, especially seniors, people with disabilities, and those on limited incomes, from yet another unaffordable increase. Thank you for considering my comments.
U-21870-0073-CC	08/22/25	Amela O'Gorman	1	Consumers Energy's parent company reported nearly \$1 billion in profit in 2024, yet Michigan families face record-high electric bills after the April rate increase, and now another rate increase is proposed. As evidenced by public documents submitted on Consumers Energy behalf regarding this case, the average supply charge for customers will increase to almost \$6 per day, with distribution fees nearly the same, means many households are paying around \$300 a month - an impossible amount for those earning minimum wage. The \$2 million fund for low-income assistance is a token gesture that forces families to apply for help instead of fixing the root problem:

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				skyrocketing rates and an unfair per-kWh distribution charge. I urge the Commission to deny this rate increase, consider a rate cut, and change how distribution charges are calculated to protect Michigan residents.
U-21870-0072-CC	08/21/25	Samantha Holmes	1	Rate increases across Michigan have been so high this year, the average family cannot afford to feed their household. How is it okay for this monopoly to continue to get approved for increases?! Where I live I cannot have DTE or any other power company supply my power and I am forced to pay all of these "other charges" without explanation or the option to go with another company. Consumers should have to survey their costumers and we should get to vote on how when and why our bills increase.
U-21870-0071-CC	08/17/25	John Morrison	1	Over the last 6 years Consumers has requested rate increases almost every year. It is unsettling that once it gets a rate increase, it immediately requests another. Because of these increases my electric bill has increased at least 30%, while my income has not. I have had to try to find ways to reduce my costs, in order to pay for the sky-rocketing cost of electricity. What is Consumers doing to reduce its costs, so it won't have to request rate increases yearly? As a business Consumers should be working to become more efficient and reduce its costs. It should pass some of those savings on to its customers. I oppose Consumers rate increase request.
U-21870-0070-CC	08/12/25	Sharon Donovan	1	Dear MPSC DTE Rate Case, ENOUGH. We are not ATMs, and we are increasingly tired of being treated like one. The profits and the high salaries are outrageous and need to be at the very least, slowed down. LET'S FOCUS ON SUSTAINABLE, RENEWABLE ENERGY AND SURVIVAL. I urge you to reject DTE and Consumers Energy's rate increase requests totaling more than \$1 billion. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, DTE and Consumers' CEOs made more than \$12 million and \$10 million in 2024, respectively. DTE was just approved for a \$217 million increase in January. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Our bills are already too [REDACTED] high! DTE and Consumers Energy have repeatedly raised their rates in recent years. Instead of using these funds to maintain record profits, these companies should be using them to truly invest in our grid and improve reliability Please reject these latest rate increase requests. Thank you for your time and consideration.
U-21870-0069-CC	08/07/25	Karen Thompson	1	Comments signed by many submitters. Please see the attachment.

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<https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/068cs0000143ZrJAAU>

U-21870-0068-CC	08/04/25	Brenda Cole	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. I try to use as little as possible! Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0067-CC	08/04/25	Robin Graham	1	Dear MPSC DTE Rate Case, I urge you to reject DTE and Consumers Energy's rate increase requests totaling more than \$1 billion. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, DTE and Consumers' CEOs made more than \$12 million and \$10 million in 2024, respectively. DTE was just approved for a \$217 million increase in January. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Our bills are already too damn high! DTE and Consumers Energy have repeatedly raised their rates in recent years. Instead of using these funds to maintain record profits, these companies should be using them to truly invest in our grid and improve reliability. Please reject these latest rate increase requests. Thank you for your time and consideration.. I'M ANGRY AT THE AMOUNT OF MONEY IT TAKES TO LIVE AS IT IS. I'M ON A FIXED INCOME AS MANY ARE. PRETTY SOON I W I LL HAVE TO TURN OFF MY AIR CONDITIONER IN THE SUMMER AND HEAT IN THE WINTER. NO ONE SHOULD HAVE TO MAKE THAT CHOICE. IT SEEMS TO ME PROFIT MARGINS ALWAYS ARE FOR THE GOOD OF COMPANIES. TELL YOU WHAT, MAYBE YOU SHOULD ASK DONALD TRUMP FOR THE MONEY SINCE HE'S BUSY WASTING MONEY.
U-21870-0066-CC	08/04/25	Richard Bosler	1	Dear MPSC: Tell us why these companies always are coming back to the table asking for more each time when we are suppose to be reducing costs? Enough is Enough! I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has

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				raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0065-CC	08/04/25	Rick Boisvert	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. On top of rate increases these corporations are charging additional fees based on usage and pocketing millions. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0064-CC	08/01/25	Artemis Kryke	1	Dear MPSC DTE Rate Case, It is simple. We all live or you make a bit of money and we all die. All of the stories humanity has generated, a common thread marks you as a vilkian if you allow this. Grow some [REDACTED] ovaries.
U-21870-0063-CC	08/01/25	Linda Secor	1	Dear MPSC DTE Rate Case, I dont know how many times my electric has gone out in the last 5 years ive lived here but its alot. We pay good money a very high cost and it continues to go out many times a year. So no raising the cost. Older people on a fixed income cannot afford it already. So NO To RAISNG THE COST.I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0062-CC	07/30/25	Connie Boris	1	Dear MPSC DTE Rate Case, Do not approve DTE's and Consumers Energy's rate increase requests totaling more than \$1 billion. I have a house in the DTE service area and a house in the Consumers Energy service area. These continuing increases in my energy rates is overwhelming, economically hurtful, and cannot continue - so do not approve another price

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				hike when Min just We suffer some of the most frequent and prolonged power outages when PSC just increased energy rates 3 months ago. Reduce the never ending increases in compensation to the CEO's, if you need to offset expenses. Do not approve these rate increase requests.
U-21870-0061-CC	07/30/25	Patricia Shure	1	Dear MPSC DTE Rate Case, Please don't allow DTE and Consumers Energy to raise their rates again. We have constant Power outages in my neighborhood. They don't need more money, they just need to do a decent job.
U-21870-0060-CC	07/30/25	Dave Palmer	1	Dear MPSC DTE Rate Case, DTE SHOULD BE PAYING FOR THEIR UPGRADES FROM THEIR OWN PROFITS, THEY SHOULD NOT BE CHARGING THE CUSTOMER'S DIRECTLY BY RAISING OUR RATES TO PAY FOR UPGRADES TO THEIR INFRASTRUCTURE. I urge you to reject DTE and Consumers Energy's rate increase requests totaling more than \$1 billion. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, DTE and Consumers' CEOs made more than \$12 million and \$10 million in 2024, respectively. DTE was just approved for a \$217 million increase in January. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Our bills are already too damn high! DTE and Consumers Energy have repeatedly raised their rates in recent years. Instead of using these funds to maintain record profits, these companies should be using them to truly invest in our grid and improve reliability. Please reject these latest rate increase requests. Thank you for your time and consideration.
U-21870-0059-CC	07/30/25	Elizabeth Lupher	1	Dear MPSC DTE Rate Case, I urge you to reject DTE and Consumers Energy's rate increase requests totaling more than \$1 billion. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. I personally have had power out multiple times a year every single year for at least half a decade. I have lost fridge contents and had to replace major appliances with no compensation from DTE. Just last year, Consumers Energy has performed half-hearted updates to infrastructure that messed up my community's water lines and hacked up our lawns and concrete with no attempts to fix the problem until MPSC complaints are made - and even then CERTAINLY did not leave our property as they found it before. Meanwhile, DTE and Consumers' CEOs made more than \$12 million and \$10 million in 2024, respectively. DTE was just approved for a \$217 million increase in January. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Our bills are already too damn high! DTE and Consumers Energy have

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				repeatedly raised their rates in recent years. Instead of using these funds to maintain record profits, these companies should be using them to truly invest in our grid and improve reliability. They have not shown accountability for the rate hikes in the past few years and do not deserve to be approved for more now, especially with the monopoly they hold over the market. Please reject these latest rate increase requests. Thank you for your time and consideration.
U-21870-0058-CC	07/30/25	Hannah Stent	1	Dear MPSC DTE Rate Case, I urge you to reject DTE and Consumers Energy's rate increase requests totaling more than \$1 billion. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, DTE and Consumers' CEOs made more than \$12 million and \$10 million in 2024, respectively. DTE was just approved for a \$217 million increase in January. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. How do they expect to make more when less can even pay? Our bills are already too damn high! DTE and Consumers Energy have repeatedly raised their rates in recent years. Instead of using these funds to maintain record profits, these companies should be using them to truly invest in our grid and improve reliability. An example is how DTE outright left Highland Park in the dark rather than use that money to fix the street lights. Street. Lights. A meaningful tell of how DTE prioritizes it's spending. What neighborhood is next? Please reject these latest rate increase requests. Thank you for your time and consideration.
U-21870-0057-CC	07/30/25	Edmund Kowalski	104	Dear MPSC DTE Rate Case, I urge you to reject DTE and Consumers Energy's rate increase requests totaling more than \$1 billion. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, DTE and Consumers' CEOs made more than \$12 million and \$10 million in 2024, respectively. DTE was just approved for a \$217 million increase in January. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Our bills are already too damn high! DTE and Consumers Energy have repeatedly raised their rates in recent years. Instead of using these funds to maintain record profits, these companies should be using them to truly invest in our grid and improve reliability. Please reject these latest rate increase requests. Thank you for your time and consideration.
				Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile,

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U-21870-0056-CC	07/29/25	Kimberly Stiglich-Myers	1	<p>Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Senior citizen's can't afford anymore price hikes! Ridiculous DO SOMETHING Thank you for your time and consideration.</p>
U-21870-0055-CC	07/29/25	Doreen Onthank	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. With the well documented income inequality for most of the population we are seeing higher prices everywhere with no income increase. now is not the time to freeze people out of utilities. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0054-CC	07/29/25	Elizabeth WardDonahue	1	<p>Dear MPSC DTE Rate Case, We have unreliable energy service, in part because Consumers Energy has not kept up their infrastructure. In the neighborhood where I grew up, the power poles have been standing for 75 years. Many still standing with the help of mature trees. Our own pole is so rotted that no utility worker will climb it. It's been bad since we moved here 33 years ago. And, yes, a mature tree holds that pole up. A rate increase is not appropriate until the company is willing to work on updating the infrastructure. We just had a rate increase, yet still have more and longer power outages than anywhere else in the nation. No increase in rates until there is a decrease in outages and an increase in infrastructure improvement. I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>

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U-21870-0053-CC	07/25/25	Julie Johanningsmeier	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. If it were proven that the money would go to those who maintain the infrastructure - utility arborists, and lineman - I wouldn't be opposed. But this is NOT the case. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Why should we be paying for PROFITS. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0052-CC	07/25/25	Steve and Linda Sobel	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. This is no time to ask for another rate increase! Under the Trump Administration where cuts to those working; or simply making cuts where the workplace is useless; Jobs lost and his high tariffs that are just beginning to take affect, prices will be rising on many things we purchase! Please show some caring and withhold your planned increase! Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0051-CC	07/25/25	Jeremy Williams	1	Dear MPSC DTE Rate Case, Many residents are suffering at the cost of living here in Michigan. We have a beautiful state in which we all love. Raising the energy cost will eventually result in more poverty and potentially even more residents leaving our beautiful state. I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please

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				reject Consumers Energy's latest rate increase request. Thank you for your time and consideration. God bless
U-21870-0050-CC	07/25/25	Jody Spangenberg	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. As someone on a fixed income, I am struggling to pay my electric bill every month. I have to set the thermostat to an uncomfortable temperature in both the summer and winter in an attempt to keep my bill in a range that I can pay every month. Yes, I am on the budget plan. I avoid using my electric stove, or my electric clothes dryer also. I only take cool showers twice a week so my water heater doesn't run. Nobody with a disability should have to live like this just to not have their power shut off. I bet few, if not none of you on this commission have to consciously have to take these steps. Do you walk around turning off power strips every day? Do you sit in the dark in the evenings to avoid turning on your lights? This will hurt disabled people and seniors the most. Find a way to pay for the increased energy all these new data centers consume somewhere else. Maybe charge them more? I'm sure they get a discounted energy cost that isn't available to other Michiganders. Please reject Consumers Energy's latest rate increase request.
U-21870-0049-CC	07/23/25	Peter Ponzetti III	1	Michigan Public Service Commission (MPSC): Please oppose the Consumer's Energy Electricity Rate Hike request of 10% (and \$24 million in deferred fees) AND the Natural Gas Hike request of \$248 million (6.22%). Please fight for Michigan citizen consumers in these fiscally precarious times. Thank you.
U-21870-0048-CC	07/22/25	Francesca Konieczki	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. Consumers Energy was just approved for a hundreds of million dollar increase in March. These constant rate hikes are making our energy unaffordable. I can barely afford my energy costs as the increase in March someone who is on a fixed income and I can't imagine if double that amount was charged for my DTE bill from the last increase. It would cut into my food costs Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and all your staff does.

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U-21870-0047-CC	07/22/25	Mike Austin	1	<p>During the summer months, we have a huge increase in electric rates each weekday between 2-7 PM. Younger people are often at work during those hours, so it does not affect them, but on the weekend, when they are home, the rates go back to normal during those hours. So they can enjoy running the air conditioner on the weekends when they are home. But senior citizens, like us, have to suffer through the heat each weekday afternoon, or pay a huge rate increase. My wife is [REDACTED] years old, and finds it hard to breathe in the hot, humid air. Last month we kept the air on during that 2-7 PM period, to help her, and our bill was \$391.65. Whoever came up with this plan of raising the rates, obviously did it with younger people in mind, who would not really care if their air conditioners were running during those hours. But this plan definitely hurts the elderly people who are home weekdays during those hours, and discriminates against them. I think that senior citizens should be exempted from this huge summer afternoon rate increase, and should be able to have the normal rates. May the Lord bless you</p>
U-21870-0046-CC	07/15/25	Emily Baker	1	<p>Dear MPSC DTE Rate Case, Writing as a member of a family who relies on Consumers Energy for one of our houses, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. My family has personally experienced this several times, many of which Consumers could have prevented by identifying and removing dead or dying trees in danger of falling on a line with proper time and care. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid, maintain lines properly, and minimize risks to them. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0045-CC	07/03/25	Becca Auten	1	<p>I'm not sure if this is the right place to send this but I saw consumers wants to hike rates again and I hope that it gets voted down. It's already ridiculously expensive and should be voted down</p>
U-21870-0044-CC	07/03/25	unknown unknown	1	<p>Please don't give Consumers Energy another rate hike. I am [REDACTED]and live alone and my bill is already between 2 and 4 hundred dollars a month.pretty soon I'll have to sell my house. They only give seniors a 3 dollar a month discount.</p>
				<p>To The Michigan Public Service Commissioners, How can you</p>

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U-21870-0043-CC	07/03/25	Carolyn Edwards	1	<p>raise the power fees at this time, when I can barely afford my living and housing needs as it is. I am on Social Security and rely on assistance to meet my needs, and the assistance (SS & DHHS) barely covers them as is. An added increase in rates would likely put my ability to maintain my housing at risk. I am [REDACTED] years old, have [REDACTED] and [REDACTED] disabilities, as well as a some [REDACTED]. This request will put myself, and thousands like me at risk of becoming homeless. Please don't approve further rate increases at this time. Respectfully begging for help, Carolyn Edwards</p>
U-21870-0042-CC	07/01/25	Beth Pfoutz	1	<p>Ms. Nessel & MPSC, I am reaching out to you regarding the recent requests by Consumers Energy & DTE. I am EXTREMELY upset that any rate increase would be considered at this time. From my understanding a rate increase was approved in Jan. 2025 & the power companies have already made hundreds of millions of dollars. I also understand that the power companies were given substantial tax dollars in effort to NOT try to raise fees for consumers again. I resident in a 3 bedroom ranch house in Chelsea Michigan. I am including pictures of my DTE bills for Feb. & March of this year so you can see that there is NO exaggeration. I do have an electric furnace, which no surprise, the power companies want to force into having to use electricity for everything in our homes. Could it be that they make more off of us from electricity than gas? My thermostat was never over 70 degrees for 8 hours a day, then back down to 65. I spent countless hours splitting wood, which I used all winter to assist in keeping the electric bill down, and still got what you can see in my attachment. In Feb. 2025 I received a \$906.37 bill, \$427.30 of which were distribution fees. When I looked up what they are, on the DTE website it says they are for delivery to home, maintenance & reliability. I ask this, is that not why they received millions of tax dollars to prevent? Yet, an increase was already approved once this year. I also heard a report on NPR about how Michigan residents pay more than ANY other Midwestern state for our power already. I am a [REDACTED] year old social worker who has lived in Michigan most of my life & love it here. I work for Washtenaw County & was paid \$54,000 last year for full time work, working with disabled adults with a college degree. The income needed to live a decent life in our country is \$80,829-180,000, & I'm sure much more in Washtenaw County thanks to the U of M owning 65% & paying no taxes, so lucky us, we get to keep paying for an entity that brings in around 19 Billion dollars a year & keeps buying more & more of the county without contributing a penny. In an environment in which the general public is struggling to maintain their housing & basic needs, the growing rates of working people & families becoming homeless with no assisting resources available, I can't comprehend how allowing the ongoing Gouging of the public for a basic need by companies who have been receiving record profit margins, could or would possible be contemplated.</p>

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			<p>But, yet it is. As a tax paying citizen of Michigan, I am BEGGING you to NOT do this to us. Over 67% of the population is NOT paid a living wage, including myself. If the monopolization of power companies is not working, why is this service not being diversified? This would allow for competition which lowers costs, as well as to provide for more companies to share maintenance costs. I firmly believe that divirsication of the power companies in our state is REQUIRED to end the money gouging that is currently occurring for a basic need for survival. But, again, PLEASE, PLEASE, DON'T ALLOW THEM, CONSUMERS ENERGY & DTE, TO FINANCIALLY BLEED US TO DEATH! I would appreciate the respect of an response to my email from both of you explaining this to me. Also, please don't share my DTE account information with anyone. I wanted you to see for yourself what they are doing to us.</p>
<p>https://mi-psc.my.site.com/sfc/servlet.shepherd/version/download/068cs0000xBkc0AAC</p>			
<p>U-21870-0041-CC</p>	<p>07/01/25</p>		<p>Ms. Nessel & MPSC, I am reaching out to you regarding the recent requests by Consumers Energy & DTE. I am EXTREMELY upset that any rate increase would be considered at this time. From my understanding a rate increase was approved in Jan. 2025 & the power companies have already made hundreds of millions of dollars. I also understand that the power companies were given substantial tax dollars in effort to NOT try to raise fees for consumers again. I resident in a 3 bedroom ranch house in Chelsea Michigan. I am including pictures of my DTE bills for Feb. & March of this year so you can see that there is NO exaggeration. I do have an electric furnace, which no surprise, the power companies want to force into having to use electricity for everything in our homes. Could it be that they make more off of us from electricity than gas? My thermostat was never over 70 degrees for 8 hours a day, then back down to 65. I spent countless hours splitting wood, which I used all winter to assist in keeping the electric bill down, and still got what you can see in my attachment. In Feb. 2025 I received a \$906.37 bill, \$427.30 of which were distribution fees. When I looked up what they are, on the DTE website it says they are for delivery to home, maintenance & reliability. I ask this, is that not why they received millions of tax dollars to prevent? Yet, an increase was already approved once this year. I also heard a report on NPR about how Michigan residents pay more than ANY other Midwestern state for our power already. I am a [REDACTED] year old social worker who has lived in Michigan most of my life & love it here. I work for Washtenaw County & was paid \$54,000 last year for full time work, working with disabled adults with a college degree. The income needed to live a decent life in our country is \$80,829-180,000, & I'm sure much more in Washtenaw County thanks to the U of M owning 65% & paying no taxes, so lucky us, we get to keep paying for an entity that brings in around 19 Billion dollars a year & keeps buying more & more of the county without contributing a penny. In an environment in</p>

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				<p>which the general public is struggling to maintain their housing & basic needs, the growing rates of working people & families becoming homeless with no assisting resources available, I can't comprehend how allowing the ongoing Gouging of the public for a basic need by companies who have been receiving record profit margins, could or would possible be contemplated. But, yet it is. As a tax paying citizen of Michigan, I am BEGGING you to NOT do this to us. Over 67% of the population is NOT paid a living wage, including myself. If the monopolization of power companies is not working, why is this service not being diversified? This would allow for competition which lowers costs, as well as to provide for more companies to share maintenance costs. I firmly believe that divirsication of the power companies in our state is REQUIRED to end the money gouging that is currently occurring for a basic need for survival. But, again, PLEASE, PLEASE, DON'T ALLOW THEM, CONSUMERS ENERGY & DTE, TO FINANCIALLY BLEED US TO DEATH! I would appreciate the respect of an response to my email from both of you explaining this to me. Also, please don't share my DTE account information with anyone. I wanted you to see for yourself what they are doing to us.</p>
U-21870-0040-CC	07/01/25	Joanne Joslin	1	<p>Regarding their latest rate increase request, I would like to express my opinion that their current rates are already higher than necessary. Also, their plan to run new lines along a new path...I feel that they should be restricted to using the easements that they already have rather than destroying families livelihoods to suit their wants.</p>
U-21870-0039-CC	07/01/25	Branden Smith	1	<p>Hi my name is Branden Smith and I broke my back in 2009 have had 3 back surgeries since. I loved working and it made me want to [REDACTED]. I'm thankful for Disability and at the same time with rent always going up how are we supposed to survive if Consumers energy keeps hiking up the price and for what?? So the CEO's can make millions?? I mean if the average person can't afford the hundreds they charge are at risk of shut off. Use government and nonprofit organizations to help pay, why do the CEO's make so much. Government should take over the electric company. It would save the American people Billions cause there's not one person that should be Robbing the poor and the government while giving one person millions. I mean c'mon can I get 1 million and I'll pay it all to consumers so I won't have to struggle. I need air in summer or my health issue will kill me. 300+/month on a small 3 bedroom house. I mean small. Same with insurance. Why do we need different insurance from different agencies?? Life, health, house, vehicles?? Do you see how this only screws people so they can't fix the car or repair the house and even digs into the grocery bill. I'm just lost why?? Why does one person make away with Robbing the public? C'mon one CEO made 25 million and yet they are hiking prices for us. If you</p>

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				want to make America Great find a solution to this broken system. Before everyone ends up at these overly Rich just to enjoy heat and eat since we are the ones suffering
U-21870-0038-CC	06/30/25	Mary Ann Yaeger	1	I urge you to reject Consumers Energy's rate increase request. I volunteer for several non-profits that address food insecurity. With all the penalties that will hurt lower-income Americans by Trump's reconciliation bill, Michigan households are in NO POSITION to pay any more for energy to heat or power their homes (if they still even have one). We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. That salary makes NO SENSE. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0037-CC	06/30/25	Suzann Ogland-Hand	1	I urge you to reject Consumers Energy's rate increase request. Please! We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0036-CC	06/30/25	Fran Van Howe	1	I urge you to reject Consumers Energy's rate increase request. We truly cannot afford them, I am speaking for the Seniors and 20-30year old people in my family. Yes, we have some of our college graduates living back at home because of the cost of housing Give us a break. Some 45 percent of young people cannot afford to live away from the parents home, let alone the struggling young families with two parents working and child care costs. HELP!!! We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please

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				reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0035-CC	06/30/25	Georgia Griffin	1	It is unconscionable to approve a rate increase for Consumers Energy in light of their record profits. I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0034-CC	06/30/25	Ben Pinti	1	I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. As a Consumers Energy customer I highly recommend you tell them enough is enough, their customers are tired of price increases that mostly help their bottom line and reward their management, who are already overpaid. Thank you for your time and consideration.
U-21870-0033-CC	06/25/25	Gwen Knapper	1	Dear MPSC DTE Rate Case, They have so many fees and other charges on the electric bill, they need to get rid of some of them. My electric will go out on a clear sunny day with no wind. It just happened again 2 weeks ago for 6 hours they said it was equipment failure, I should get a credit on my bill.. I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using

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				those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0032-CC	06/25/25	Cathy Hyska	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Most people are lucky to get a 2-3% raise a year, that can't keep up with all the constant increases in food, products and services. They have a budget they have to try to make work. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Why is it we are losing thousands of acres of prime farmland to solar farms, using energy efficient products and yet rates continue to rise? Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0031-CC	06/25/25	Dorrie Sarhad	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. Consumers Energy has already taken advantage of too many people in Michigan, myself included. I spent over a year clearing up a \$3k screw up that happened when they switched over their meters, and a lot of my friends and family had the same happen to them. Their customer service is horrible, their billing is a joke, and every time you try to contact someone about it it's an even bigger joke. Half the time I got hung up on by customer service reps for little things like saying "this is ridiculous" or asking for a supervisor. They need to take the money they've been given by their customers and focus on upgrading administration and customer service issues. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
				Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile,

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U-21870-0030-CC	06/23/25	Marjorie Switzanowski	1	Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. We can't continue to pay more as we already use led bulbs and conserve energy but pay increasingly more for using less. This makes no sense! Thank you for your time and consideration.
U-21870-0029-CC	06/23/25	KarenLea Cole	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. So many of us are on fixed income , only S.S. Money seems to mean more to them than the well being of regular people . How much money is enough for them ? Please not another hike !!!! Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0028-CC	06/23/25	Ali Kosiara	1	Dear MPSC DTE Rate Case, Please do not do this. Consimers already jacked rates. They dont care about consumer. They sprayed my grape vines and pine trees and killed them. My power goes out four days at a time. And no compensation for. I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
				Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million

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U-21870-0027-CC	06/23/25	Renea Semeneck	1	increase in March. These constant rate hikes are making our energy unaffordable. I live below the poverty level and they just raised my rates by 61%! ENOUGH!!!! Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0026-CC	06/23/25	Richard Bird	1	Dear MPSC DTE Rate Case, I urge you to EXAMINE Consumers Energy's rate increase request. I have been pleased with dependability increasing over recent years. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes could make our energy unaffordable. Consumers Energy has raised our rates in recent years. Instead of maintaining record profits, Consumers Energy could be using those funds to truly invest in our grid. Please use your considerable knowledge to rate or not grant customer rate increase. Thank you for your time and consideration.
U-21870-0025-CC	06/23/25	Karyn Maddock	1	Dear MPSC DTE Rate Case, PLEASE PLEASE I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0024-CC	06/20/25	Sarah Martin	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Put customers before profit! Thank you for your time and consideration.
				I am totally against Consumers Energy electricity rate hike

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U-21870-0023-CC	06/19/25	Lenora Evennou	1	<p>request for an additional 12.9% or any part of that percent. I am also against the \$12 million of deferred fees that they would like to collect beginning in 2026. How much more can the average consumer take? We are paying increased prices for just about everything under the sun. We struggle to put food on our tables. We are being forced to shift our daily activities to an inconvenient time due to 1 1/2 times the regular electric rate from 2 p.m. to 7 p.m. Mon thru Fri. Consumers can pay for whatever upgrades they seem to need out of the billions in profit they already make JUST SAY NO to their request. This will never stop and we will be forced into living a primitive life style without natural gas or lights. I am also sending in letters to you and the Attorney General that have been signed by many . I am also passing out flyers to hundreds of people to make them aware of this request , along with addresses where they can submit their concerns. I hope that you take the people's voice seriously. These greedy practices need to stop.</p>
U-21870-0022-CC	06/17/25	Laura Rose	3	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. I can't afford any higher bills. Most of us can't. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0021-CC	06/17/25	Amber Wright	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration. They ask for a raise every year and every year the Michigan government pretends to be shocked. They still allow it to happen every single time they ask. I can't afford to pay my bills let alone have the cost of a bill I can't get rid of go up. Consumers and DTE have a monopoly in Michigan. I can't</p>

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				switch energy companies where I live. Theres no reason for them to be consumer friendly. Please don't allow greed to ruin the lives of your average citizen
U-21870-0020-CC	06/17/25	Gwen Knapper	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration. My electric was just out this morning (06/16/2025) for several hours. Good weather, no wind, no rain, clear skies the moon was bright. Why????
U-21870-0019-CC	06/17/25	Kathy Clemons	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We are retired, live on fixed income. Our electric bills are outrageous, Consumers Energy has too many added items added to the bills already. We are charged, PSCR(not sure what that is) System access,Deferral charge,IRM Surcharge,DistributionFCM Surcharge, other Surcharges,Power Plant Securitization, Karn 1&2 Securitization charge,DR Surcharge,Low-income Assist Fund. In my May 2025 bill all of those extra charges were \$354.86. The actual electric was \$153.31. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0018-CC	06/16/25	Cindy Krueger	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly

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				invest in our grid. Please reject Consumers Energy's latest rate increase request. I am on SSA providing for my daughter and 2 grandsons on \$1500. a month and have been paying \$190. a month for electricity for over 2 years for a 900 sq. ft apt. And now it will increase due to Marchs rate increase AND THEY WANT MORE!! ENOUGH ALREADY WE WILL HAVE TO LIVE ON THE STREETS.
U-21870-0017-CC	06/16/25	Kim Marciniak	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Rates are the worse than ever. Consumers continually asks for rate raise real times a year. Enough is enough. Stop approving rates. We should be getting rebates not raises. Thank you for your time and consideration.
U-21870-0016-CC	06/16/25	Kim Fink	1	Dear MPSC DTE Rate Case, I can't afford to live in Michigan if I can't pat my electric. I'm disabled & on a [REDACTED] machine. I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0015-CC	06/13/25	Paula Horton	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. We do not get increases in our social security checks to cover these costs! We have to budget and keep within that budget just like Consumers Energy should do! Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy

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				should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0014-CC	06/13/25	Tonya Linck	1	Stop increasing our consumer energy and property tax In Michigan you are killing us with your [REDACTED]taxes and you're raising of our electric bills. This is gotta stop. Thank you.
U-21870-0013-CC	06/13/25	Terri Reichhart	8	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. We can barely make the payments now!!! Quincy's other electric company is way lower but they don't reach my area so I'm stuck with Consumers. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
U-21870-0012-CC	06/12/25	Tonya Linck	1	Stop raising our consumers bill in Michigan
U-21870-0011-CC	06/12/25	Kyle Tenhaaf	1	Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Over the last 15 years as customers we've lost power countless times. Sometimes for up to 6 days during the winter. We've lost money from buying generator gas, having to stay somewhere else, losing food, and despite upgrading almost all appliances to energy efficient, avoiding extra use during peak summer hours, and using solely led lights our bill keeps climbing. Our electric bill is nearly the cost of full coverage insurance on both of our vehicles combined. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.
				Dear MPSC DTE Rate Case, Please reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while

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Case Number U-21870

U-21870-0010-CC	06/09/25	Vivian Abramowitz	1	<p>paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was _just approved_ for a \$154 million increase in March. Consumers Energy has raised our rates repeatedly in recent years, but is not using those funds to truly invest in our grid. In the last few years, I've suffered through 3-5 day outages and the loss of up to \$500 worth of fresh and frozen food-repeatedly. Tell them NO. Thank you for your time and consideration.</p>
U-21870-0009-CC	06/09/25	Pamela Bloink	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. I am disabled and living on Social Security. I put in a new HVAC system in 2022 that I'm still paying for. I can't afford higher utility bills. I already keep the temp up to 79 or 80 all summer. I can't keep it any higher. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0008-CC	06/09/25	Gloria Baldwin-Wilson	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. I am a senior living on a fixed income. My energy costs for my small home have more than doubled in the past 7 years. That's even after having energy-saving work done on the building and installing a heat pump. I cannot afford ever-increasing prices, ESPECIALLY when the current Federal Administration is planning to cut energy assistance programs. Thank you for listening.</p>
U-21870-0007-CC	06/09/25	Allyssa Crump	1	<p>Dear MPSC DTE Rate Case, Thank you for taking the time to read this; I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Temperatures will only increase and more and more families will be unable to stay comfortable with energy costs like this. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>

MICHIGAN PUBLIC SERVICE COMMISSION
Case Number U-21870

U-21870-0006-CC	06/09/25	Deborah Ten Brink	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We're already hit with high inflation, high natural gas hikes, tariffs, can't afford high automobile insurance, food prices are through the roof, we're losing our Medicare, Medicaid, Social Security here in Michigan. We can't take another hit! They just got a rate hike! Where's our raises? Our tax cuts? Our deals? We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0005-CC	06/09/25	Ben Pinti	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. As a Consumers customer I feel I already pay enough! Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0004-CC	06/06/25	Pamela Erbe	1	<p>Dear MPSC DTE Rate Case, I urge you in the strongest possible terms to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. A report that you received last year spells out how Consumers Energy uses the income from those rate hikes NOT to improve our profit, but rather to buy back stocks and increase pay to the already overpaid executives. This should not be tolerated. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>

MICHIGAN PUBLIC SERVICE COMMISSION
Case Number U-21870

U-21870-0003-CC	06/06/25	Christina Linguidi	1	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. My daughter has complex medical needs and as a single parent because her father passed away of cancer I can already not afford our electric bill like this will force us to have to move out of state somewhere where it's cheaper because this is getting out of control. They already make a ton of money yet they are drowning families who are just trying to survive. Where does it end? When does someone tell them know? When does someone stand up for us the people? Thank you for your time and consideration.</p>
U-21870-0002-CC	06/06/25	Susan Kirschner	1	<p>Dear MPSC DTE Rate Case, Please reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation YET WE PAY THE HIGHEST energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year! How can that be justified? Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>
U-21870-0001-CC	06/06/25	Susan Farquahar	1436	<p>Dear MPSC DTE Rate Case, I urge you to reject Consumers Energy's rate increase request. We suffer some of the most frequent and prolonged power outages in the nation while paying the highest energy rates in the Midwest. Meanwhile, Consumers' CEO makes more than ten million dollars a year. Consumers Energy was just approved for a \$154 million increase in March. These constant rate hikes are making our energy unaffordable. Consumers Energy has raised our rates repeatedly in recent years. Instead of maintaining record profits, Consumers Energy should be using those funds to truly invest in our grid. Please reject Consumers Energy's latest rate increase request. Thank you for your time and consideration.</p>

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

Re: Case No. U-21870 – Consumers Energy Rate Increase

Dear Ms. Felice,

I am writing to formally comment on Case No. U-21870 and to urge the Commission and decision-makers to fully consider the impact of yet another Consumers Energy rate increase on Michigan residents.

Consumers Energy's parent company, CMS Energy, reported nearly \$1 billion in profits in 2024, an increase of more than 13% from the prior year. Despite this strong financial performance, Consumers Energy raised rates in April and has now requested *another* rate increase. As a response, the company set aside a mere \$2 million for low-income individuals to apply for assistance. This sum pales in comparison to the rate burden being placed on families across Michigan.

Low-income individuals do not want handouts. The process of applying for help carries stigma and uncertainty, and it is deeply unfair for Consumers Energy to profit at record levels while forcing families to **beg** for assistance just to keep the lights on. The average supply charge proposed equates to roughly \$6 per day on average, and the distribution charge is nearly the same, pushing average monthly bills close to \$360. For those working minimum-wage jobs, this cost is simply unsustainable.

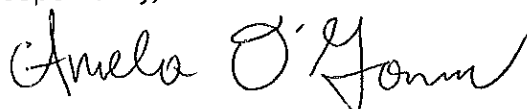
High utility costs can have devastating consequences. As bills rise beyond what families can afford, people will become desperate to stay warm in the winter, potentially resorting to unsafe heating methods that put lives at risk. These rate hikes will do far more harm than good if they continue unchecked.

I urge the Commission to deny further rate increases, consider a rate cut, and revisit the unfair calculation of the distribution charge, which punishes households based on usage even though the cost of maintaining poles and lines does not change.

Michigan families deserve affordable, fair energy rates - not record corporate profits at their expense.

Thank you for your time and for considering the voices of everyday consumers who are struggling under these rate increases.

Respectfully,



Amela O'Gorman
Big Rapids, Michigan

Michigan Public Service Commission
PO Box 30221
Lansing, MI 48909

August 22, 2025

Public Service Commission,

I am asking the Public Service Commission to step in to protect myself and other Consumers Energy customers that are forced to pay to keep the J. H. Campbell power plant in West Olive in operation. Consumers reported to the SEC that it spent \$29 million in the first 38 days of the DOE order to keep the Campbell plant online and it is reported the costs continue at one million dollars per day. These expenditures are not necessary. Furthermore, the plant is a major contributor to air pollution in Michigan, and therefore a physical expense to Michigan residents.

The J. H. Campbell power plant was slated to be closed in May of this year because it is not needed. Consumers Energy must stop wasting money. Consumers wasteful actions cost money that comes from its customers . Please exercise your authority as the Public Service Commission and stop this known waste and overcharge based on keeping this unneeded plant in operation.



John Zang

██████████
Mount Pleasant, MI 48858

CC Board of Directors, Consumers Energy
CMS Energy Corporation, One Energy Plaza, Jackson, MI 49201
Dana Nessel, Michigan Attorney General
G. Mennen Williams Building, 525 W. Ottawa Street, P.O. Box 30212, Lansing, MI 48909

June 14, 2025

MPSC
P.O. Box 302221
Lansing, MI 48909

Re: Consumers Energy Case # U-21870

TO WHOM THIS MAY CONCERN:

As a concerned citizen and registered voter living in Genesee County, Michigan, I am sending this letter of concern regarding Consumers Energy Case # U-21870. Consumers Energy has also requested an additional \$24 million of deferred fees to be collected by their residential customers to be collected in 2026.

Their requested electricity rate hike of 10% is unacceptable in my opinion. If this rate hike (or any part of it) is approved by the MPSC it will add detrimental hardships to the thousands upon thousands of customers who are already enduring financial hardships during this time of sky-high inflation.

Also, Consumers Energy customers are being forced to pay 1 ½ times the electricity rate from June through September on Mondays – Fridays, from 2:00 p.m. until 7:00 p.m., causing additional hardships for most of their customers. Why are we still being forced to pay this extra cost during the prime time of our daily schedules? This needs to stop. Why should we have to disrupt our daily schedules to avoid this Consumers Energy ploy for them to collect more money from the American people. Most people have forgotten the original reasons for this increase in electricity rates. Now, they want to hit us with even more rate hikes. They are taking advantage of their customers.

Utilities, including electricity, are a necessity for modern life, providing us with comfort and protection from adverse weather and darkness. Electricity is used to light our homes in times of darkness (decreasing criminal activity), used to cool our homes in times of excessive heat and to power up our furnaces to keep us warm during cold weather. To go without electricity and natural gas would send us back to primitive times, causing great discomfort and sometimes, even death.

While we struggle to keep food on our tables, maintain adequate health care, pay the price for housing costs, etc., Consumers Energy continues to devise ways to line their own pockets on the backs of the median and low income customers.

Year after year Consumers Energy keeps requesting and being approved for rate hikes, pushing these increased rates onto the backs of struggling Americans. Does Consumers Energy really need this increase? I dare say, NO!

The power company is holding American people hostage by forcing us to pay increasing rates to remain comfortable in our homes.

Their administrative personnel should be able to manage their massive amounts of profits to cover the cost of upgrading power lines and power grids. These are regular costs of doing business. If my roof, hot water heater, or furnace need to be replaced I must pay the cost of replacement from my own budget. I cannot pass this cost unto anyone else. (A regular cost of life.) So why should Consumers Energy be allowed to pass their extra costs onto their

KAREN THOMPSON	Grand Blanc	MI	48507	Karen Thompson	6-15-25
Print Name	City,	State	Zip	Signature	Date

PROSS THOMPSON	Grand Blanc	MI	48507	[Signature]	[Date]
Print Name	City,	State	Zip	Signature	Date

BILL STRICKLER	Beech Run	MI	48512	Bill Strickler	6-15-25
Print Name	City,	State	Zip	Signature	Date

AMANDA CHARVAT	Midland	MI	48640	[Signature]	6-15-25
Print Name	City,	State	Zip	Signature	Date

LINDA SWELL	Mt Morris	MI	48458	Linda Swell	6-15-25
Print Name	City,	State	Zip	Signature	Date

JOHN W JEANING	Flint	MI	48504	John Jeaning	6/15/25
Print Name	City,	State	Zip	Signature	Date

AMBER FUHR	Mt. Morris	MI	48458	Amber Fuhr	6-15-25
Print Name	City,	State	Zip	Signature	Date

REBECCA PARKER	Mt Morris	MI	48458	Rebecca Parker	6.15.25
Print Name	City,	State	Zip	Signature	Date

NANCY TUCKER	Mt Morris	MI	48458	Nancy Tucker	6-15-25
Print Name	City,	State	Zip	Signature	Date

ASHLEY DURHAM	Mt. Morris	MI	48458	Ashley Durham	6-15-25
Print Name	City,	State	Zip	Signature	Date

JONATHAN WILSON	Mt Morris	MI	48458	Jonathan Wilson	6/15/25
Print Name	City,	State	Zip	Signature	Date

RUTH WILSON	Mt Morris	MI	48458	Ruth Wilson	6/16/25
Print Name	City,	State	Zip	Signature	Date

STEPHANIE LARKIN	Clio	MI	48420	Stephanie Larkin	6/17/25
Print Name	City,	State	Zip	Signature	Date

BRANDON GIFFORD	Mt. Morris	MI	48458	Brandon Gifford	6/17/25
Print Name	City,	State	Zip	Signature	Date

LOREN GRANO	Mt Morris	MI	48458	Loren Grano	6/17/25
Print Name	City,	State	Zip	Signature	Date

BETHANY GORDON	Clio	MI	48420	Bethany Gordon	6-18-25
Print Name	City,	State	Zip	Signature	Date

Print Name	City,	State	Zip	Signature	Date
Diana Brock	Mt Morris	MI	48458	Diana Brock	6-18-25

Print Name	City,	State	Zip	Signature	Date
DIANA SNEED	CLIO	MI	48420	Diana Sneed	6-18-25

Print Name	City,	State	Zip	Signature	Date
CHARLES SNEED	CLIO	MI	48420	Charles Sneed	6-18-25

Print Name	City,	State	Zip	Signature	Date
BETTY Murphy	CLIO	MI	48420	Betty Murphy	6-18-25

Print Name	City,	State	Zip	Signature	Date
SANDRA KLEINOW	BURTON	MI	48509	Sandra Kleinow	6-18-25

Print Name	City,	State	Zip	Signature	Date
JULIE ANTHONY	Lennon	MI	48449	Julie Anthony	6-19-25

Print Name	City,	State	Zip	Signature	Date
ELAINE TUSZUK	CLIO	MI	48420	Elaine Tuszuk	6-19-25

Print Name	City,	State	Zip	Signature	Date
Sherry Powell	Swartz Creek	MI	48473	Sherry Powell	6-19-25

Print Name	City,	State	Zip	Signature	Date
Angela Smith	FLINT	MI	48504	A. Smith	6/19/25

Print Name	City,	State	Zip	Signature	Date
Cassie Bomba	FLINT	MI	48504	Cassie Bomba	6-23-25

Print Name	City,	State	Zip	Signature	Date
Joseph Lucas, Jr	FLINT	MI	48504	Joseph Lucas, Jr	6-23-25

Print Name	City,	State	Zip	Signature	Date
Patrick Lavrain Jr	Essexville	MI	48732	Patrick Lavrain Jr	6-23-25

Print Name	City,	State	Zip	Signature	Date
Tonya Williams	Battle Creek	MI	49015	Tonya Williams	7-15-25

Print Name	City,	State	Zip	Signature	Date
David J. Brown	FLINT	MI	48506	Dave J Brown	7-17-25

Print Name	City,	State	Zip	Signature	Date
JEFF P Gattow	FLINT	MI	48505	Jeff Gattow	7-17

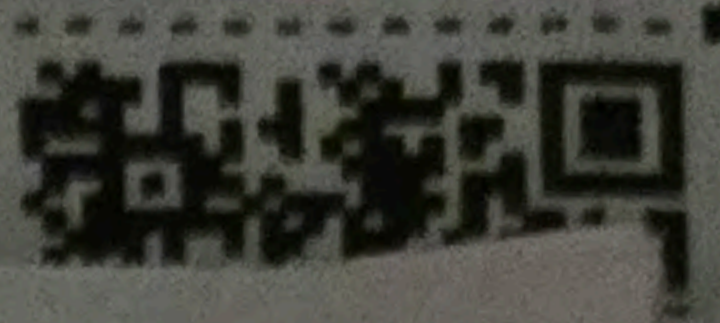
Print Name	City,	State	Zip	Signature	Date
JOSEPH P LAURAIN	Mt Morris	MI	48458	Joseph P Laurain	7-17-25

Print Name	City,	State	Zip	Signature	Date
WAYNE Joseph NVarre	FLINT	MI	48504	Wayne NVarre	7-18-25

200065663452

Return upper portion with your payment

SCAN CODE WITH PHONE FOR QUICK AND SECURE PAYMENT PROCESS!



For the average Michigan residential customer, renewable energy is estimated to avoid \$3.08 per month of new coal-fired generation costs.

Your account is past due. Please pay the past-due balance now. To pay by phone, call us at 800.477.4747. If paid, please disregard this notice.

Average temperatures for this billing period were 10.47 degrees colder than last billing period. As a result your appliances may be working harder to make you feel more comfortable.

Other Information

Detail of Current Charges

For Service at 13499 Riker Rd, Chelsea, MI

DTE Electric Company Residential Electric Service - Time-of-Day Pricing

Current Charges

Power Supply Charges

On Peak Capacity Charge	1404.772 @ 0.014270	20.05
Off Peak Capacity Charge	3846.552 @ 0.005470	21.04
On Peak Non Capacity Charge	1404.772 @ 0.117830	165.52
Off Peak Non Capacity Charge	3846.552 @ 0.045120	173.56
Power Supply Cost Recovery	5251.324 @ 0.002500	13.13
Other Power Supply Volumetric Surcharges		7.53

Delivery Charges

Service Charge		8.50
Distribution	5251.324 @ 0.081370	427.30
LIEAF Factor		0.87
Other Delivery Volumetric Surcharges		31.33
Residential Michigan Sales Tax		34.72
Total DTE Electric Company Current Charges		903.55

Current Billing Information

Service Period	Dec 24, 2024 - Jan 24, 2025
Days Billed	32
Meter Number	9268205 17
Meter Reading	39140.742 Actual - 44392.066
KWH Used	5251.32400
Your next scheduled meter read date is on or around Feb 2025	

Usage History - Average per day

	Current Month	Last Month	Year Ago
KWH Usage	164.1	129.8	130.2
Change		26%	26%

Other Charges and Credits

Late Payment Charge	0.05
Total Other Charges and Credits	0.05

Total Current Charges

903.60

You Smell Natural Gas and DTE Gas Company is Your Natural Gas Provider, Call 800.947.5000

When Your Electricity Goes Out

Check your fuses or circuit breakers, then see if your neighbors' lights are on. To report an outage or fallen power line, contact your electric company. If it's touching, including metal fences and puddles.

Electricity Theft is illegal & dangerous

Immediately report suspected tampering by calling our theft hotline at 800.441.6698.

More Information

For more information on your bill or alternative payment methods, call 800.477.4747, visit dteenergy.com, or write to DTE Energy, One Energy Plaza

DTE Electric Company and DTE Gas Company are DTE Energy subsidiaries and are regulated by the Michigan Public Service Commission, Lansing, Michigan.

Contact Information

Programs you are enrolled in

Gas Leak or Gas Emergency 800.947.5000
 Customer Service or Power Outage 800.477.4747
 Hearing-Impaired TDD Line 800.888.6886 (Mon-Fri 8am-5pm)
 Web Site dteenergy.com

Summary of Charges

Account Number

Account Balance as of Jan 27, 2025	906.37
Payment Received Feb 10, 2025 Thank You!	- 903.60
Balance Prior to Current Charges	2.77
Total Current Charges	838.92
Account Balance as of February 26, 2025	\$841.69

Your current charges are due on March 20, 2025. A 2% late payment charge will be applied if paid after the due date.

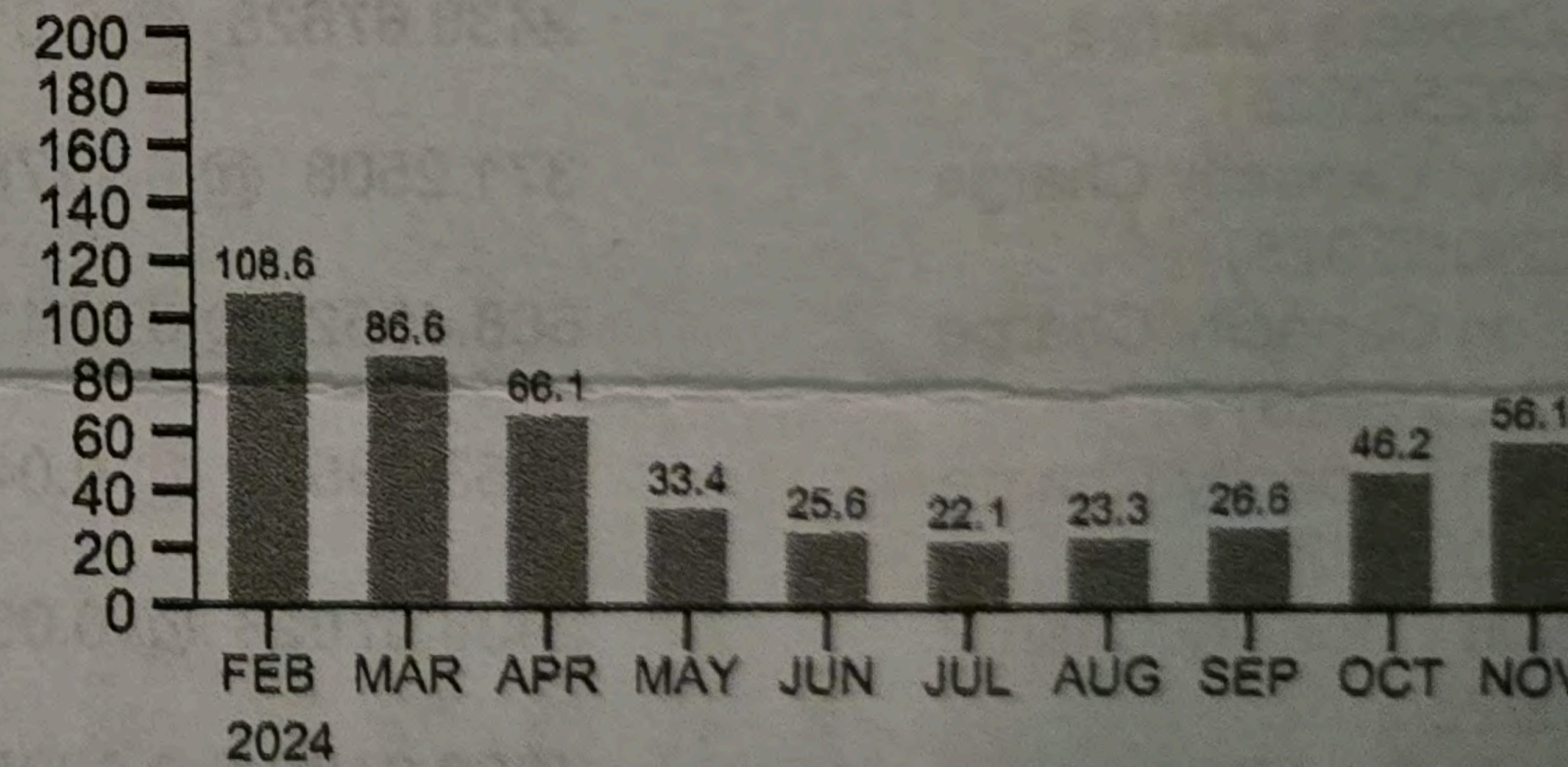
Your Monthly Energy Usage

For ways to save energy and save money, go to dteenergy.com/saveenergy

ELECTRIC

KWH

Average Usage per day			
	Current Month	Last Month	Year Ago
KWH Usage	150.9	164.1	108.6
Change		-8%	39%



Your average daily electric cost for this billing period was \$26.21

Important Information

Account Information

The Michigan Public Service Commission recently approved price changes on your bill. These changes to distribution prices support an investment request to accelerate the generation of clean energy and improve service for customers. There was also a small increase in the Nuclear Surcharge. These new changes are being offset by a bill reduction in the Power Supply Cost Recovery (PSCR) factor applied in November 2024. Your actual charges will vary depending on your monthly usage.

The Infrastructure Recovery Mechanism (IRM) surcharge is being increased on this bill. The IRM recovers certain distribution system investments. The IRM surcharge is included in the Other Delivery Volumetric Surcharge and has increased from 0.0139 cents per kWh to 0.0941 cents per kWh.

Your bill this month reflects an update to the Energy Waste Reduction Surcharge (EWRS) recently approved by the Michigan Public Service Commission in Case No. U-21558. The EWRS is included in Other Delivery Volumetric Surcharge and has increased from 0.2552 cents per kWh to 0.2699 cents per kWh.

Contact Information

Gas Leak or Gas Emergency 800.947.5000
 Customer Service or Power Outage 800.477.4747
 Hearing-Impaired TDD Line 800.888.6886 (Mon-Fri 8am-5pm)
 Web Site dteenergy.com

Programs you are enrolled

Summary of Charges

Account Number

Account Balance as of Dec 26, 2024	679.37
Payment Received Jan 10, 2025 Thank You!	- 676.60
Balance Prior to Current Charges	2.77
Total Current Charges	903.60
Account Balance as of January 27, 2025	\$906.37

Your current charges are due on February 18, 2025. A 2% late payment charge will be applied if paid after the due date.

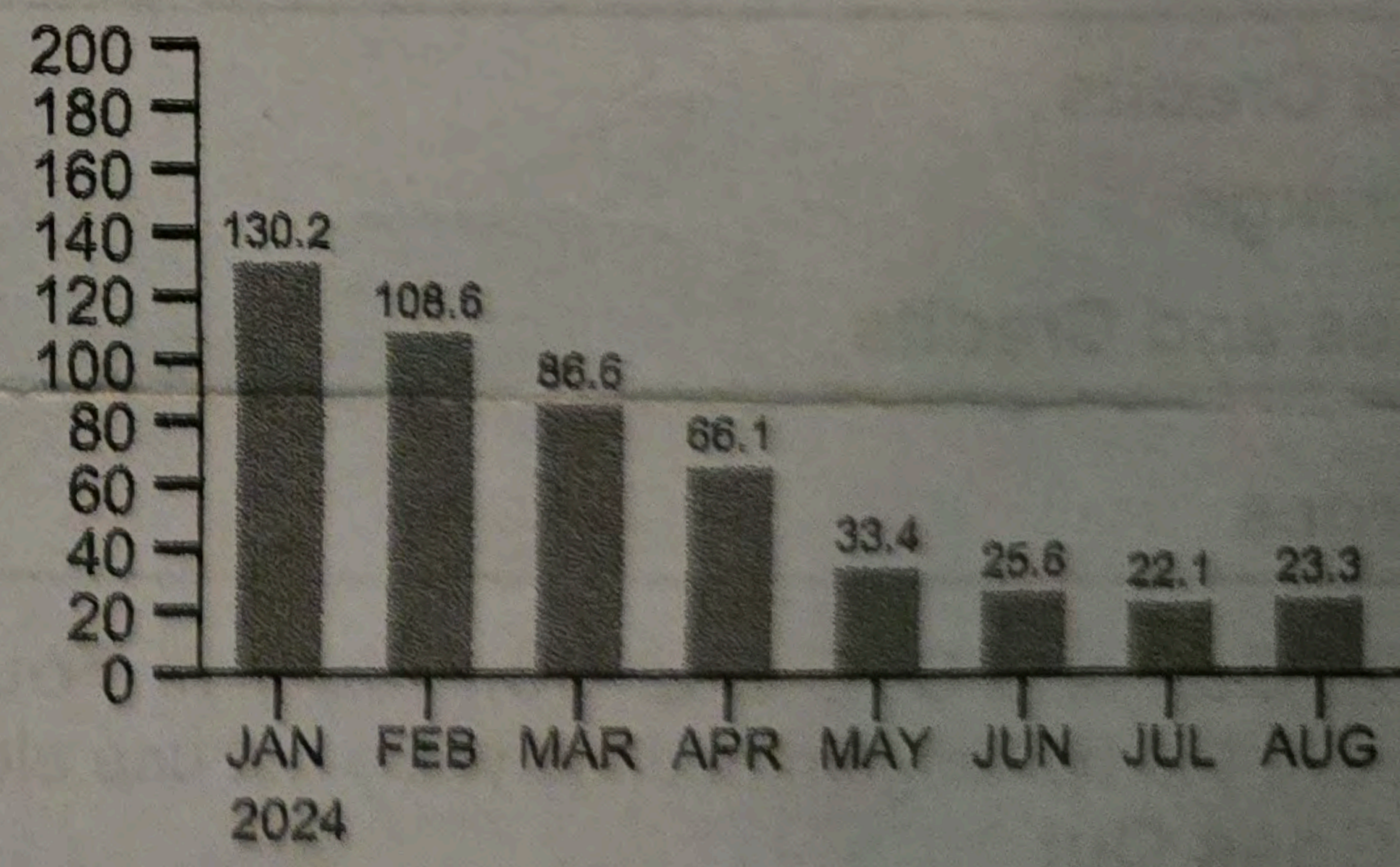
Your Monthly Energy Usage

For ways to save energy and save money, go to dteenergy.com/saveenergy

ELECTRIC

KWH

	Average Usage per day		
	Current Month	Last Month	Year Ago
KWH Usage	164.1	129.8	130.2
Change		26%	26%



Your average daily electric cost for this billing period was \$28.24

Your usage is based on an ACTI

Important Information

Account Information

The Infrastructure Recovery Mechanism (IRM) surcharge is being increased on this bill. The IRM recovers certain distribution system investments. The IRM surcharge is included in the Other Delivery Volumetric charge has increased from 0.0139 cents per kWh to 0.0941 cents per kWh.

Your bill this month reflects an update to the Energy Waste Reduction Surcharge (EWRS) recently approved by the Public Service Commission in Case No. U-21558. The EWRS is included in Other Delivery Volumetric charge and has increased from 0.2552 cents per kWh to 0.2699 cents per kWh.



Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature

Sonal Jessel¹, Samantha Sawyer² and Diana Hernández^{2*}

¹ Helibrunn Department of Population and Family Health, Columbia University Mailman School of Public Health, New York, NY, United States, ² Department of Sociomedical Sciences, Columbia University Mailman School of Public Health, New York, NY, United States

Household energy is increasingly vital for maintaining good health. Unaffordable and inadequate household energy presents adverse consequences that are amplified by poverty and a changing climate. To date, the connections between energy, socioeconomic disadvantage, and well-being are generally underappreciated, and household energy connection with climate change is under-researched. Building on the energy insecurity framework, this review explores literature related to household energy, poverty, and health in order to highlight the disproportionate burdens borne by vulnerable populations in adequately meeting household energy needs. This paper is based on a comprehensive review of books, peer-reviewed articles, and reports published between 1990 and 2019, identified via databases including JSTOR and PubMed. A total of 406 publications were selected as having potential for full review, 203 received full review, and 162 were included in this paper on the basis of set inclusion criteria. From the literature review, we created an original heuristic model that describes energy insecurity as either acute or chronic, and we further explore the mediators and pathways that link energy insecurity to health. In the discussion, we posit that the extant literature does not sufficiently consider that vulnerable communities often experience energy insecurity bundled with other hardships. We also discuss energy, poverty, and health through the lens of climate change, making the criticism that most research on household energy does not consider climate change. This evidence is important for enhancing research in this field and developing programmatic and policy interventions as they pertain to energy access, affordability, and health, with special emphasis on vulnerable populations, climate change, and social inequality.

Keywords: energy insecurity, climate change, vulnerable populations, housing, health

OPEN ACCESS

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INTRODUCTION

Global energy demand and consumption have increased substantially and are expected to continue rising (1); this is particularly evident in countries with strong economic growth such as China and India (2). The U.S. Energy Information Administration (EIA) has predicted that world energy use will increase by 28% by 2040 (2). In 2017 alone, global energy demand rose 2.1%—twice as much as in 2016 (3). As climate change worsens, the demand for more energy services and the strain on existing services will increase. As of 2017, residential energy consumption accounted for 20% of

the total energy consumption across all sectors in the U.S. (4). Ensuring affordability, access, and adequate production of household energy is vital for maintaining individual and population-scale health and well-being. Household energy uses include cooking, lighting, heating, cooling, cleaning, and technological, medical, and other life-sustaining devices (5–7). Yet, millions of households around the world live without an adequate amount of energy (8).

Adequate access to energy is encumbered by limited and faulty infrastructure, affordability challenges, and service disruptions due to disasters and extreme weather events, often linked to climate change. This phenomenon, known as energy insecurity, is defined as the “inability to adequately meet household energy needs” (9). The energy insecurity framework includes physical, economic, and behavioral dimensions that lead to or exacerbate adverse health issues (9). The physical dimension includes poor housing quality, the structure of the home environment, and inefficient appliances (9). The economic dimension consists of affordability challenges (though it is not based merely on an economic ratio or threshold), while the behavioral dimension focuses on coping strategies, social vulnerabilities, and indicators of resilience (9). This conceptual framework helps us to understand the phenomenon of energy insecurity and its consequences. This framework parallels that of food insecurity—the “disruption of food intake or eating patterns because of lack of money and other resources” (10)—in that it reflects cost, quality, and health impacts.

In this article, we present the results of our review of the existing literature on energy insecurity and demonstrate the range of concerns and of approaches to resolving them. We propose the new terms—“acute” and “chronic” energy insecurity to further understand and break down household energy issues. Our findings suggest that the literature does not sufficiently consider the intersectionality of vulnerability types and multiple hardships. Furthermore, the use of numerous terms for household energy insecurity further compartmentalizes energy issues by geography and discipline, hampering the possibility for a comprehensive, or systematic literature base. This compartmentalization foregoes the opportunity to address energy insecurity as a complex, interdisciplinary, intersectional, and multidimensional issue, especially in the context of the pressing threat of climate change. For the sake of clarity, we provide below a brief overview of terms currently used to describe household energy issues as they relate to socioeconomic disadvantage, and in some cases, health.

HOUSEHOLD ENERGY TERMINOLOGY

Many different terms have been used to describe the demand side of energy-related hardship. Researchers, policymakers, and practitioners have popularized terms such as fuel poverty, energy burden, energy vulnerability, and energy poverty, among others. These terms differ in their geographic usage and somewhat in their methods of measurement, but all similarly reference issues related to energy consumption and affordability. Energy burden and fuel poverty are mirroring terms that are used separately in different geographic regions; the former in the

U.S. and the latter mostly in the United Kingdom (U.K.), Ireland, and New Zealand. Both terms are generally defined by an economic ratio whereby households that allocate more than 10% of their gross income for indoor energy expenses are considered energy burdened or fuel poor (9, 11–13). Energy poverty is generally attributed to the Global South and refers to the lack of modern energy services and low energy consumption (5, 14–20). Outcomes and indicators of energy poverty center on socioeconomic development, well-being, and poverty (21). A newer term, energy vulnerability, was developed to bridge the geographical research gap between fuel poverty and energy poverty in order to shed light on energy hardship as a global problem (14, 21). Importantly, these terms and their definitions have not yet incorporated the uncertain realities of climate change and its impact on energy, even though climate impacts are fundamentally rooted in how energy is produced and consumed, and its availability is threatened by the aftermath of extreme weather events, often caused by climate change.

Despite evidence of a strong association between energy access, affordability, and health, none of the above terms inherently focus on health. Research and policy tend to focus on the economic factors of energy burden, fuel poverty, and energy vulnerability, leading to financially-motivated interventions. For example, household-level financial subsidies (e.g., bill assistance) are a popular intervention, as opposed to more structural measures such as energy efficiency upgrades or adoption of clean energy technologies. Moreover, such an economic focus does not address the full scope of the problem, as it leaves out psychosocial and behavioral factors, among others, that contribute to energy hardship. Even energy poverty’s focus on well-being and socioeconomic development omits housing quality and affordability constraints as a focus. By comparison, energy insecurity more broadly encompasses a wider spectrum of energy-related hardships that may be internal or external to an individual’s experience of the phenomenon and is attuned to an expansive range of socioeconomic, psychological, and environmental determinants that produce energy-related hardship. The energy insecurity framework offers the opportunity to evaluate health predictors and outcomes in the context of climate change (22).

The present review provides an encompassing account of the relationship between energy, health, poverty, and climate change and the pathways by which these factors are interlinked. We address the critical gap in the importance of energy for population health (15, 23) by focusing not only on medical issues but also on the cycles of social disadvantage implicated in the nexus of energy, health, and poverty. We outline the impacts of global climate change on household energy access and how it contributes to the severity of health effects and discuss the need to accommodate growing demand on energy systems. This review provides evidence that health is a necessary consideration amidst increases in global energy demand. This is particularly important when: (1) developing methods for energy efficiency and production; (2) deciphering how to distribute and provide energy to low-income, marginalized, and vulnerable households equitably; and (3) preparing for climate change and acute threats to energy access.

PAPER ORGANIZATION

We begin our analysis with a heuristic model linking the various factors that emerged during the review process, including the phenomena of chronic and acute energy insecurity (see **Figure 2**). This paper is organized into four thematic sections with subthemes. First, we propose new terminology to describe different manifestations of energy insecurity. Second, we review the evidence on energy insecurity and the social determinants of health by discussing the social patterning of energy insecurity by gender, age, health status, education, employment, socioeconomic status, and race. Next, we review evidence on the association between energy insecurity and place, noting the spatial inequalities in neighborhood resources and demographics that contribute to the increased likelihood that some community members will experience energy insecurity. Third, we outline findings regarding the connection between energy insecurity, housing quality, and home energy infrastructure by exploring the relationships between housing tenure, energy efficiency, and home age. Fourth, we highlight the salience of coping strategies and behaviors enacted by households experiencing energy insecurity and describe the health effects of temperature extremes, high-effort coping, and the depletion of resilience reserves. The *resilience reserve* is a framework that describes how resilience that should be preserved for use in a specific event, such as in response to a natural disaster, becomes depleted due to constant use in response to a greater prevalence of chronic daily struggles (24). To conclude, we summarize the findings of our review and describe the cumulative hardships of energy insecurity. In the discussion, we offer a critical analysis of the literature, highlighting that the research does not adequately consider the intersectionality of experiences of energy insecurity, infrequently employs an environmental justice framework, and lacks cohesive terminology. These critiques are discussed in relation to the growing wealth gap, increasing energy costs and demand, research into household energy in the Global South, and the inevitable impact of climate change.

METHODS

This review is based on a comprehensive search for relevant literature published between 1990 and 2018 and archived in JSTOR and PubMed. The literature review conceptually frames energy issues along the lines of climate change, health, and socioeconomic factors. The literature review search was conducted using a matrix of terms in varying combinations with one another. The search terms and their categories are outlined in **Table 1**. Terms from each category were searched along with terms from other categories. For example: (1) [(energy insecurity) AND (poverty) AND (climate change) AND (health)]; and then, (2) [(fuel poverty) AND (poverty) AND (climate change) AND (health)]. A term from the “Social,” “Health,” and “Energy” category was used in every search because one of our inclusion criteria is that articles discuss the relationship between household energy, health, and socioeconomic status. We did not include “climate change” as a required term for every search, as part of the review is analyzing the extent to

which the existing literature on household energy considers climate change. We excluded sources about energy and climate change that did not have a health outcome or a socioeconomic focus. Any source that did not discuss energy at the household, neighborhood, or community level was also excluded. Beyond this, our criteria were purposefully broad in order to capture the breadth of topics related to household energy use, health, and climate.

The search was limited to articles in English. Books, peer-reviewed articles, and reports were included, and all other source types were excluded. Our initial database search plus additional articles added from reviewing the reference sections of various sources yielded 750 results. After discarding duplicate sources and literature that was not relevant based on title, we had 406 sources. These sources underwent title and abstract screening. At this point, we identified 203 sources for full review. Of these, 162 were analyzed and incorporated into the final manuscript (**Figure 1**). Some sources out of the 203 identified were not included in the final manuscript due to the subsequent irrelevance of their topic once the topics discussed in the manuscript had been refined during editing.

HEURISTIC MODEL

Energy insecurity can impact health in a multitude of ways. Studies on energy insecurity encompass not only direct but also indirect health impacts because they consider social determinants of health and the coping strategies people use in response to energy insecurity. Inadequate household energy has been linked to the following health outcomes for both adults and children: cardiovascular, pulmonary, and respiratory illnesses; cancer; arthritis; acute hospitalization; excess mortality in summer and winter; and anxiety, depression, and stress (9, 13, 22, 25). Indirect health impacts, such as food insecurity, are also associated with energy insecurity (6, 26–30). It is important to highlight how indirect health problems contribute to and compound direct health impacts related to household energy insecurity. With health as an endpoint, our innovative, original heuristic model (**Figure 2**) tracks the multifaceted pathways that directly and indirectly link energy insecurity to health by distinguishing between chronic and acute energy insecurity.

DEFINING CHRONIC AND ACUTE FORMS OF ENERGY INSECURITY

Energy insecurity is a complicated, multifaceted issue that may be best understood by parsing out its various forms—acute and chronic energy insecurity. For this reason, we propose the incorporation of these terms into the lexicon of energy insecurity work. *Chronic energy insecurity* is a long-term issue that can arise from a consistent inability to afford or access adequate energy to meet household needs. An example of chronic energy insecurity would be living in a home that is consistently cold because the cost of heating is unaffordable. The lack of adequate household energy is often predicated on a number of social and demographic factors including age, gender, socioeconomic

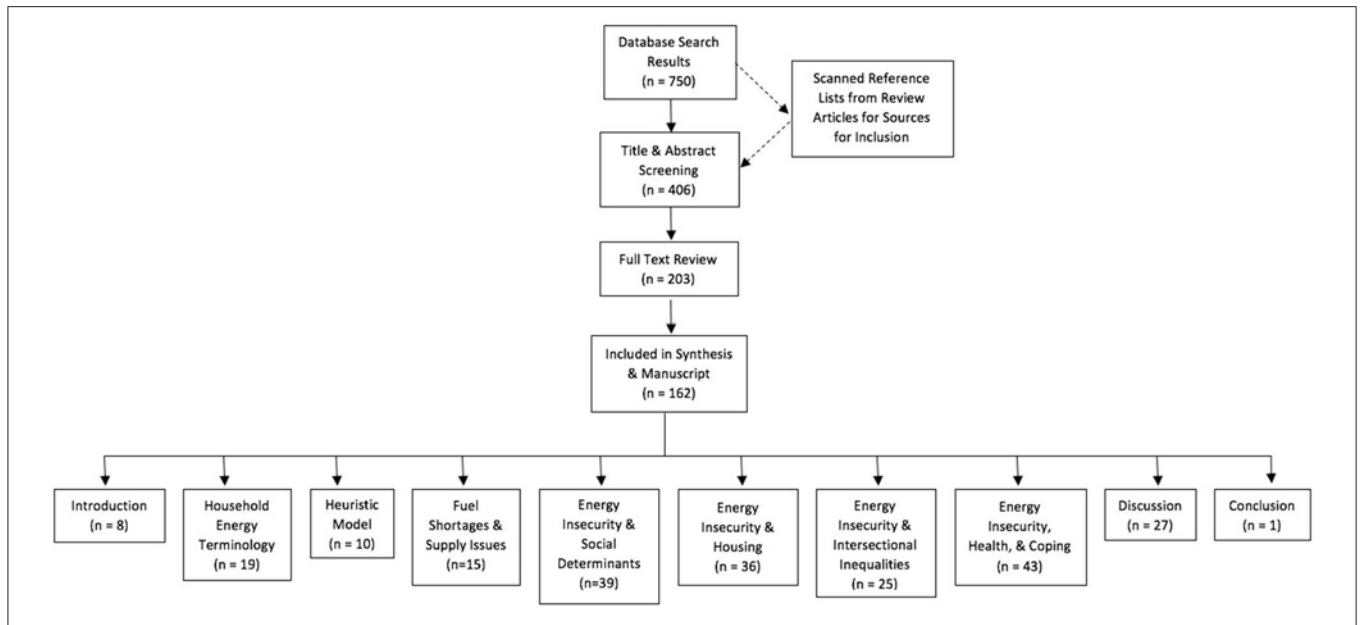


FIGURE 1 | Flow chart of literature selection and review process.

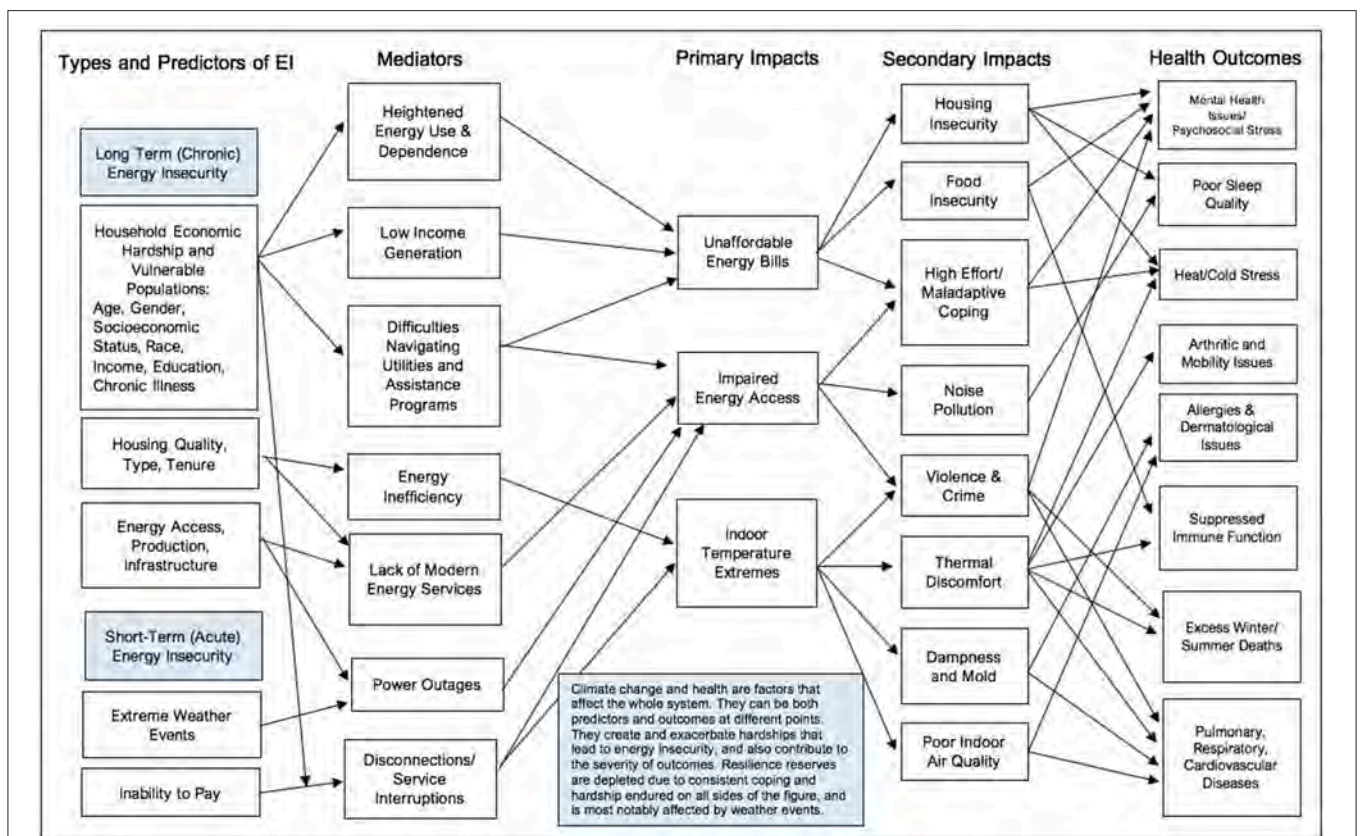


FIGURE 2 | Connection between household energy insecurity (EI) and health.

TABLE 1 | Search terms used in the literature review.

ENERGY TERMS
<ul style="list-style-type: none"> • Fuel poverty • Energy poverty • Energy burden • Energy vulnerability • Energy insecurity • Energy inefficiency
HEALTH TERMS
<ul style="list-style-type: none"> • Health • Chronic illness or conditions • Excess winter mortality, excess heat death
HOUSEHOLD TERMS
<ul style="list-style-type: none"> • Household, Housing, or Home • Neighborhood or Community
SOCIAL TERMS
<ul style="list-style-type: none"> • Low-income • Poverty • Socioeconomic Status • Vulnerable population • Social vulnerability • Resilience • Coping • Housing/Food insecurity
CLIMATE TERMS
<ul style="list-style-type: none"> • Natural disaster • Extreme Weather event • Climate change • Global warming • Heat wave • Hurricane • Power outage or shutoff

status, education, income, race, and employment status. These characteristics may have implications for earnings potential, can determine a household's ability to navigate available resources, and affect access to efficient housing and energy use patterns.

Acute energy insecurity is a short-term issue that tends to arise from infrastructural, maintenance, environmental, or other external sources that disrupt access to energy sources. Some examples of acute energy insecurity include a power outage from a hurricane or a gas shutoff from a reported leak. Interestingly, chronic energy insecurity can lead to a significant crisis point of acute energy insecurity, such as shut-offs due to non-payment. Shutoffs are an acute form of energy insecurity because, for the most part, they are short-lived, and services are reinstated upon cost recovery by the energy service provider. Three primary forms of acute energy insecurity—fuel shortages and supply issues, power outages, and shut-offs—and the links between service interruptions and ill health are described next.

FUEL SHORTAGES AND SUPPLY ISSUES

Health impacts from energy access issues (when infrastructure is available) can arise when demand exceeds supply via two

primary routes: (1) fuel shortages and (2) capacity of the energy infrastructure to handle excess demand during extreme weather. Fuel shortages across the world also indirectly impact health by increasing fuel cost and making sources unaffordable, leading to inaccessibility. Sometimes, other resources necessary for life are contingent on energy access. For example, during a fuel shortage, rural Iñupiaq Eskimo villages in Alaska's Northwest Arctic Borough were unable to access clean water because they did not have heat or electricity to prevent pipes from freezing (31). The shortage led to increased rates of infectious disease, hygiene-related diseases, and pneumonia (31). Fuel shortages may become worse as climate change worsens, increasing the prevalence of health issues related to energy insecurity (32).

In other instances, the energy infrastructure has proven incapable of tolerating higher than normal demands. A polar vortex, which occurred in January 2019 across the United States, brought extremely cold temperatures that strained energy systems. Some parts of the Midwest reached temperatures as low as minus 38 degrees Fahrenheit (33). An estimated 21 people died across the country from causes directly related to the polar vortex, such as death by hypothermia while indoors (34). One woman in Milwaukee died from the cold when her thermostat malfunctioned (34). In many cities, gas companies ordered households and industry to lower their heat in order to prevent citywide gas shortages (33). This compromised capacity is related to reliance on an aging infrastructure and increased demand, which is likely to be an issue over time and as weather patterns become more extreme as a result of climate change.

Power Outages

Infrastructural issues, extreme weather, and natural disasters may result in power outages and energy service interruptions. Short-term power outages often occur for the following reasons: (1) older and less reliable infrastructure; (2) overloading from high electricity demand; (3) household maintenance defects; and/or, (4) other systems fail (35). Long-term power outages are typically a result of disasters such as hurricanes. In 2017, Hurricane Maria left Puerto Rico's residents without power for an unprecedented average of 84 days. An estimated 83% of these households were in the most remote regions of Puerto Rico (36). These outages interrupted healthcare for people with chronic illnesses who required care and medication (36). Moreover, the death toll attributable to Hurricane Maria in Puerto Rico was estimated to be 4,645 people, and 9.5% of those deaths were due to an inability to access electricity needed for respiratory equipment (36). The adverse impacts of service interruptions—both short- and long-term—are ubiquitous. Elevator shutdowns impede movement, transit systems close, medical device access can be cut off, blackouts can increase crime and cause accidents, food can spoil in warming refrigerators, temperature control can be lost, and much more (35, 37–39).

Shutoffs

Affordability challenges may lead to a different type of service interruption—shutoffs or disconnections due to non-payment. It is challenging to measure a national prevalence rate of shutoffs, because utility companies seldom, if ever, report which and

how many households are shut off, and these data are generally not publicly available. Hernández and Laird (40) used the Residential Energy Consumption Survey (RECS), administered by the Energy Information Administration (EIA), to analyze the prevalence of disconnection notices and service disconnections based on a nationally representative sample of US households. Hernández and Laird (40), presenting their results at the annual conferences of the American Sociological Association (ASA) and the American Public Health Association (APHA), demonstrated that in 2015 an estimated 3% of US households were disconnected and another 15% received a disconnection notice, suggesting that there is indeed some hardship. Consistent with previously observed patterns of inequality, the authors also found that low-income households, African-American and Latino households, households with children, renters, and people living in older and poorly insulated homes were most likely to receive disconnection notices and service interruptions. Hernández and Laird's (40) research further explores the coping strategies that families resort to, such as forgoing food and medicine and keeping homes at an unhealthy temperature, that compromise health and may even lead to death. Hernández and Laird (40) found that households rely on these strategies to prevent and respond to the threat and occurrence of shutoffs (40).

Service Interruptions and Health

Shutoffs and power outages have a number of direct health impacts (30, 35, 37). Temperature-related issues such as hypothermia and heat stress increase when interruptions occur at times of extreme outdoor temperature. Chronic health conditions are strained by short- and long-term service interruptions in electricity and hot water services (30, 41). Additionally, people with chronic illnesses, particularly those with cardiovascular, respiratory, and renal diseases, are often forced to seek outside medical care during interruptions, increasing the rate of hospitalization (35, 42). Rates of all-cause and external-cause mortality are significantly higher during power-outage periods, especially when outages are due to weather events such as hurricanes, heatwaves, and snowstorms (30, 35). Households that have faced threats of shutoffs have reported more long-term mental health issues stemming from financial, physical, and environmental stress, as well as fears and anxiety over potential future service interruptions (13, 43).

ENERGY INSECURITY AND SOCIAL DETERMINANTS

Both acute and chronic energy insecurity are influenced by the social determinants of health, which are defined by the Centers for Disease Control and Prevention (CDC) as the political, economic, and social circumstances in which people live, work, and play (44). These determinants include factors such as gender, age, health status, education, employment, socioeconomic status, and race. Here, we review literature indicating that the social determinants of health play an important role in predicting the existence of household energy difficulties and outline the importance of making a connection between the impact of

climate change on social determinants of health and energy insecurity. As climate change increases the frequency, duration, and magnitude of extreme weather events, it is important to consider the populations that are most vulnerable to the impacts of such events within the context of household energy use (45, 46).

Age and Life Course Vulnerability

Age-related vulnerabilities (i.e., being young or elderly) and exposure to environmental hazards are predictors of energy insecurity. The elderly, because they are at a higher risk of experiencing medical events during heatwaves than other populations due to a combination of social isolation, heightened physiological vulnerability, and the likelihood of not having air conditioning, are more likely to endure heat stress (46–48). Children are at risk of asthma, especially those living in urban, low-income communities, and are therefore in more need of adequate energy for ventilation and temperature control (49–51). Both the elderly and children spend more time in their home environments than other groups (1), increasing their exposure to the health risks of energy insecurity (52).

Education: Literacy and Impacts on Academic Achievement

Education, as it relates to energy insecurity, also has implications for health. Lacking sufficient knowledge and ability to navigate the bureaucracy of utility companies makes it difficult for less-educated households to address and prevent energy insecurity. Knowing how to access resources such as financial subsidies or medical certifications to prevent shutoffs requires knowledge of how such bureaucratic systems work. Understanding the risks associated with using alternative methods to address energy needs also requires education. On average, those with less educational attainment have more limited income potential, making it more difficult to afford and make energy payments (6, 15).

Energy insecurity also perpetuates a cycle of lower educational attainment, most notably for children. Environmental stress and financial insecurity can lead to mental health issues and result in worse educational outcomes (53). The stress of energy hardship is associated with behavioral problems in children, whereby they are more likely to have low academic motivation, difficulty concentrating, and often act out (54, 55). Children experiencing energy insecurity and food insecurity (discussed in detail in subsequent sections) are also more likely to experience intensified behavioral issues such as depression, rule-breaking behavior, and somatic complaints (54). Asthmatic children in energy-insecure households with poor air quality miss more days of school due to illness than do non-asthmatic children (55, 56). Homes that use unsuitable energy sources expose children to toxic gasses that impair cognitive development. Additionally, children living in energy-insecure households often have trouble focusing on their homework due to noise pollution from generators, other loud energy sources, and open windows, which can lead to lower academic success (57). As a coping strategy, some households confine energy use to specific rooms to keep energy bills low or because there are limitations in their heating and cooling systems;

this forces all residents to be in the same room, resulting in homework distractions and crowding, among other issues. Poor or restricted lighting to certain rooms also makes schoolwork and reading for pleasure more challenging.

Employment

Energy insecurity perpetuates the detrimental health effects associated with low-income employment. Many low-paying jobs require work in extreme temperature conditions (58), such as farming in excess heat or working in refrigerated warehouses. Those working in extreme temperature conditions are also more likely to be experiencing energy insecurity at home because they are low-income. Exposure to thermal discomfort at work and at home has a cumulative effect on temperature-sensitive health problems. Members of low-income households are also more likely to work multiple jobs to pay bills and support their families, meaning they are often physically absent from the home. This absence of caretakers can affect children's developmental needs and contribute to social deprivation and caretaker stress. Single mothers are more likely to be primary caretakers and often experience augmented impacts because they do not have a partner with whom they can share the burden and responsibility. Single mothers are also more at risk of experiencing energy insecurity compared to other groups (9, 23).

Socioeconomic Status and Household Income

Socioeconomic factors are a predictor of energy insecurity. In most households, utilities make up a substantial portion of living costs, and in low-income households, this proportion is much greater (9, 30, 59). Therefore, it can be difficult for low-income households to pay for enough energy to meet household needs and also afford other expenses (9, 30). Households at or near the Federal Poverty Level (FPL) are significantly more burdened by energy insecurity than other socioeconomic groups (9). A brief look at 2011 American Community Survey (ACS) data on the characteristics of people experiencing the gap between energy affordability and unaffordability found that 44% of low-income families (defined as below 200% of the FPL) experience economic energy insecurity compared to 2% of families who are not low-income (60). A 2016 report by the American Council for an Energy-Efficient Economy (ACEEE) found that lower-income households experience higher median energy burden (7.2%), defined as the percentage of household income spent on energy bills, whereas non-low-income households experienced a median energy burden of 1.5% (61). Furthermore, a recent study found that low-income households in the studied U.S. cities spend on average from 10 to 20% of their income on energy bills, while wealthier households spend on average between 1.5 to 3 percent on energy bills despite being the higher consumers (59). The 2015 RECS found that the lower the income, the higher the energy expenditure and energy consumption per square foot of the home due to a number of potential factors (62). For example, socioeconomic status has major implications for affordability, access, and levels of environmental hazards in the home. Additionally, low-income households are often unable to afford utility bills and therefore live without adequate energy

due to heightened conservation and/or an inability to upgrade energy-related appliances and systems (59).

Race

Race is another social determinant of health that can predicate energy insecurity. Minorities tend to suffer from higher rates of energy cost burden than non-Hispanic whites in United States' cities (59). In the U.S., African Americans suffer more from energy insecurity than do any other racial groups (23, 60, 63). Of surveyed households with an African-American head of household (HOH) and children under the age of 18, 35% reported facing energy insecurity compared to 21% of Latino HOHs with children under 18 and 14% of Caucasian HOHs with children under 18 (60). Across all income levels, Black families still maintained the highest rates of energy insecurity (60). In the Washington Heights neighborhood in New York City, energy-insecure households were more likely to be black and Hispanic/Latino, low-income, and have less education (64). In Detroit, a study found that African-American households were twice as likely to be behind on utility payments and three times more likely to suffer from arrearage or shut-offs than white households (65).

When considering racial disparities, the association between environmental hazard exposure and geographical location is stronger for Black and Latino communities than for other racial groups (66). The health impacts of energy insecurity are compounded for racial-minority households that live in areas with high rates of exposure to environmental hazards energy inefficiencies (59, 66). The disparity in the impacts of acute energy insecurity is especially apparent for minority racial groups. For example, a study by O'Neill et al. (67) found that during heatwaves in four different cities across the U.S., the rate of air conditioning use was more than two times higher among the white population than the black population, suggesting that black residents did not have access to or could not afford to use air conditioning at the same rate as white residents. Additionally, the mortality rate of black residents was significantly higher than that of other racial groups across all four cities (67). This trend could be attributed to low income levels and unaffordable electricity, which disproportionately impact racial and ethnic minority households.

Gender

Gender is another social factor associated with energy insecurity that has direct and indirect health implications. In the Global South, women and girls, who are responsible for cooking, use biomass fuel, resulting in high rates of respiratory illness. Respiratory illness from solid-fuel cooking is one of the greatest causes of premature mortality globally (5, 7, 15, 68). In the Global North, women are more likely to be caretakers and spend more time at home, increasing their rate of exposure to other energy inefficiencies. Single mothers are especially vulnerable because they take on financial and psychosocial burdens alongside the responsibility of being the sole caretaker (23). It is important to note, however, that the literature in this review often fails to recognize that the separation of how gender relates to energy insecurity in the Global North vs. the Global South is reductive

and essentialized, as all of the mechanisms by which women and girls are impacted by energy issues crosscut both spheres of the world.

Health Status

Illness and chronic health problems often determine energy demand and have implications for energy consumption, thereby making poor health both a predictor and outcome of energy insecurity. Residents with health conditions such as cardiovascular, pulmonary, and respiratory diseases and arthritis are sensitive to temperature extremes, meaning that a home that is too cold or too hot can exacerbate and worsen symptoms (13, 69–71). People living with a chronic health condition may be especially reliant on energy-dependent devices for treatment or maintenance of their condition, lowering their ability to withstand inadequate or unavailable energy services. For example, patients with kidney disease, chronic obstructive pulmonary disease (COPD), and cardiovascular disease (CVD) rely on dialysis and oxygen machines that require electricity (72) and diabetics must refrigerate their insulin. Cancer patients in active treatment need more heat (73), and those suffering from hypertension are more susceptible to cold stress (74). Not only do people with chronic health conditions have an increased need for energy, but they also spend more time in their households, further increasing energy use (75).

ENERGY INSECURITY AND HOUSING

A number of household characteristics beyond location predict the existence of unmet household energy needs. The type of housing, whether owned or rented, its level of energy efficiency, and its age are all associated with energy insecurity. Low-income and minority residents face a higher proportion of difficulties related to these housing characteristics.

Housing Tenure and Type

Energy insecurity is affected by housing tenure because renting and owning can lead to unique challenges that perpetuate energy insecurity. Low-income renters often face difficulties affording household costs (76) and tend to spend the greatest portion of their income on energy bills when compared to other socioeconomic groups (77). They also tend to live in the most structurally deficient homes due to a lack of weatherization and efficiency upgrades (77). Energy insecurity can become a chronic issue, partly because low-income renters have limited ability to persuade landlords to maintain proper upkeep and implement effective modifications related to energy efficiency (43, 78). They also have limited social and economic capital to afford self-repairs or to hold landlords accountable through the court system (43). Low-income owners are also at risk for energy insecurity due to the high cost of upgrading homes to higher efficiency standards or because buying a home that is already efficient is expensive. Homeowners are often responsible for the entire burden of utility bills and other operational costs, including property taxes, home insurance, and water, garbage, and sewer costs. The stress of low-income housing on both renters and owners is associated with adverse mental health outcomes and poor self-rated health (43, 76).

Housing type also influences rates of energy insecurity. Similar to homeowners, renters of single-family units face difficulties because they are responsible for the entire cost burden. Multifamily housing can be more advantageous than single-family housing because there is a shared cost with property owners. However, residents in multifamily housing and low-income tenants often lack control over the conditions (e.g., heat) of their units and have restricted ability to combat energy insecurity, mostly due to financial constraints and lack of control over housing infrastructure (9). The New York City Housing Authority (NYCHA), the country's largest public housing authority, has faced notorious housing quality and energy infrastructure issues that have plagued residents by severely compromising their housing experience and, likely, their physical, and mental health. One challenge is that NYCHA is not subject to the same maintenance regulations as private housing or developers, resulting in structural deficiencies and energy inefficient housing, attributable in part to deferred maintenance (79). Public housing is not alone in this regard. Rental housing, including subsidized, or affordable housing, presents challenges for renters since the property owners determine the level of energy efficiency and other aspects of housing quality. In most cases, there are no guidelines that stipulate a minimum level of efficiency, particularly in older housing that was constructed when building codes were less focused on sustainability. This conundrum, known as the "split incentive," occurs when the incentive structure for an asset is not equally beneficial to both parties. In such cases, the deciding actor works in their own best interest, as is the case with owners who dictate the terms of housing without consideration of tenancy. Previous research demonstrates that subsidized housing recipients face an increased burden because they are more likely to rent from private landlords who neither weatherize nor optimize energy efficiency due to upfront costs and administrative encumbrances, which generally privileges the property owners and negatively impacts the tenants both economically and experientially (77, 80).

Beyond rental and multiunit housing, people living in manufactured housing, such as trailers or mobile homes, are disproportionately impacted by physical energy insecurity. These housing structures are often not well-insulated or weatherized, so residents tend to spend a high proportion of their income on energy and heating bills. For example, the ACEEE found that mobile home residents are more likely to be energy burdened (61). Residents living in these manufactured housing types also tend to be low-income and therefore the least able to sustain high utility bill costs or afford general maintenance (81).

Energy Inefficiency

Energy inefficiency is a common housing problem and aspect of energy insecurity that has serious health implications. Energy inefficiency is marked by poor insulation, drafts, leaks, and other points of intrusion of the outside elements that make it difficult to control indoor temperatures (82–84). Other structural deficiencies and poor housing quality conditions, such as a lack of central air conditioning and proper ventilation, can also lead to high utility bills and unsafe conditions (85). Energy inefficiency caused by poor housing quality and structural deficiencies

spurs costly utility bills that are unaffordable for low-income people (86). Poor energy efficiency has been associated with an increase in household dampness (85), which is associated with worsened arthritis symptoms, dizziness, headaches, and fevers (79), and increases the presence of mold, exacerbating medical conditions such as allergies, eczema, and asthma (69, 87–90). Energy inefficiency is also associated with an increase in a number of thermal-related illnesses (85), and homes with poor ventilation and outside air infiltration have more dust mites and cockroach feces, which are known to exacerbate or lead to acute respiratory illnesses (27, 91–93). Households that are unable to open windows (see also the section entitled Heat Stress and Forbearance) have the additional risk of dampness as a result of obstructed airflow (57).

A popular intervention for older and/or poorly constructed homes is retrofitting (87). However, energy efficiency without attention to ventilation can lead to excess tightness in the building envelope, thereby obstructing airflow and exacerbating the aforementioned health issues related to ventilation and air quality (94). Air-tightness due to energy efficiency improvements is also associated with increased levels of radon, which significantly increases the risk of lung cancer (95, 96).

Age of Housing

Older housing is a frequent contributor to energy insecurity because much of the aged housing stock around the world is neither weatherized nor energy-efficient, which results in an increased prevalence of thermally inadequate home environments (97). Low-income, older and minority householders are often relegated to substandard living conditions, in part due to residence in older housing that has not been renovated (98). The effect of older, less efficient housing on energy insecurity has been studied mostly in the fuel poverty literature from northern Europe and New Zealand, where the regularity of colder outdoor temperatures heightens the need for consistent indoor heating (82, 99). Excess winter deaths are a measure of mortality as a result of cold homes, a problem known to be caused by a lack of insulation (13, 47, 69, 84, 99–101). Heat stress is a common health effect of hotter outdoor temperatures, whereas newer technology such as centralized air conditioning may not exist in older homes. A lack of air conditioning contributes to heat stress, excess deaths, and hospitalizations during heatwaves (67, 102). Therefore, the use of newer technology is important for health and safety, particularly as it relates to the prevention of premature death.

Newer homes are subject to current housing codes, many of which include public health considerations, and tend to be more energy-efficient and have fewer maintenance issues (97). Many states have ventilation standards, for example, which can combat mold from dampness and therefore reduce asthma symptoms (98). Regulations on toxin levels in homes, such as through initiatives for lead-free homes, also exist. It is, of course, easier to control risks that are never introduced into the housing sphere. Therefore, living in new housing stands to benefit occupants. However, the most vulnerable groups are often the least likely to benefit from such advantages.

ENERGY INSECURITY AND INTERSECTIONAL INEQUALITIES

Research has demonstrated that socioeconomic status and race are predictors of neighborhood, place, and presence of other hardships that can lead to or exacerbate energy insecurity. For example, residents in low-income and minority neighborhoods tend to experience issues such as increased exposure to environmental hazards, a lack of investment in housing maintenance, and poorer quality housing, all of which contribute to energy insecurity. Moreover, poverty and material hardship are complex issues in and of themselves, whereby the inability to meet basic needs extends far beyond any one category. In this section, we explore the overlapping issues that intersect with energy insecurity.

Socioeconomic Status, Race, and Place

The coalescence of socioeconomic status, race and neighborhood factors can lead to or exacerbate energy insecurity and present other hardships as well. For example, racial residential segregation, a proxy for concentrated neighborhood disadvantage, is a demonstrated predictor of energy insecurity (103). Black and Latino/a-headed households are more likely to live in an energy-insecure household because of their home's lack of energy efficiency (103). For example, NYCHA housing, predominantly inhabited by minorities, is facing a backlash over its dilapidation and lack of maintenance, which has resulted in widespread power outages, lack of heating, and the presence of mold and lead problems (79). Of these issues, NYCHA has been criticized severely for the persistent lack of available heat in its properties due to faulty boilers (104). In the winter of 2017/2018, ~80% of NYCHA residents faced a heat outage, which lasted 48 hours on average (105). Some advocates state that the difference in regulations for NYCHA housing compared to private housing is unjust and disproportionately disadvantages low-income communities of color (79, 106).

Low-income and minority neighborhoods collectively bear the brunt of more environmental hazards in and outside of their individual households (50, 107). For example, the siting of highly-polluting sources such as bus depots, landfills, highways, and plants or factories tend to be located in low-income communities. Low-income homes are also more likely to have maintenance defects, rodents, mold, and other poor housing conditions (66). Households in low-income and minority neighborhoods are also more likely to be overcrowded; this is especially true for immigrant populations in New York City and other urban areas. Overcrowded homes are associated with psychosocial stress, disease outbreaks, and higher asthma rates; they are also a predictor of the existence of other physical and social housing-related hardships that contribute to the burden of disease (93, 98, 108).

Furthermore, institutional and systemic racism and place-related social factors are drivers of higher rates of energy insecurity for minority populations. Ethnic minorities, immigrants, and indigenous groups are some examples of people who experience housing discrimination (57), a barrier to accessing more energy-efficient homes. Gentrification in many urban areas in the U.S is another social process that perpetuates

racial and ethnic disparities in energy insecurity prevalence. Gentrifying or newer residents are less likely to experience energy insecurity or have an energy inefficient home compared to longer-term residents who live in older households in the area (97). Long-term residents of Washington Heights in New York City, for example, are Dominican immigrants and African Americans, and they suffer far more energy insecurity than new neighborhood residents (64).

Neighborhoods and Spatial Inequality

Energy insecurity, as we have noted, is highly correlated with spatial inequality, where residents of different neighborhoods are more or less likely to experience energy insecurity due to their neighborhood's economic, environmental, and social makeup. The mean annual energy use intensity (EUI), which is a proxy for energy insecurity by way of high energy use from low housing efficiency, is much higher in urban areas that have lower socioeconomic status, less education, and more racial minority dwellers (65, 103). In cities that are more racially segregated, neighborhoods with low-income and minority populations are more likely to suffer from difficulties in affording or accessing energy (65, 109). As the gentrification of urban areas continues, racial residential segregation increases such that lower socioeconomic status populations are forced to live in areas that have substandard conditions both in housing quality and neighborhood characteristics.

Low-income and racial-minority neighborhoods in urban areas often suffer from the highest amount of environmental hazard exposure through air and noise pollution and substandard sanitation (110). This increased prevalence of environmental hazards can contribute to the health impacts of existing energy insecurities. For example, housing with poor ventilation in an area with high levels of air pollution can aggravate a child's asthma. There are well-established, clear disparities in neighborhood rates of asthma due to both indoor and outdoor environmental hazards (50), and there is an association between neighborhoods with energy insecurity and asthma prevalence (22). There is also spatial inequality and disparity in the prevalence of psychosocial stress. Low-income and minority neighborhoods suffer from higher rates of stress, which can compound the negative health effects that result from their already-increased exposure to environmental hazards (e.g., air pollution) (111). For example, family stress combined with exposure to neighborhood violence has been found to increase the incidence of traffic pollution-induced asthma in children, due to the strain on psychosocial pathways (112). The spatial disparities in energy insecurity and health also exist between urban and rural areas, where some low-income rural communities do not have access to natural gas or even electricity services, whereas lack of access to electricity services is rare in urban communities (113).

Bundled Hardships: Energy and Other Insecurities

As demonstrated by this robust review, energy insecurity is a complex problem, and it does not occur in a vacuum. The hardship of energy insecurity intersects with other hardships,

such that each compounds the severity of the others and contributes to detrimental health consequences. Competing needs and hardships, such as food insecurity, water insecurity, and housing insecurity, result in tradeoffs where basic needs are prioritized and sometimes foregone (9, 114, 115). The stress from having to make trade-offs between basic needs for food, water, housing, and energy profoundly affects adult and child mental health (116, 117), which can exacerbate many kinds of physical health and social issues.

With food insecurity, the "heat or eat" dilemma occurs when households must decide whether to expend resources on proper nutrition or adequate energy services because they cannot access or afford both (28, 30, 118, 119). Often, this dilemma leads to undernutrition, especially during the winter and summer months when there are higher energy use needs when it has been found that low-income adults and children have decreased caloric intake compared to lower-energy use months in the spring or fall (28, 118). Other health impacts from food insecurity include acute hospital visits, poor diabetes control, developmental delays, fatigue, and behavioral issues in children (54, 120, 121). In response to high energy bills, people also opt out of medical and dental care, which can lead to worse health outcomes in the future (119).

Water insecurity is another co-occurring hardship. Water and electricity tend to be dependent on one another. On a large scale, hydroelectric dams need water and electricity to function, power plants need cooling water when there are high temperatures, and nuclear plants use large volumes of water (122–124). It is not only water that is needed for energy, but the other way around as well. At the community and household level, access to hot water can be encumbered by energy insecurity (30, 41). When concerned about the cost of energy, some residents may cut back on hot water use (30). Furthermore, water pipes can freeze if there is a fuel shortage or shut-off in time of freezing outdoor temperatures (31). Without water, people's ability to access energy reduces.

Lastly, housing insecurity is a frequently cited competing hardship to energy insecurity (22). The dimensions of housing insecurity include frequent moves, lack of housing options, homelessness, high housing costs, overcrowding, and unstable neighborhoods (125–127). Households that do not have enough money to afford high-quality housing also suffer from an inability to pay high utility bills, which can result in household debt owed to utility companies. Low-income families juggling financial hardships often prioritize other financial obligations such as paying for rent or groceries, seemingly more immediate needs, over paying off debt; this behavior can leave families in prolonged debt cycles (128). Debt owed to utility companies often prevents low-income households from moving because utility debts are not transferable (9), forcing residents to continue living in poor-quality housing. A home cannot be rented without a utility account in the renter's name, which is not possible if they have arrears at another address (9). Frequent moving is also a common form of housing insecurity. Low-income families are five times more likely than higher-income families to experience eviction, resulting in a move (50, 129). Evictions generally occur when rent prices increase beyond what a family is capable of affording. Utility shut-offs play an important role in housing insecurity,

as they are often the precursors to eviction. In both instances, households may encounter the double burden of housing *and* energy insecurity (23). As gentrification spreads across US cities, urban housing affordability is unachievable for most low-income families, forcing evictions, moves, overcrowding, and an increase in homelessness, and while newer buildings often enjoy energy-efficiency upgrades, older homes and buildings, which are often less efficient and more expensive to operate from an energy cost perspective, do not receive such upgrades (64, 130). In short, energy cost burdens can increase housing affordability strains whereas lower energy bills can protect against high housing costs and promote residential stability.

ENERGY INSECURITY, HEALTH, AND COPING

Health issues are linked to energy insecurity. In particular, such direct health outcomes are often a result of indoor temperature extremes and inadequate energy access. Thermal stress occurs when residents are unable to heat or cool their homes properly, frequently due to unaffordable utility bills or an inability to access adequate services. As a result of inadequate home energy, residents resort to coping strategies, which, with chronic use, can be taxing and overburden resilience reserves.

Improvising and Coping Without Energy

Residents implement coping strategies to manage and respond to unmet energy needs; we consider this to be the behavioral dimension of energy insecurity. Despite the ingenuity and agency many people demonstrate in the face of suboptimal energy circumstances, these coping strategies have negative health implications. One such coping strategy is the use of emergency energy technology (i.e., generators), which is generally reserved for disasters but is often employed by energy-insecure households. Generator use is strongly associated with carbon monoxide (CO) fatalities, especially when the generator is placed incorrectly in the household (e.g., in the garage or outside of a bedroom window) (35, 37, 131). Even when placed correctly, generators constantly release CO, which in small, consistent doses can lead to cognitive decline, headaches, nausea, and dizziness. Maintenance issues can aggravate the health impacts of some coping methods, such as poorly maintained households exposing people to higher levels of toxins (50). For instance, some residents living in low-quality housing use unvented gas heaters as their primary heat source and/or hot air units that do not have ducts because they are unable to afford or access improvements. Both practices are associated with increased levels of nitrogen dioxide (NO₂) and volatile organic compounds (VOCs), which exacerbate allergies and respiratory illness symptoms, create ear, nose, and throat irritation, and contribute to cognitive delays (51, 132). People also resort to avoiding energy sources in their homes or use extreme conservation strategies to reduce energy expenditure. For example, some avoid using a refrigerator, which is associated with undernutrition due to a lack of fresh food in the diet, and/or avoiding hot water use, which can lead to infections and hygiene-related illnesses. Other survival strategies include

practices such as only heating one room of the house, going to bed early, and using low lighting (114).

Cold Stress and Coping

In the winter, cold homes due to a lack of proper heating lead to excess deaths and a number of health problems (13, 47, 69, 99, 100, 133, 134). Cardiovascular symptoms as a result of inadequately heated homes are a prevalent cause of medical issues (69, 135), and rates of hypertension increase in cold temperatures, which can lead to strokes and heart attacks (69, 74, 101, 135). The elderly and people that are already diagnosed with CVD are more at risk of heart attack and stroke due to cold stress (13, 47). Furthermore, research has found that arthritis symptoms worsen in cold homes (12). The rate of pneumonia and other infections, mostly among children, increases due to suppressed immune function from the cold (70), and upper and lower respiratory symptoms, such as coughing and wheezing, are worsened by the cold as well (69, 99, 100). Asthmatic residents and caretakers of asthmatic children living in inadequately heated homes report higher rates of poor well-being and more frequent hospital visits (27, 136). Alzheimer's patients have a higher rate of mortality from a combination of physiological and behavioral factors as a result of the cold (137). Poorer well-being and financial strain from an increased number of medical visits can exacerbate mental health issues, such as depression and anxiety, that may already be heightened due to the stress of energy insecurity (114).

In response to a cold home, many households cope by using alternative heating methods that have a direct impact on health (23). For example, using generators and stoves to provide heat also results in the release of toxic gasses such as NO₂ and CO that can impair cognitive function, exacerbate respiratory illnesses, and cause mortality (35, 49, 51, 138–140). The use of space heaters or ovens as alternative heat sources can also increase the risk of fire and injury, which could potentially lead to displacement or death (23, 104).

Heat Stress and Forbearance

Heat stress occurs when households are unable to afford or access energy to cool their homes. The health effects from this type of energy insecurity, such as increased morbidity and mortality rates, are most often seen during heatwaves when excess heat from outside conditions creates heat stress (135, 141, 142). Cardiovascular issues such as heat strokes, hypertension, and heart attack, dehydration, hyperthermia, and nervous system morbidities are examples of health impacts that occur under heat stress (69, 135, 143). Other health effects include a higher likelihood of acute renal failure (42) and increased sleep disturbances as a result of the extreme heat in inadequately cooled homes, which can exacerbate mental health conditions triggered by the stress of energy insecurity (53, 57). This increase in morbidity and mortality is motivated by other social determinants of health that predict energy insecurity (142).

Coping mechanisms for dealing with heat stress have their own related stressors and issues. For example, opening windows for ventilation and relief from heat may seem like an easy, free solution to cool down warm homes; however, in neighborhoods

that are perceived to be unsafe, many people cannot or do not travel to cooler locations nor do they leave windows open due to fear of crime and violence (141, 144). Furthermore, open windows expose households to noise pollution, particularly in urban areas where there is high traffic flow, which causes sleep disturbances and obstructed concentration on tasks (57). Open windows also increase the infiltration of outdoor air pollution, such as from motor vehicle exhaust, that is associated with respiratory and cardiovascular health risks (57).

High-Effort Coping and Resilience Reserves

Energy insecurity plays a role in depleting a person's resilience reserve (24). The *resilience reserve* framework offers a different lens than does past resilience research, which found that marginalized groups were less resilient because they had less social and material support and more life stressors (145). The resilience reserve framework argues instead that marginalized groups that contend with social, economic, medical, physical, and geographic vulnerabilities expend resilience resources to manage everyday hardships, leaving less opportunity to accumulate the psychological and material means with which to respond to and recover from large shocks such as extreme climate events (24). Therefore, after a disaster, marginalized groups have greater difficulties coping and rebounding, because they have already depleted their reserves. For example, years after Hurricane Sandy, which occurred in 2012, low-income NYCHA residents reported longstanding physical and psychosocial difficulties, citing the Hurricane's exacerbation of existing hardships and emotional trauma (24). Specifically, NYCHA residents cited the lack of electricity, heat, and functional elevators as a source of struggle, not just after the Hurricane, but before it as well. Housing, economic, and energy-related hardships had long been a source of chronic stress, constantly gnawing at their resilience reserve before the hurricane hit (24). One risk of an increased frequency of extreme weather events is the potential to exacerbate existing hardships and deeply impact the resilience capacity of vulnerable populations as they confront a growing number of social, economic, health, and energy challenges on a normal basis.

DISCUSSION

Energy insecurity is a multifaceted phenomenon with short- and long-term iterations influenced by social determinants and a changing climate, ultimately impacting health. This paper reviews existing literature in order to trace the pathways by which chronic and acute energy insecurity directly and indirectly result in various adverse health conditions. Our heuristic model is a unique contribution to the literature that intends to depict seemingly far-flung factors associated with energy, poverty, health, and climate change. We demonstrate the disproportionate effects on vulnerable populations and the mechanisms of household energy that lead to poor health and excess death. Contributors to acute energy insecurity include power outages, fuel shortages, supply issues, and shut-offs stemming from affordability challenges. For the most part,

these acute issues are short-lived, though their impact can still be significant for short- and long-term health, well-being, and survival. Meanwhile, the fundamental causes of chronic energy insecurity are rooted in socioeconomic disadvantage as determined by race, income, educational level, position within the life course, and medical conditions that affect energy needs and dependency. It is also deeply affected by housing quality and the concentration of inefficient housing at the neighborhood level that is unfortunately closely patterned along the axes of social inequality and racial residential segregation. The literature suggests that the social determinants of health, housing characteristics, and neighborhood quality seem to predict and/or exacerbate household energy insecurity. As a result, residents turn to coping methods that can have a number of negative health consequences, such as toxic exposure from generators, fires from space heaters, noise pollution and crime from open windows, and many more. Energy production and infrastructure, both globally and locally, contribute to energy insecurity in terms of access and environmental degradation. High energy demand can strain systems, weather events can create power outages, and affordability issues can lead to shut-offs and arrearages. The result of such energy insecurity contributes to outcomes such as psychosocial stress and mental health issues, poor sleep, cardiovascular and respiratory issues, and heat stress, among others. These energy-related difficulties can also deplete people's resilience reserves, such that affected populations are less able to bounce back from acute and chronic hardships. In the context of climate change, more wear-and-tear on the energy systems, housing infrastructure, and population health seems inevitable.

The following discussion offers a critical analysis of the vast but disjointed literature on energy insecurity. One critique of the present literature is that much of it lacks an environmental justice framework, which should be integral to energy insecurity research, and we exemplify this issue by discussing the lack of intersectional consideration of the rising wealth gap, coupled with increasing urbanization, and energy transitions. Second, we explore connections to energy-related issues in the Global South. Although the Global South was not the focus of this review, energy-related issues are prevalent across countries in Africa, Asia, and Latin America and must be taken into consideration when designing interventions, because energy reform anywhere has global implications. Lastly, we discuss the current and future impact of climate change on energy insecurity and the need for greater consideration of climate change when conducting research on energy insecurity. We contend that the use of acute and chronic energy insecurity terminology can be helpful to researchers using a climate change framework because it separates the direct energy-related effects of climate events (acute) from more long-term effects (chronic).

Wealth Inequality, Urbanization. Energy Transitions, and Environmental Justice

As energy becomes more expensive and the wealth gap increases in the U.S., poorer households may have greater difficulty affording adequate household energy. The difference in the

proportion of income allocated to paying for energy bills could grow wider between the rich and the poor; low-income households may increasingly spend a higher proportion of their income on energy bills, because energy bills may increase at a rate faster than does their income (22). In contrast, wealthier households may experience an increase in their income at a rate that can sustain the increased price of energy. Take, for example, the yellow vest protests in France, which were incited by increased fuel costs. Wealth inequality should be addressed in energy insecurity literature, not only to ensure that lower-income households can afford and access energy through evidence-based policy but because socioeconomic status plays a direct role in determining a persons' health environment beyond energy needs.

The growing wealth gap is influenced by the exponential influx of people to urban areas, which do not have adequate infrastructure to provide for the growing population. As urbanization increases, more people are expected to benefit from urban advantage—the idea that there are health benefits to living in urban vs. rural areas (146). However, higher-income urban residents tend to benefit more from the urban advantage, and more often, low-income residents are left in unhealthy, poorly maintained neighborhood and residential environments (146). Thus, poorer residents are left without support and endure intergenerational socioeconomic hardships that prevent families from accumulating wealth. Constantly coping with hardships is financially costly, and high energy bills can be an obstacle to saving money among low-income households (9). Higher-income residents, on the other hand, pay less of their household income toward energy bills and benefit from more efficient and comfortable living environments.

The growing wealth gap between black and white families could also worsen disparate racial impacts as it relates to the intersection of energy, health, and poverty (147, 148). Energy transitions from fossil fuels to renewables such as wind and solar may also contribute to a growing gap because white-collar businesses and wealthier households are able to control and obtain financing for renewable energy, whereas poorer, minority populations are unable to grow their use of renewable energy technology because the cost is prohibitive and access is difficult given the cost, lack of social capital, and lack of education around renewables (130). African Americans have been historically excluded from opportunities for social and economic mobility, and, in the energy sphere, they are also unduly burdened. The literature has failed to explicitly acknowledge the racial divides in energy-related hardship related to cost, comfort, and efficiency and the protracted uptake of the cleanest energy technologies among minoritized groups. It is important to recognize how an increasing wealth gap will perpetuate energy insecurity, further impacting the ability of low-income and minority families to afford adequate energy. Identifying racially based injustices has been critical to advances in environmental justice, and here too, we see a potential for greater analysis of the racial disparities in energy insecurity and related health and social outcomes.

Energy Insecurity and the Global South

While this review has focused on energy implications in the U.S. and the Global North, many of the same issues are relevant to the Global South. Few articles discussed in this review use a framework of intersectionality to discuss the burden that inordinately affects marginalized populations around the world. Research on global household energy insecurity that uses environmental justice and intersectional frameworks could more adequately analyze this topic. In the Global South, millions of households lack adequate energy sources (149). It is vital that we find methods to expand modern energy services to reach more of the population (150). However, more systematically speaking, energy is dispersed unjustly and inequitably around the world (151, 152). Some populations have greater energy access than they need, while others do not have enough (8). We know that reducing carbon emissions worldwide is vital for addressing climate change, but it is also important to address the unequal distribution of energy sources. Health impacts from energy poverty in the Global South exist partially due to limited access to modern energy technologies. One example is the increased risk of COPD and heart disease from air pollutants that stem from cooking with biomass fuels rather than using electric or gas stoves (7, 19, 153, 154). Households using biomass cookstoves, for instance, face the dilemma of inhaling toxic pollutants from cooking or not eating—both of which have significant health implications. About one-third of the world, almost entirely in the Global South, relies on solid fuel sources such as wood and crop waste for cooking fuel (5, 7). Burning solid fuels for cooking creates indoor air pollution, which is significantly associated with stroke, ischemic heart disease, COPD, lung cancer, and pneumonia. The health impacts of solid-fuel cooking disproportionately impact women and children, who are exposed to higher pollution due to spending a larger amount of their time cooking than do men. Of the 1.3 million COPD deaths among women, about 511,000 are attributable to indoor cooking pollution. In contrast, of the 1.4 million COPD deaths among men, a much smaller proportion—173,000 cases—are attributable to indoor cooking pollution (7). Increasing the prevalence of and access to cleaner fuels for stoves around the world could significantly reduce these negative health outcomes.

In the same way that people of color in the U.S. disproportionately experience energy insecurity, people of color and those living in lower-middle-income countries (LMICs) around the world disproportionately bear the burden of an inequitable global energy system. Globally, people of color bear the burden of household energy insecurity. To this day, 1.3 billion people, most of whom live in Asia, Latin America, and Africa, lack access to modern energy services (155). Of the total number of people lacking electricity access worldwide, 41.3% of the people live in African countries, 28.5% live in India, 27.3% live in other Asian countries, and 2.2% live in Latin American countries (155). Countries of color are also more likely to shoulder the impacts of climate change, though they are less responsible for carbon emissions and environmental degradation, and their ability to withstand and rebuild from weather events is lower than higher-income countries (156).

Climate Change and Energy Insecurity

The literature reviewed here does not adequately demonstrate a thoughtful link to climate change that goes beyond the concepts of adaptation and mitigation. Future research should examine the impact that climate change will have on energy insecurity. We propose that the concepts of acute and chronic energy insecurity may allow future researchers to expand upon and better evaluate the effects of climate change on household energy. Climate change worsens the direct and indirect health outcomes of energy insecurity and exacerbates cumulative risk, such that those already experiencing energy insecurity are most affected by climate events because they are less able to prepare for, respond to, and recover from disaster events (157). Communities that are most vulnerable to daily hardships are also most vulnerable to the impact of weather events, and the disparity worsens with repeated shocks from climate change (156). For instance, mortality from heatwaves disproportionately affects older, minority, and low-income residents who are less equipped socially, economically, and physiologically to withstand high temperatures. After the 1995 Chicago heatwave, there was clear demographic disparity in mortality rates—lower-income and older people died at much higher rates than the rest of the population (48). These populations were much more vulnerable to heat stress due to living in decaying housing, lack of access to medical services, and social isolation (48). Without movement toward addressing the world's substandard housing, medical, and financial systems, natural disasters could continue to disenfranchise marginalized populations, intensifying and worsening existing stressors. Though some of the literature critically appraised in this review discusses weather events, the vast majority did not explicitly discuss climate change. Research should incorporate and explore the detrimental implications of climate change when evaluating energy insecurity in order to better prepare for future climate scenarios.

While vulnerable populations tend to be hit harder by climate change-related weather events all people are affected by climate change. Climate change-related energy insecurity issues, therefore, could impact anyone regardless of socioeconomic status (158). Severe weather events will lead to acute energy insecurity such as power outages that can affect anyone. More frequent heatwaves will significantly increase energy demand, the need for expanded energy systems, dependence on household air conditioning for entire populations (45, 93, 141, 142, 159). Power outages from heatwaves and storms can put anyone at risk of medical difficulties. Furthermore, storms are increasing in frequency and severity all over the world, putting people at risk of cut off energy access. And regardless of socioeconomic status, people resort to using emergency energy systems (e.g., generators) or non-energy methods during storms or disasters, which puts residents at risk of CO poisoning (160). It is difficult for residents with chronic illnesses to withstand acute energy insecurity from storm-related power outages (141, 161). As shown in these examples, energy insecurity, particularly acute energy insecurity, may become more prevalent for all people as climate change worsens. Notwithstanding the importance of the issue, a demonstrable gap in the literature exists, given that only one-third of the sources

included in this review discuss climate change in relation to energy insecurity.

STRENGTHS AND LIMITATIONS

This review paper was inspired by a desire to comprehensively understand the predictors and outcomes of energy insecurity. The household energy literature spans many disciplines and research methods. As a result, we drew from a large interdisciplinary pool of research in order to capture enough relevant sources on this topic. The broad inclusion criteria allowed us to find articles that spanned many disciplines and methods to give us a realistic look at the full range of the household energy insecurity literature. Though the breadth of information about household energy is a strength, it was also challenging in that it demonstrated a clear lack of cohesion and systematic guidelines around research on household energy. Therefore, making connections and critiques across these fields of research and sources presented a formidable challenge, though we have done our best to synthesize the literature and draw conclusions from it. The papers vary significantly not only in focus but in scientific quality and rigor—some are more descriptive in nature, while others are more empirical. Many of the studies were not rigorously designed, and for the most part, the literature proved to be quite underdeveloped overall. This review did not assess for quality or eliminate studies on the basis of potential bias. The challenge of a highly dispersed evidence base led us to develop our heuristic model, which attempts to conceptually unify the literature on household energy and health.

CONCLUSION

When considering the substantial impact that inadequate household energy can have on population health, we recognize the need to adopt policies and practices that protect people from energy insecurity. This review sought to highlight how energy needs are important for all aspects of daily living and for protection against the effects of acute insecurities in the context of climate change. Climate change threatens life on earth as we know it, and our collective vulnerabilities to energy hardship need to be addressed with extreme urgency (162). By using energy insecurity as a framework for understanding the nexus of effects of unmet household energy needs, we can draw connections between the direct effects of inadequate household energy, such as hypertension from a cold home, and how social vulnerabilities and co-occurring hardships contribute to the problem. With this broader framework, we can begin to understand how policies that address food insecurity, housing insecurity, structural and institutional racism, neighborhood segregation, education inequality, income inequality, and so many other social issues, will also affect energy insecurity and together impact population health. Studying the energy–health–justice nexus through the lens of acute and chronic energy insecurity presents a novel and innovative direction for public health research, advocacy, and policy that can be used to improve the health of people in the U.S. and around the world.

AUTHOR CONTRIBUTIONS

SJ, SS, and DH contributed to the conception and design of the review, performed the analysis, contributed to manuscript revision, response to comments from reviewers, read and approved the submitted version of the review, and all accountable of all aspects of the review, including its accuracy and integrity. SJ organized the database and wrote the first draft of the manuscript. SS and DH wrote sections of the manuscript.

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Behavioral and financial coping strategies among energy-insecure households

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When households struggle to pay their energy bills and avoid being disconnected from the grid, they may accrue debt, forgo expenses on food, and use space heaters or ovens to warm their homes. These coping strategies can introduce significant physical and financial risks. In this study, we analyze an original survey with a representative sample of low-income households during the first year of the COVID-19 pandemic, from June 2020 to May 2021. We evaluate the prevalence of a wide range of coping strategies and empirically estimate the determinants of these strategies. We find that more than half of all low-income households engage in at least one coping strategy, and many use multiple strategies. Households with vulnerable members, including young children or those who rely on electronic medical devices, and households that live in deficient housing conditions, are more likely to use a range of coping strategies, and many at once. Our findings have direct implications for public policy improvements, including modifications to the US Weatherization Assistance Program, the Low-Income Home Energy Assistance Program, and state utility disconnection protections.

energy insecurity | energy poverty | coping strategies | material hardship | COVID-19 pandemic

The “Big Freeze” of February 2021 led to rolling power outages across the state of Texas for more than 4.5 million households (1). Within 2 days, the freezing temperatures and power blackouts resulted in over 150 official deaths, with one media source reporting a death toll above 700 people (2). In the days following the blackout, the news revealed several causes of death, including medical conditions exacerbated by the blizzard, dangerous behaviors that households used to escape the cold (e.g., people sitting in their cars with the heat running, keeping a fire in the fireplace while the family slept around it). Even after power had been restored to most Texans, many remained burdened with exceptionally high utility bills (3). The freezing cold temperatures and mass blackouts are an extreme case, but the incidence of these severe events is increasing due to climate change (4, 5), and people engaging in risky behavior to mitigate exposure to uncomfortable or dangerous temperatures is not a rare phenomenon. Under “normal” economic and physical conditions, such strategies are practiced regularly around the country—and world—by individuals and families.

Energy insecurity, or energy poverty, both of which refer to a household’s struggle to pay energy bills and exposure to inadequate residential energy services, is a widespread problem in the United States as well as across the world (6; see ref. 7 for a comprehensive discussion of definitions and metrics). In the United States, an estimated 24.3 million low-income households were unable to pay their energy bills and 10.3 million were disconnected from their service providers between April 2019 and April 2020 (8), the year preceding the onset of the COVID-19 pandemic. Furthermore, the incidence of energy insecurity is not evenly spread across all populations. Over this time and during the onset of the pandemic, households of color, those with young children, and those that rely on at-home electronic medical devices were significantly more likely to face utility disconnections (8). These disparities were exacerbated by the pandemic and the resulting economic recession, which left millions out of work (9) and increased rates of residential energy consumption and costs (10).

Energy-insecure households make difficult decisions daily, navigating keeping their power on and maintaining safe indoor temperatures, while still meeting their other essential needs, such as food and health care. To pay their bills, households need to weigh several possibilities, including asking for a loan, seeking government assistance, or engaging in potentially risky behavior to keep their bodies warm.

The extant literature provides some insights on how families cope when they struggle to pay their monthly bills. Material hardship scholars often study the role of various assistance programs in reducing hardship (see, for example, ref. 11), and they additionally consider the prevalence of different forms of hardship (see, for example, ref. 12). Material hardship research, however, typically excludes energy insecurity, even though

Significance

Millions of Americans are regularly unable to pay their energy bills. For these Americans, avoiding being shut off from their electricity service is a daily challenge and one that requires them to take financial and behavioral risks, such as acquiring utility debt or burning trash to generate heat. In this study, we find these techniques to be prevalent and often used in combination. We also find that households with young children and those with individuals who rely on electricity to power their medical devices are more likely to use these coping techniques, as are households with deficient housing conditions. There are, however, efforts that the government can undertake to help these especially vulnerable populations.

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it has been found to be among the most common forms of material hardship for US families (12). The analyses that include measures of energy insecurity focus specifically on financial coping strategies, finding that those who face energy insecurity usually rely on assistance from friends or family, bill balancing or alternating payments between bills, or seeking assistance from government programs (11–17).

By contrast, scholarship on energy insecurity and related topics focuses more heavily on behavioral coping strategies. A study of Austrian households, for example, found that the most common strategies for keeping a comfortable temperature in the home were wearing extra layers of clothing, heating a single room in the house, and “slipping under the covers” (18). Chard and Walker (19) found additional behaviors that UK families with elderly members routinely adopted as commonsense solutions, including going to sleep earlier and only heating specific rooms in their homes in the winter months. Evaluations in the United States and United Kingdom also found that households facing energy insecurity tended to use less fuel or electricity, allowing their home to reach uncomfortable temperatures before they turned on heat or air conditioning (20–22). To afford monthly energy bills, other studies have found families often cut expenditures, such as food or medical care (23, 24), accrue considerable debt by taking out high-interest payday loans (20, 24, 25), or signing up for utility payment plans (22).

In a recent study, Hernández and Laird (26) examined how households cope with energy insecurity. Analyzing household data from the 2015 Residential Energy Consumption Survey, they consider whether households facing the threat of disconnections or actual disconnections respond by forgoing other necessities, adjusting their home’s temperature to an unsafe or unhealthy level, or seeking energy assistance. They find that households, particularly those who report having had their energy services disconnected, use each of these coping strategies to some extent and often in combination.

Collectively, the literature reveals that energy-insecure households use a range of coping strategies and often pursue many at once (see, especially, refs. 11, 13, 20, 26), but the existing literature has a few important gaps. First, few studies include a wide range of potential coping strategies in a single analysis. The material hardship literature more often focuses on financial behavior, and the energy literature more often considers temperature-seeking behavior. Studies that have considered both in the same analysis have data limitations, including a limited set of household-level coping strategies. No previous study, to the authors’ knowledge, has evaluated a comprehensive range of coping strategies for this distinct, yet prevalent, form of material hardship.

Second, while the literature emphasizes the challenges associated with material hardship, it is less common for studies to explore the risk associated with using coping strategies to mitigate such hardship. For example, households must make decisions about whether to be disconnected from their service provider(s), risk a house fire by running a space heater, or forgoing meals to pay an energy bill. In fact, with some exceptions (e.g., seeking bill assistance from the government or a friend or family member), many coping strategies carry considerable risks, either financially or physically. Evaluating a wide range of coping strategies, both financial and behavioral, puts such risks in perspective and highlights how dire the tradeoffs can be for energy-insecure households.

Third, less often addressed in the literature, and central to the present analysis, is the question of why energy-insecure households engage in one strategy or another and how certain conditions faced by a household may influence such behavior. For example, if a household has one or several vulnerable members residing in

the home, such as small children or medically compromised family members, they may be more likely to pursue certain coping strategies over others. The exceptions are studies by Harrington et al. (27) and Gibbon and Singler (24), which find that households with small children or members with disabilities, respectively, more frequently accrue utility debt presumably because these populations are less able to withstand extreme temperature or food deprivation. No study, to the authors’ knowledge, has gathered all coping strategies into a single analysis, assessed the frequency and overlap among them, and evaluated which factors (i.e., sociodemographic and housing conditions) lead to the greater use of any given strategy.

We address these gaps in our analysis. Here, we analyze the frequency of various energy-coping strategies and what factors lead households to engage in one approach or another. We draw from an original survey of a representative sample of approximately 2,000 low-income households (with a resulting sample after multiple survey waves and accounting for the nonresponse of 5,187 respondents)—defined as those within 200% of the federal poverty level (FPL)—that we sampled at multiple points in time over the course of the COVID-19 pandemic, from roughly June 2020 to May 2021.

The contributions of our analysis are twofold. First, we analyze an original survey dataset that allows us to measure a wide range of coping strategies, including both behavioral and financial responses to energy insecurity, at the household level. The survey is longitudinal and measures outcomes across time periods that span the course of a year, which allows us to capture seasonal variation (e.g., temperature) and control for conditions faced by households in previous time periods. Second, this analysis pulls together disparate strands of literature to present and assess a wide range of coping strategies, which we use to test which conditions lead certain households to adopt one approach or another, or combinations thereof.

Our analysis is also set in the dynamic context of the COVID-19 pandemic, which restricted social engagements and set stay-at-home orders, unsettled labor markets, and shifted more energy use to residential settings. During this time, millions of households experienced material hardships and were unable to pay their monthly bills, including their energy bills. Unexpected economic shocks require low-income households to make sudden and difficult decisions (13). Therefore, the timing of the data collection provides unique insight into how low-income households cope both financially and physically during times of economic and social stress.

Results

Coping Strategies. We combined insights from the extant literature to generate an extensive list of coping strategies, including both financial and behavioral, which we then included in our survey analysis. The survey results reveal that energy-insecure households tend to engage in four general coping strategy categories. First, they seek the right temperature through behavioral techniques, some of which are riskier than others. We define risky temperature behavior as the use of space heaters, the fireplace, the oven, the dryer vent, or burning trash to generate heat.* Second, to pay energy bills, households tend to forgo

*In this analysis, we do not include the behavior of keeping one’s home at an uncomfortably high or low temperature because we do not have such a measure in our survey instrument. We assume that these riskier behavioral techniques, however, are to compensate for an inability or unwillingness to turn on the heat or air conditioning to a safe or comfortable temperature. Future studies may seek to disentangle these two behaviors and may also consider including a more extensive set of both warmth- and cold-seeking behaviors that individuals pursue with the expressed purpose of coping with energy insecurity.

paying for other essential needs, such as medical bills or food. Third, households seek assistance from both formal (e.g., government, banks) and informal (e.g., friends, family, churches) networks to pay their bills. Fourth, households engage in a variety of bill strategies, such as carrying debt across utility bills, skipping payments on select bills each month until the consequences become severe (e.g., notice of disconnection, report to the credit authority), or practicing bill balancing, which is paying down a portion of one or more bills to have enough to pay for another.

We display these practices in Fig. 1, along with the percentage of respondents who reported engaging in each activity at least once during the year. General coping strategy categories are colored blue and are the dependent variables in the primary analyses that follow. More specific strategies are colored green, which serve as the dependent variables in the secondary analyses. The figure illustrates that ~55% of the sample engaged in at least one coping strategy. Given that the survey is a representative sample of low-income households in the United States, we merge the data with estimates of those who live at or below 200% of the FPL from the 2018 American Community Survey (ACS) to extrapolate that just under 10.5 million domestic households, or 53.4 million individuals, engaged in at least one coping strategy, with many using more than one during this time (28). The most common techniques, at 32% of the sample, are financial strategies, such as bill balancing or acquiring utility debt. The second most common, at 26%, is behavioral—engaging in risky temperature-related techniques, such as using a space heater. A relatively limited number of respondents, at 11%, seek government assistance to cope with energy insecurity, despite this being one of the least risky strategies of the full set.

In Fig. 2, we present the proportion of the sample that engaged in the general coping strategy categories, or the dependent variables in the primary set of results, over the time period of analysis. The summer wave represents June 2020 through August 2020, the fall and winter wave represents September 2020 through January 2021, and the winter and spring wave represents February 2021 through May 2021. This figure reveals important seasonal

dynamics. In the early winter months, we observe that most types of coping strategies rise, except for forgoing expenses. Comparatively, temperature-based behaviors rise significantly in the winter months, which is expected since all the temperature behaviors included in this analysis facilitate warmth. All four strategies declined between the winter and spring months as temperatures became more temperate and additional relief (i.e., COVID-relief checks and child tax credits) were released by the federal government during this time.

Determinants of Coping Strategies. Select regression analysis results are presented graphically in Fig. 3, with a table of full model results available in *SI Appendix, Table S1*. Our primary analysis estimates the correlation between various socioeconomic household attributes and the four general coping strategies. We estimate each model twice, first without and then with two measures of self-reported energy insecurity. The first measure is a single-wave lagged measure of difficulty paying a household energy bill and the second is a self-reported utility disconnection at any point between roughly May 2019, 1 year before survey administration, and the time of survey administration. Including these lagged variables enables us to account for both recent energy-insecurity conditions that may lead one to engage in a coping strategy (e.g., if a person struggled to pay their bill last month, they may curtail energy usage and engage in other behaviors this month), as well as previous, more extreme experiences that may affect how one behaves in the present time period (e.g., if a person has been disconnected previously, they may be more likely to use coping strategies to avoid being disconnected again). We ran robustness checks on the construction of these measures in *SI Appendix*, as discussed in the Determinants of Multiple Coping Strategies.

Results reveal that the two energy-insecurity measures are statistically significant determinants across all four general coping strategies. If a household struggles to pay its bill in the previous wave or if it was disconnected at any time in the previous year, then it is more likely to engage in all four general coping strategy categories, particularly bill balancing. Fig. 3 also shows that sociodemographic characteristics are associated with certain

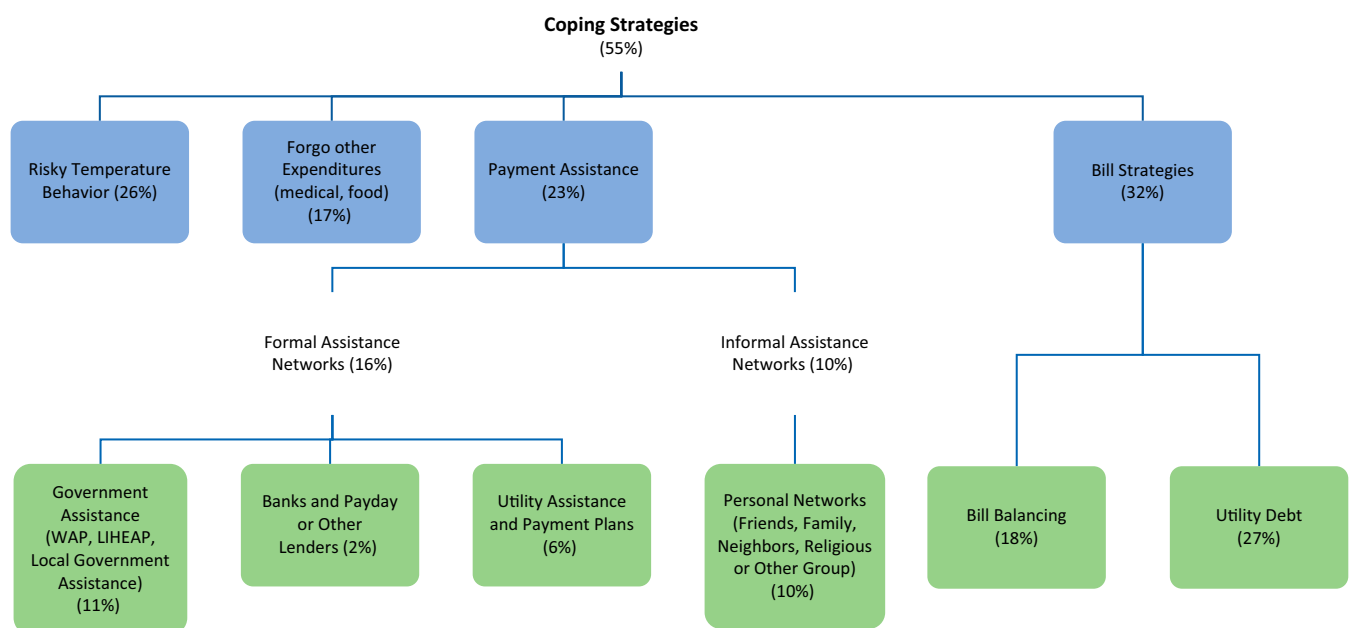


Fig. 1. Coping strategies, with percentage of respondents who engaged in each activity between June 2020 and May 2021.

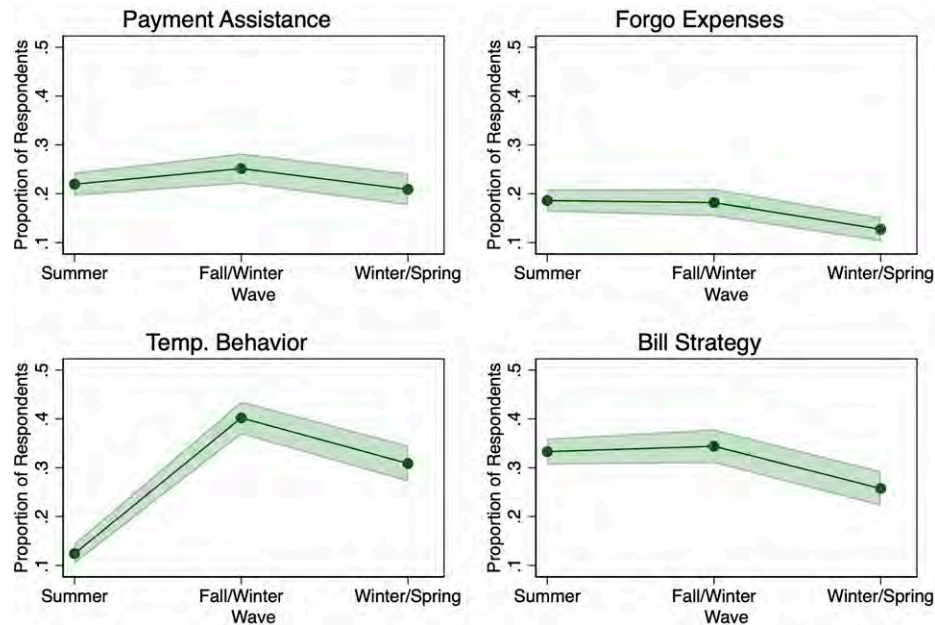


Fig. 2. Proportion of respondents (with 95% CIs) who engaged in each coping strategy category, by wave.

coping strategies. Broadly speaking, households with vulnerable members are more likely to engage in at least one of the general categories of coping strategies.

As presented, our results reveal that households with children younger than age 5 years are more likely to engage in all of the strategies: use temperature strategies, forgo expenses, seek payment assistance, and use bill strategies. Households with health-compromised members are more likely to seek a broader range of coping strategies as well. Specifically, if a household has a member with a medical disability, it more typically seeks payment assistance, and households with members who rely on an electronic medical device, a demographic that is particularly vulnerable to a lack of power, engage in all of the strategies, including using risky temperature behaviors, which, of course, could particularly compromise the health of the household. We also find racial disparities, with Black and Hispanic households more likely than White households to use bill strategies, such as bill balancing or debt accrual, and Hispanic households more likely than White households to forgo expenses, but neither is more or less likely to undertake temperature strategies. Lastly, when we stratify the sample by income, the results reveal that lower income levels correlate with seeking payment assistance, forgoing expenses, and using bill strategies.

Beyond the sociodemographic characteristics, Fig. 3 reveals that those living in deficient housing conditions—mold in the home, poor insulation, drafty air, holes in the wall, bad plumbing, exposed electric sockets, broken air conditioning, or nonworking stove or refrigerator—are more likely to engage in all four general categories of coping strategies. Finally, there is significant seasonal variation, likely due to weather conditions. *SI Appendix, Table S1* reveals that in the colder months, households are more likely to engage in all of the coping strategies, whereas in the warmer months, respondents used less warmth-seeking behavior and more bill balancing.

We also tested the specific coping techniques under the payment assistance and bill strategies categories (i.e., those in green in Fig. 1). Select results are presented in Fig. 4, with a model specification that matches the models presented in Fig. 3; full model results are found in *SI Appendix, Table S2*. Here, we find three groups that are more likely to engage in all six coping strategies:

(1) households that have at least one member who relies on an electronic medical device, (2) households with young children, and (3) those who live in deficient housing conditions. Consistent with Harrington et al. (27) and Gibbon and Singler (24), households with small children and with members who are medically compromised, either disabled or rely on an electronic medical device, are more likely to accrue debt; yet we also find that several other vulnerable populations are more likely to take on utility debt as a coping strategy, including those who have experienced energy insecurity in the past, Black and Hispanic households, those who live in deficient housing conditions, and those at the lowest income level.

We additionally find that households that have a member with a disability as well as Black households are both more likely to seek out government assistance, while Hispanic households and respondents with less than a high school education are more likely to engage in bill balancing. Those in the lowest income strata and those who are 100 to 150% of the FPL are associated with seeking government assistance and tapping their informal networks, while those under 100% FPL are also more likely to balance their bills.

Determinants of Multiple Coping Strategies. The results presented thus far suggest that households often engage in more than one coping strategy, and often at the same time, as reaffirmed by other scholars (11, 13, 20, 26). A natural extension is an examination of which sociodemographic or household factors correlate with the use of a greater number of strategies. To do so, we ran a Poisson model in which the outcome measure is a count variable that ranges from zero (no coping strategies) to four (all four main coping strategy types, as presented in blue in Fig. 1). Fig. 5 presents the marginal effect size of key variables, and the full set of results are presented in *SI Appendix, Table S3*. Here, we see that previous incidence of energy insecurity, sociodemographic variables, and deficient housing conditions are correlated with a greater number of strategies used in the home. Previous inability to pay one's energy bill has the largest effect size, followed by a previous disconnection experience. On average, those with small children in the household or with medical conditions use more coping strategies. Similarly, we

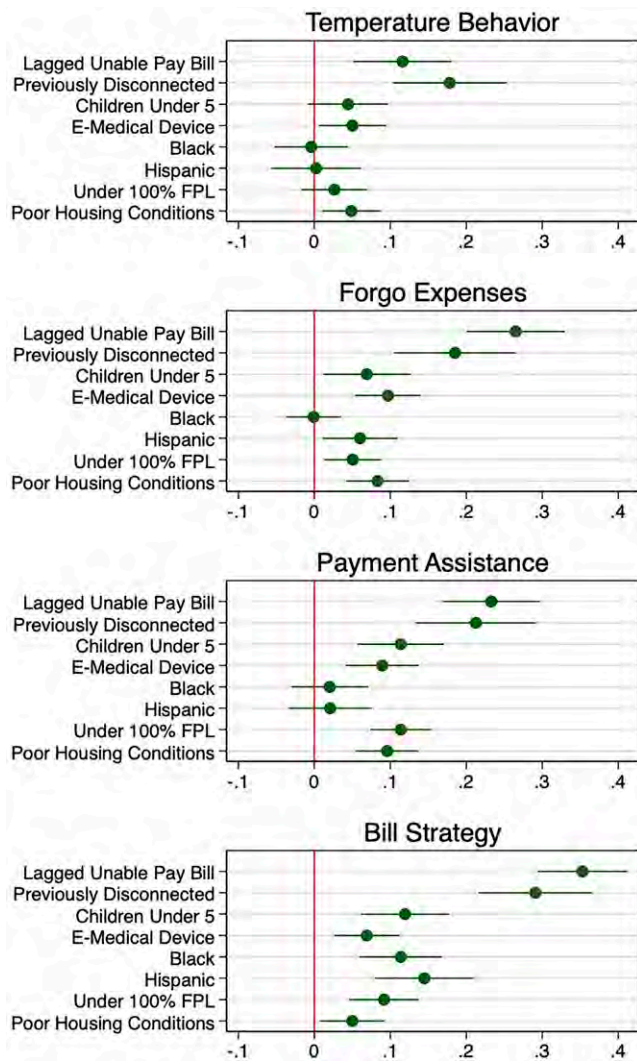


Fig. 3. Linear probability model regression results, with 95% CIs for selected variables with dependent variables: risky temperature behavior, forgo expenses, seek payment assistance, and engage in a bill strategy ($n = 5,187$). The omitted race category is White. The omitted income category is household within 150 to 200% of the FPL. Additional control variables include members in the house are older than 65 years, other race, respondent has a high school education or less, household is within 100 to 150% of the FPL, respondent is employed, home ownership/renter type, type of home, state fixed effects, and wave fixed effects.

find that households of color and lower-income households also typically use more strategies. These behaviors are more pronounced in the winter months than in the summer months.

Fig. 5 provides insights as to who is more likely to engage in a greater number of coping strategies, but it does not reveal how households may pair specific strategies together. In Table 1, we extrapolate the number of low-income households that engage in any given pairing of the four general coping strategies over the course of the year. Once again, we calculate these values by multiplying the 2018 ACS estimate of all US households within 200% of the FPL (28) by the percentage of households in the sample that reported using these coping strategies over the course of the year. The most common pairings, with more than 2 million households each, are between forgoing expenses and bill strategies as well as risky temperature behavior and bill strategies. The least common is the pairing of payment assistance and bill strategies; however, more than 190,000 households still engaged in these two financial strategies simultaneously during the course of the year to pay energy bills.

We test the robustness of these results through several techniques. First, we modify the construction of the energy-insecurity variables by making them both single time period lags and a measure of occurrence anytime in the past year, respectively. Second, we consider the possibility that the unbalanced nature of our panel introduced bias if observations are missing not at random. Third, we expand the count variable in the final regression to include all coping strategy measures, not just the higher order categories. In this set of regressions, we include behavior strategies and forgoing expenses, and then separate out each individual measure of payment assistance and bill strategies, for a total of eight measures. Finally, we replace the state fixed effects with regional fixed effects because regional variables may help account for climate and weather patterns. We estimate these models with both standard regional classifications (e.g., West, South, Northeast, and Midwest) and climate regions using the classification from Karl and Koss (29), which are also used by the National Oceanic and Atmospheric Administration.

All robustness checks are available in *SI Appendix, Tables S4–S7*. Model results are remarkably stable with the variation in energy insecurity measures (*SI Appendix, Table S4*) and with the alternative count variable (*SI Appendix, Table S6*). The balanced panel results (*SI Appendix, Table S5*) are also quite similar to the main results in terms of statistical significance, although with a few differences in which a variable falls out of the conventional statistical significance thresholds. Specifically, those with household members who rely on medical devices are not associated with risky temperature behavior or payment assistance. While these minor differences between the main results and the balanced panel results are important to weigh when assessing the overall validity of the findings, none of these suggest significant model specification problems, nor do they undermine the main findings of the analysis. The final set of models, in *SI Appendix, Table S7*, which controls for region, is entirely consistent with the main results.

Discussion

In this analysis, we address two tiered questions. First, descriptively, what are the primary ways in which households cope with energy insecurity and how prevalent is each strategy? Second, who engages in these strategies among the US low-income population? To answer these questions, we analyze data from an original, nationally representative, multiwave survey of low-income households that was administered during the first year of the COVID-19 pandemic. We find that households do not solely engage in financial coping techniques, such as debt accrual, paying their bills at strategic intervals, or applying for government assistance, as is typical for other forms of material hardship. In fact, households pursue additional, arguably quite risky, energy-specific behaviors. For example, to pay their energy bills, households will forgo purchasing groceries, delay going to the doctor, or compensate for colder indoor temperatures through risky warmth-seeking behaviors. Our results reveal that all of these practices are not only common among low-income American households but also many households engage in several of these approaches simultaneously.

We also find variation across sociodemographic groups. Most important, we find that households with vulnerable residents, such as young children or medically compromised individuals, cope through several concurrent techniques. Both types of households use both behavioral strategies, such as engaging in potentially risky efforts to remain warm, and financial strategies, such as taking on utility debt, strategically shifting their

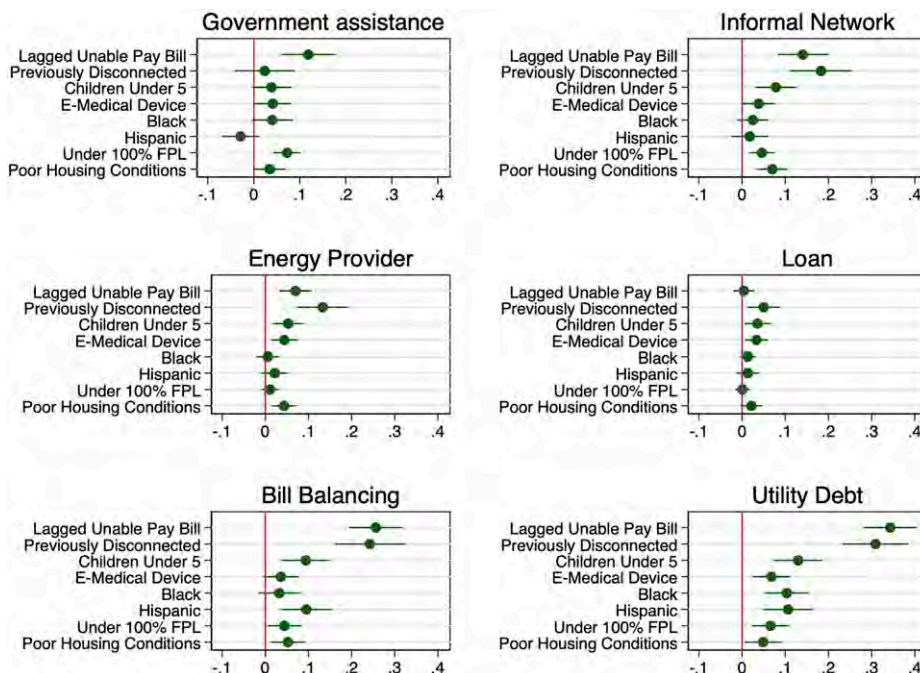


Fig. 4. Linear probability model regression results, with 95% CIs for selected variables with dependent variables government assistance, informal network assistance, energy provider assistance, loan, bill balancing, and utility debt ($n = 5,187$). The omitted race category is White. The omitted income category is household within 150 to 200% of the FPL. Additional control variables include members in the house are older than 65 years, “other” race, respondent has a high school education or less, household is within 100 to 150% of the FPL, respondent is employed, home ownership/renter type, type of home, state fixed effects, and wave fixed effects.

bill payments, or seeking payment assistance from both formal and informal networks. This suggests that these households need to do everything within their abilities, including the most risky strategies, to avoid a life-threatening utility disconnection.

The results of this analysis suggest several opportunities for public policy action. First, one of the leading predictors of engaging in any, or a combination of, coping strategies is the condition of one’s home. Approximately 17.8% of survey respondents, or an estimated 3.4 million low-income households (28), reported that their dwelling suffered from at least one deficient housing

condition. Our empirical analysis further suggests that when a household has dilapidated or inefficient dwelling conditions, such as a broken heating, ventilation, and air conditioning system or holes in the wall, they more frequently use all possible coping strategies. Helping these households repair equipment, upgrade appliances, and update the physical structures in which they live would improve energy efficiency and lower home energy bills, and thereby alleviate the need to engage in risky coping behaviors. Thus, the government can expand programs such as the Weatherization Assistance Program (WAP)—a federally funded program

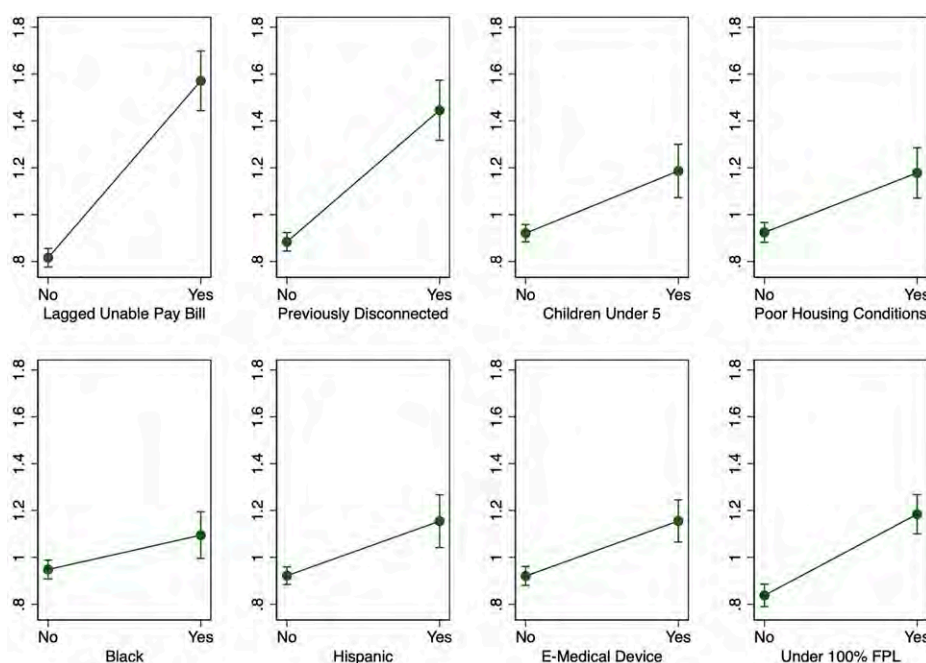


Fig. 5. Marginal effects from Poisson regression with dependent variable as a count of coping strategies.

Table 1. Estimates of households that engaged in coping strategy pairings

	Risky temperature behavior (%)	Forgo expenses (%)	Payment assistance (%)
Forgo expenses	1,429,578 (7.5)		
Payment assistance	1,848,921 (9.7)	1,753,615 (9.2)	
Bill strategy	2,153,897 (11.3)	2,287,325 (12.0)	190,610 (1.0)

Each cell contains 2 values: (1) an estimate of the No. of US households within 200% of the FPL that would engage in each coping strategy pairing and (2) the proportions of the survey sample that reported engaging in any given pairing over the course of the year are in parentheses.

that helps low-income households update their dwellings each year through energy efficiency upgrades and renewable energy installations—and, with insights from this analysis, target households with residents who are particularly vulnerable, such as those with young children or with individuals who rely on electronic medical devices. Even though millions of homes need repairs and efficiency upgrades, WAP currently only helps 35,000 low-income households each year (30). To ensure more robust participation in WAP, the government can also increase annual appropriations and clearly communicate the value of weatherization, evaluate success based on established energy poverty metrics (6), and collaborate with local community groups and members to ensure the information is shared with energy-insecure households (31).

Second, the federal government can also allocate more funds to the Low-Income Home Energy Assistance Program (LIHEAP), a federally funded energy bill assistance program. We found that applying for government payment assistance is significantly less common than several other far riskier coping techniques, such as temperature-seeking behavior, forgoing expenses on food and health care, and using bill strategies. This is not surprising because currently, due to limited Congressional appropriations, LIHEAP serves 20 to 25% of the eligible population, is only offered once per year to each eligible applicant, and has a limited program year (32). We also found that households engage in more coping strategies at the end of the year, or in the colder winter months, than other times of year, even though nearly 50% of LIHEAP funds are expended on helping households heat their homes. Based on this analysis, demand for bill assistance outstrips supply and outreach efforts to energy-insecure households are likely insufficient. Therefore, Congress should consider appropriating more money toward LIHEAP. In the absence of increased funding, LIHEAP administrators should continue to target outreach efforts to the populations that are the most likely to engage in risky financial and physical behaviors identified in this article, including households with young children, those with medically compromised members, and those who live in deficient housing conditions.

Third, state institutions can protect their constituents from utility disconnection by applying temperature-based, date-based, or targeted protections for vulnerable populations (33).[†] Many states offer such protections, but there remain opportunities for expanding the scope, scale, and duration of coverage, especially in the particularly hot and cold months, when households seek dangerous coping strategies. Based on the results in this analysis, states

[†]Note that we included these protections in the present analysis insofar as they are captured in the state fixed effects term.

could specifically and swiftly encourage utilities to provide disconnection protections for households with medically compromised individuals as well as households with young children. While only five states provide protections for households with young children, nearly all states currently have a disconnection policy to protect those with medical conditions. However, the stringency of the medical protections varies across states and often requires one or more notes from a physician (33), which may be a hurdle for some applicants to obtain, especially if they are unable to afford timely medical care. Therefore, states could reconsider the breadth of these protections for their vulnerable constituencies as well as consider easing the burdens households with particularly vulnerable members must overcome to benefit from these policies.

Our results highlight the vulnerability that millions of low-income families face, many of whom are putting their financial and physical well-being at risk to maintain indoor thermal comfort, pay their energy bills, and ultimately avoid utility disconnection. We collected these data during a public health crisis, during which stay-at-home orders were enacted. The orders resulted in people spending more time at home (i.e., consuming more residential energy) than before the pandemic. Although the timing of the data collection may limit the generalizability of the findings to future conditions, there is also reason to believe that other such factors may lead to worse conditions in coming years. For example, utilities will need to invest in low-carbon capacity and infrastructure, which will likely increase energy costs and related household bills (34). In addition, climate change will continue to produce more erratic and extreme temperatures, leading to more energy demand—heat in the winter and air conditioning in the summer—as well as more weather-related emergencies (35). These factors are likely to converge, which will expand the energy-insecure population and the need for already vulnerable individuals and families to use at least one potentially risky coping strategy to pay monthly energy bills. As such, it is imperative that we recognize the prevalence of the domestic energy insecurity problem, the risks associated with household coping behavior, and the need for targeted policy interventions to help alleviate this especially dire form of material hardship.

Table 2. Distribution of respondents by region and climate region

	Sample, %
Regional distribution	
West	21.3
Northeast	15.8
Midwest	21.0
South	44.8
Climate region distribution	
Northeast	17.7
Upper Midwest	6.5
Ohio Valley	16.9
Southeast	21.3
Rockies and Plains	1.7
Southeast	14.9
Southwest	5.2
Northwest	3.5
West	11.6
Alaska	0.1
Hawaii	0.5

Table 3. Variable names, definitions, and descriptive statistics

Variable name	Operational definition	Type of variable	Mean	Linearized SE	95% CI
Dependent variables					
Risky temperature behavior	Respondent reports engaging in any of the following: using the stove for space heat, using a space heater, burning trash in the home for heat, using the fireplace for heat, or using the dryer vent for heat	Binary	0.2597	0.0101	0.2398–0.2796
Forgoes expenses	Respondent reports the need to forgo expenses on food or medical care to pay for energy	Binary	0.1697	0.0092	0.1516–0.1877
Seeks payment assistance	Respondent reports seeking payment assistance to help pay energy bill	Binary	0.2270	0.0109	0.2057–0.2484
Engages in bill strategy	Respondent reports engaging in a bill strategy, either balancing payments across bills or acquiring utility debt	Binary	0.3170	0.0126	0.2922–0.3417
Seeks government assistance	Respondent reports seeking government assistance through WAP, LIHEAP, or another local government program	Binary	0.1146	0.0077	0.0995–0.1298
Seeks payment assistance from informal network	Respondent reports seeking payment assistance from friends, family, a faith organization, or a nonprofit	Binary	0.1036	0.0075	0.0889–0.1181
Seeks payment assistance from utility provider	Respondent reports seeking payment assistance from their utility through a payment plan or other utility support	Binary	0.0579	0.0057	0.0466–0.0692
Takes out a loan	Respondent reports taking out a loan or payday lending to pay an energy bill	Binary	0.0193	0.0033	0.0127–0.0258
Engages in bill balancing	Respondent reports engaging in bill balancing	Binary	0.1835	0.0108	0.1624–0.2046
Takes on utility debt	Respondent reports taking on utility debt	Binary	0.2719	0.0118	0.2487–0.2950
No. of coping strategies	No. of the following strategies used by the household: risky temperature behavior, forgoes expenses, seeks payment assistance, engages in bill strategy (ranges from 0 to 4)	Ordinal	0.9764	0.0310	0.9156–1.0370
Independent variables					
Lagged, struggled to pay energy bill, t-1	Respondent reported difficulty paying energy bill in the previous wave	Binary	0.1418	0.0098	0.1225–0.1611
Previously disconnected	Respondent reported being disconnected at some previous time period, either in a previous wave or any time the year before the first data administration in May 2020	Binary	0.0675	0.0090	0.0499–0.0851
Children in house are younger than 5 y	There is at least 1 child living in the house who is younger than 5 y old	Binary	0.1517	0.0105	0.1310–0.1724
Member(s) of household are older than 65 y	There is at least 1 individual living in the house who is older than 65 y	Binary	0.3292	0.0121	0.3054–0.3529
Member(s) of household have a disability	There is at least 1 individual living in the house who has a medical disability	Binary	0.4042	0.0129	0.3790–0.4295
Member(s) of household rely on electronic medical device	There is at least 1 individual living in the house who relies on an electronic medical device	Binary	0.1799	0.0100	0.1603–0.1996
Black household	Household is of Black racial composition	Binary	0.1698	0.0110	0.1482–0.1914
Hispanic household	Household is of Hispanic racial composition	Binary	0.1972	0.0144	0.1689–0.2255
Household identifies as other race	Households is of other racial composition	Binary	0.0909	0.0081	0.0748–0.1069
White household (omitted)	Households is of other White racial composition	Binary	0.5414	0.0150	0.5120–0.5707
Household respondent has high school education or less	Respondent reports having only a high school diploma or less	Binary	0.5529	0.0138	0.5258–0.5801
Household is within 100 to 150% of FPL	Respondent reports that household is within 100 to 150% of the FPL, based on income categories provided by the authors in the survey instrument	Binary	0.2966	0.0112	0.2746–0.3185
Household is under 100% of the FPL	Respondent reports that household is under 100% of the FPL, based on income categories provided by the authors in the survey instrument	Binary	0.3999	0.0131	0.3742–0.4255
Household is 150 to 200% of the FPL (omitted)	Respondent reports that household is within 150 to 200% of the FPL, based on income categories provided by the authors in the survey instrument	Binary	0.2122	0.0094	0.1937–0.2307
Household respondent is employed	Respondent reports being employed at time of the survey	Binary	0.3164	0.0132	0.2906–0.3423
Broken or inefficient house conditions reported	At least 1 of the following house conditions is present: mold in the home, poor insulation, drafty air, holes in the wall, bad plumbing, exposed electric sockets, broken AC, or nonworking stove or refrigerator	Binary	0.1778	0.0074	0.1633–0.1922
The respondent(s) rent their residence	Respondent rents their residence	Binary	0.5021	0.0142	0.4743–0.5299
The respondent(s) claim “other” for home ownership type	Respondent neither rents nor owns their residence	Binary	0.0740	0.0072	0.0599–0.0882
The respondent(s) own their residence (omitted)	Respondent owns their residence	Binary	0.5509	0.0146	0.5223–0.5796
Home is a trailer	Dwelling is a trailer	Binary	0.1147	0.0094	0.0962–0.1332
Home is an apartment or condominium	Dwelling is an apartment or condominium	Binary	0.3334	0.0140	0.3059–0.3608
Home type is “other”	Dwelling type is reported as “other”	Binary	0.0027	0.0008	0.0012–0.0043
Home type is single-family home (omitted)	Dwelling is a detached or attached single-family home	Binary	0.4242	0.0059	0.4126–0.4358
Summer (wave 2)	Data gathered in the second wave	Binary	0.4255	0.0060	0.4138–0.4372
Fall/Winter (wave 3)	Data gathered in the third wave	Binary	0.3164	0.0043	0.3079–0.3249
Winter/Spring (wave 4)	Data gathered in the fourth wave	Binary	0.2605	0.0052	0.2504–0.2707
Previously struggled to pay bill	Respondent reported difficulty paying energy bill either in any previous wave or any time the year before the first data administration in May 2020	Binary	0.2505	0.1290	0.2252–0.2758
Lagged, disconnected, t-1	Respondent reported being disconnected from their utility provider in the previous wave	Binary	0.0365	0.0060	0.0247–0.0483

Materials and Methods

Survey Design and Sampling. This study was approved by the Indiana University Human Subjects & Institutional Review Board as exempt status. We produced the data for this analysis via an original survey designed by the authors and administered by YouGov, a private polling firm. To build the sample, we surveyed a representative group of respondents of those within 200% of the FPL. This threshold is a common percentage for analyses of low-income households (see, for example, ref. 36). In addition, federal energy assistance programs such as LIHEAP tend to use 150% of the FPL as the eligibility threshold; therefore, our sample allows us to analyze differences across households that are under and over this specific threshold.

YouGov generates a random and representative sample through a two-step process. First, the firm draws a random sample from the full population of all households within 200% of the FPL. Next, the firm uses a matching algorithm to select matching households from their proprietary panel of approximately 2 million US participants. Scholars have widely validated YouGov's sampling techniques (37–39). For the present analysis, we generated demographic survey weights to ensure that the sample is fully representative of the population of low-income households and applied these weights in all regressions. YouGov awards points per completed survey, which translates into financial compensation.

We administered the survey at four separate points in time, roughly coinciding with different seasons, over the course of the year from mid-2020 to mid-2021. In the first wave, which we administered in May 2020, we asked questions about baseline conditions of energy insecurity, both in the month of May and over the past year, the year that predated the COVID-19 pandemic. In the present analysis, we only use this wave to construct lagged energy insecurity variables.[‡] Beginning in wave two, which we administered in August 2020, we asked questions that pertained to several months at a time. In our August survey, we covered the months of June, July, and August. We administered wave three in January 2021, which pertained to the months of September through January, and wave four in late May and early June of 2021, which pertained to the months of February through June. This analysis focuses only on waves two through four.

The decline in sample size across waves of the survey was anticipated, given our expectations about attrition. We also set approximate quotas for each wave to achieve nationally representative samples, and the survey was closed when these quotas were met, in the interest of keeping the surveys open for as short of a duration of time as possible. This approach allowed us to document one person's response, for example, completed on the first day that the instrument was open, as in the same time period as another's, who completed it on the last day that it was open. If we left the instrument open for too long, then the first respondent may have experienced completely different circumstances (e.g., policy, coronavirus, personal circumstances) than the second respondent, but we would still claim them both as occurring in the same wave. To avoid this problem, we set threshold for responses with YouGov ahead of time and closed the survey once we met those thresholds.

Thus, there are individuals who dropped from the sample not due to nonresponse but due to us closing the survey. As a result, it is impossible for us to identify who dropped from the sample due to attrition and who dropped due to the survey closing. To analyze whether anyone was discontinued in the study not at random, however, we present basic descriptive statistics in *SI Appendix, Tables S8 and S9*. First, for any sociodemographic variable that is likely to remain constant over the waves, we present means and SDs by subsample: those who stopped after the second wave, those who stopped after the third wave, and those who made it through all of the waves. Second, for any variable that was likely to change over time, which includes housing, energy insecurity, and coping strategy variables, we estimate means and SDs within waves. Here, we compare those who stopped after the second wave with those who went on to complete subsequent

waves, all at wave two values; we then compare those who stopped after the third wave with those who went on to complete the final wave, all at wave three values. The results show that there are no large differences for any variable, either across subsample or within wave. All means are well within the SDs of one another.

The final unbalanced sample is 2,247 in wave two (summer), 1,670 in wave three (fall/winter), and 1,378 in wave four (winter/spring). With some nonresponse to survey questions, the final sample size in the regressions is 5,187. We presented the weighted distribution of respondents across regions and climate regions in Table 2.

We administered the survey online and it lasted ~10 to 15 min. The survey included questions on respondents' personal and household characteristics, housing conditions, heating and cooling behavior, rates of energy insecurity, and various coping strategies. In each of the waves, we asked respondents to reflect on the past several months to identify whether, at any point over that time period, they experienced an inability to pay their energy bill or a utility disconnection.

Variables. In this analysis, we used these various measures to test the relationship between household sociodemographic variables and household conditions, respectively, and various coping strategies. All of the dependent variables included in Figs. 2 to 4 are binary, coded as a "1" if a respondent reported that their household performed that action in a given wave, and "0" otherwise. The two energy insecurity independent variables are coded as follows: the first is a single-wave lag if the respondent reported having difficulty paying their energy bill in the last wave; the second is a comprehensive measure of a previous utility disconnection, in the event that a respondent reported in any previous time period that they were disconnected, including the prewave-one time period of the year before the pandemic. We present the variables that we include in the analyses, the way that we operationalized them, and their descriptive statistics in Table 3.

The timing of the data collection also coincided with several policies that aimed to reduce hardship for all Americans due to the COVID-19 pandemic. For example, the distribution of the Child Tax Credit began during wave two, summer 2020, and the second and third round of stimulus checks, \$600 and \$1400, respectively, were dispersed during wave three, fall/winter 2020. The timing and provision of these payments likely explains why the overall proportion of the sample population that forwent expenses reduces over the duration of the analysis. In addition, during this time, state- and utility-level policies were implemented to protect households from being disconnected if they were unable to pay their utility bills. While this collection of policies may have had an impact on household coping strategies, we do not include them as covariates in the present analysis. The stimulus and tax credit affect all eligible families the same across space and time. By contrast, the utility disconnection policies do vary over space and time; however, these protections are monthly and at times daily protections, which cannot cleanly be aggregated to the wave level at which we collected the data and present our results. In addition and importantly, it is likely that any variation in coping strategies caused by these policies will be soaked up by the state and wave fixed effects that we include in all of the models, allowing the specification to provide unbiased correlations between the sociodemographic indicators and household coping strategies.

Regression Analysis. We use a linear probability model to produce the results presented in Figs. 3 and 4 and a Poisson model for Fig. 5. For each regression, we use the full suite of covariates with survey weights. The full reporting of modeling results is contained in *SI Appendix*.

Data, Materials, and Software Availability. Anonymized replication data and statistical code data have been deposited in the Harvard Dataverse (<https://doi.org/10.7910/DVN/XKGOCW>) (40).

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[‡]Wave one was different than the other waves in several ways. First, wave one only covered 1 month of time, while the others covered several months. Second, wave one occurred during the heart of the stay-at-home orders and mass shutdowns. Thus, including this wave of data in a substantive way could further limit the external validity of the findings.

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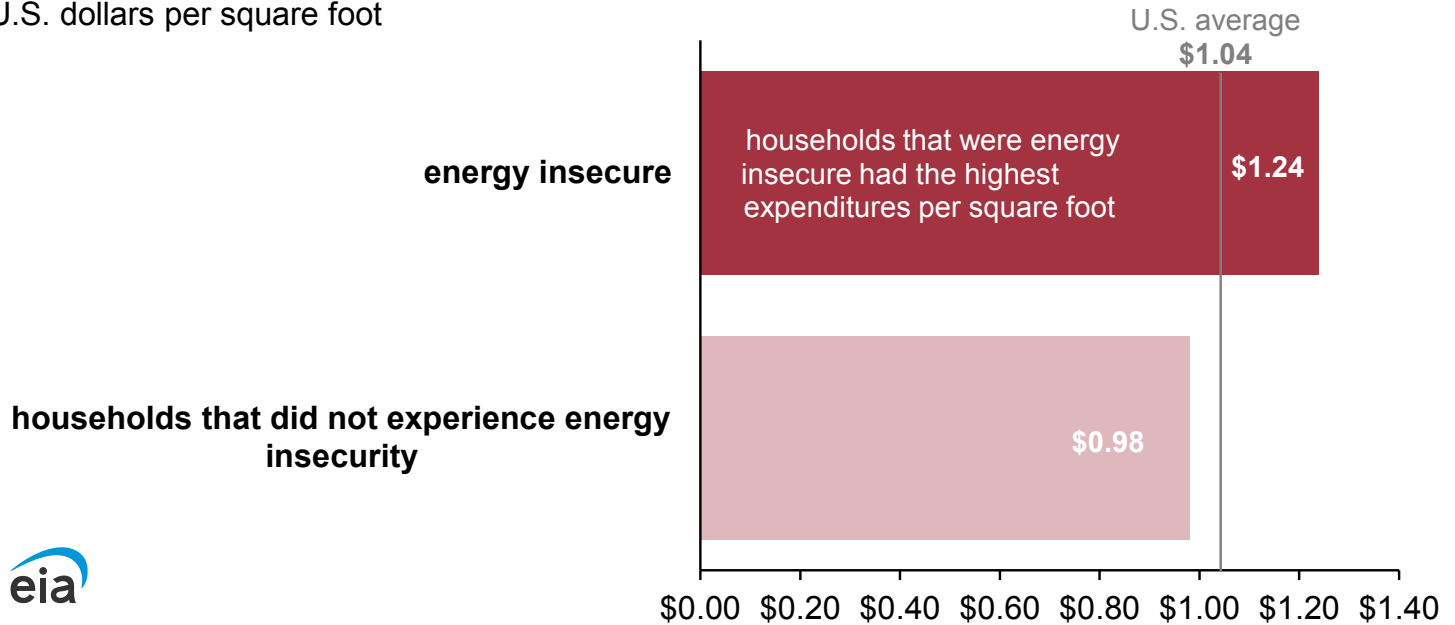
Today in Energy

May 30, 2023

U.S. energy insecure households were billed more for energy than other households

Average U.S. household energy expenditures per square foot (2020)

U.S. dollars per square foot



Data source: U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey (RECS)
 Note: Square footage is derived from RECS respondent estimates and represents the energy-consuming area of housing units.

On average, households in the United States were billed \$1.04 per square foot for energy usage across all energy sources in 2020. Those households identifying as energy insecure were billed \$0.20 more per square foot than the national average and \$0.26 more on average than households that did not experience energy insecurity. Household energy insecurity is the inability to adequately meet basic household energy needs and describes households who face challenges in purchasing the energy they need because of cost. For our Residential Energy Consumption Survey (RECS), energy insecurity is a measure we use to count households that have received a disconnection notice, have reduced or forgone basic necessities to pay energy bills, kept their houses at unsafe temperatures because of energy cost concerns, or been unable to repair heating or cooling equipment because of cost.

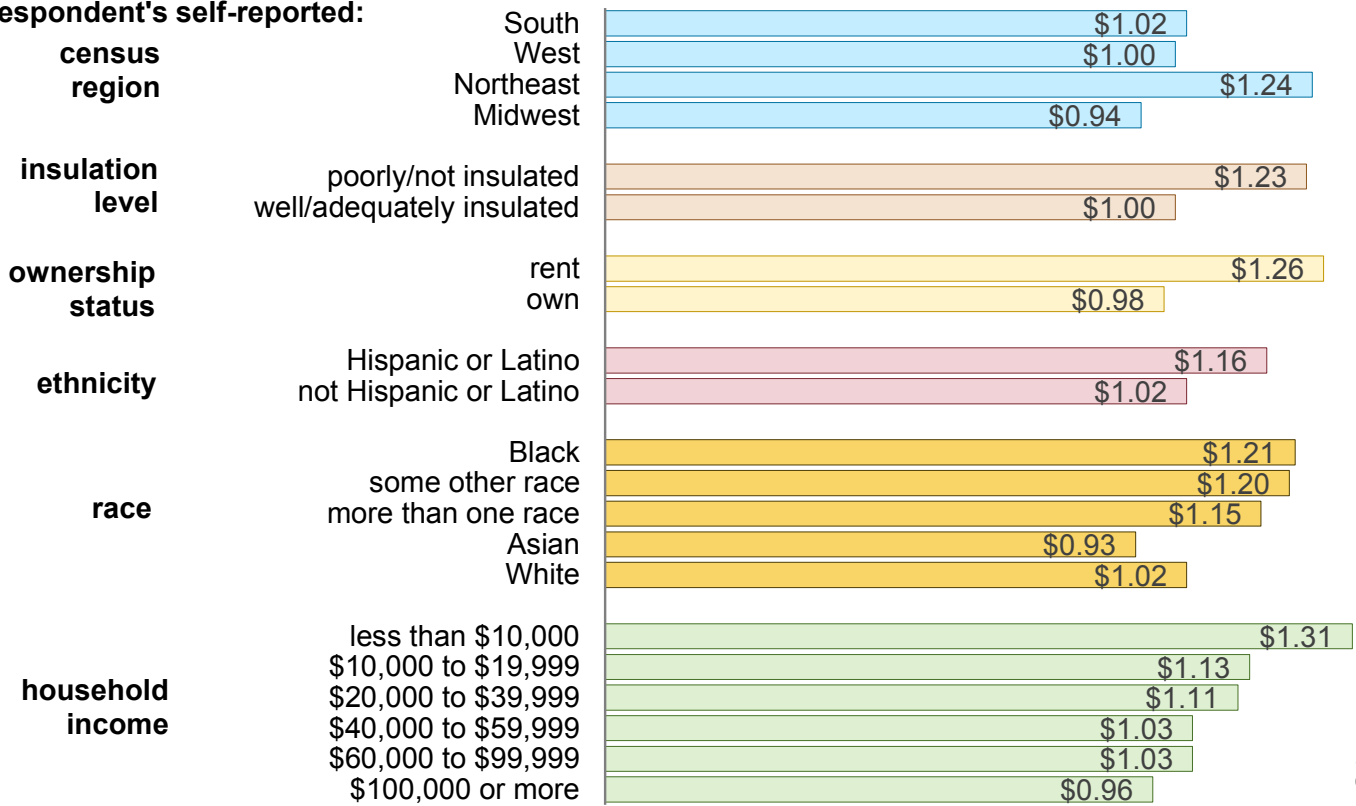
Household energy expenditures are influenced by many factors, including weather, the types of energy sources used, household behavior, and the energy-consuming space (or square footage) of the home. Energy insecure households are more likely to report their homes are drafty, poorly or not insulated, and smaller than households that did not experience energy insecurity.

Using RECS data, we can take a more detailed look at differences in energy expenditures by demographic and household characteristics. In 2020, households with income less than \$10,000 a year were billed an average of \$1.31 per square foot for energy, while households making \$100,000 or more were billed an average of \$0.96 per square foot. We can also see differences by race of the respondent, whether the home is owned or rented, level of insulation, and other characteristics. Renters with household income less than \$10,000 a year were billed \$1.37 per square foot, while owners in the same income range were billed at \$1.21 per square foot. Across all income ranges, respondents living in rented homes were billed 28 cents more across all energy sources than respondents living in homes they owned. In general, differences greater than \$0.05 per square foot are statistically significant at the 5% level, meaning that there's a less than 5% chance that the difference is explainable by chance alone.

Average U.S. household energy expenditures per square foot by select attributes (2020)

U.S. dollars per square foot

respondent's self-reported:



Data source: U.S. Energy Information Administration, 2020 [Residential Energy Consumption Survey](#)

The 2020 RECS study collected energy-use data for 18,496 households, which is the largest sample in the program's history. For the first time in RECS program history, these data are available at the state level for all 50 states and the District of Columbia. We recently released [tables detailing total consumption, total expenditures, and energy intensities](#) at the national, regional, and state levels.

Principal contributors: Ross Beall, Carolyn Hronis



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ARTICLE DEC 21, 2022

The Latest Poverty, Income, and Food Insecurity Data Reveal Continuing Racial Disparities

Federal policies implemented in 2021 led to notable progress in the fight against poverty, but data show that persistent economic disparities, by both gender and race and ethnicity, will only be closed through continued attention and investments.

AUTHORS



Kyle Ross



Justin Dorazio

[Advancing Racial Equity and Justice, Building an Economy for All, Food Insecurity, +2 More](#)



People leave a church after visiting a food pantry, March 2021, in Philadelphia. (Getty/Spencer Platt)

In September 2022, the [U.S. Census Bureau](#) and the [U.S Department of Agriculture \(USDA\)](#) released new data on the economic well-being of American households during 2021. While the poverty, income, and food insecurity data in

particular demonstrate that the U.S. economy is showing signs of recovery from the COVID-19 pandemic, substantial gender, racial, and ethnic gaps remain. These gaps have persisted for decades and make it clear that policymakers must provide targeted and sustained investments to address inequities.

The official poverty measure (OPM), the Census Bureau's older metric for measuring poverty, as well as the rate of food insecurity among U.S. households, held steady at 11.6 percent and 10.2 percent, respectively. Meanwhile, the supplemental poverty measure (SPM), a more holistic metric that accounts for a broader array of income sources and expenses, reached a record low of 7.8 percent. These rates all signify positive developments when placed in the context of 2021—a difficult year, as many communities across the United States struggled to recover from the economic turmoil of the COVID-19 pandemic. Spikes in COVID-19 cases throughout the year exacerbated this turmoil; moreover, they were more likely to harm people of color and people with disabilities.

Explore previous years of the data

CAP's interactive page includes national and state-level data on poverty, jobs, families and communities, and economic security.

[CLICK HERE ↗](#)

In response to the ongoing crisis, Congress and the Biden administration passed the American Rescue Plan Act (ARPA) in March 2021. The act provided much-needed fiscal stimulus to help ease the struggles of those hit hardest by the effects of the pandemic. Expansions in the child tax credit (CTC), unemployment insurance, and food assistance programs, as well as stimulus checks and more, helped provide some financial stability, easing poverty and food insecurity just one year into the pandemic.

The official poverty measure vs. the supplemental poverty measure

Developed in the 1960s, the **official poverty measure** considers pre-tax cash income from sources such as wages, unemployment insurance, and Social Security over the year, measuring them against an annually updated threshold.

The **supplemental poverty measure** is a newer measure that takes into account additional factors to reflect the financial situation of people more accurately; these factors include tax credits, food assistance, and housing benefits received, as well as taxes, medical expenses, and child care costs paid, with varying thresholds based on geographic differences. This measure is more helpful in a policymaking context because it more thoroughly reflects policy choices and individual and family needs.

While investments made through the ARPA were imperative to post-COVID-19 recovery and resiliency, eliminating poverty and food insecurity will require more targeted, long-term investments in strengthening the social safety net, as well as a rethinking of the U.S. economic system so that it works effectively for everyone. Economic hardship is estimated to have increased immediately as provisions from the ARPA expired, with 3.7 million children entering poverty in January 2022 after monthly payments from the expanded CTC ended. Poverty is a policy choice, and federal policymakers must recognize this by working to reverse harmful trends. This includes addressing the facts that the federal minimum wage has stagnated for years, public cash assistance dollars have slowly withered away, and the supplies of affordable housing and child care are inadequate and do not have enough federal support. To reverse the impacts of these occurrences and strengthen economic security for all, policymakers must make properly sustained investments in low-income communities.

OPM and SPM illustrate persistent racial gaps in a period of comparatively low poverty

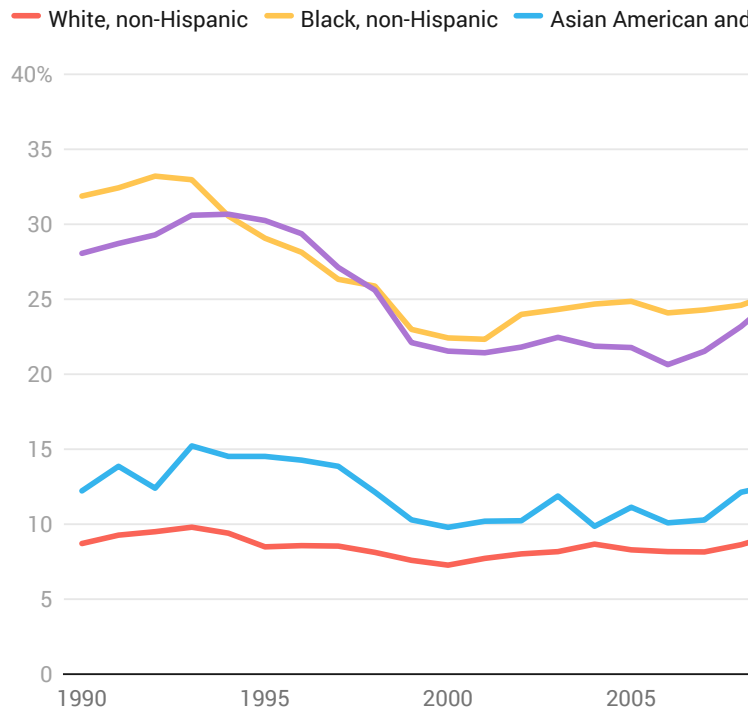
The newest set of poverty data comes from the Annual Social and Economic Supplement of the Current Population Survey conducted by the U.S. Census Bureau. According to the data, the 2021 official poverty rates did not change much compared with 2020, when Black and Hispanic poverty rates were already measured near the lowest levels seen for decades. Yet the OPM does capture some investments made during the pandemic, such as the temporary expansions to the unemployment insurance system that helped millions of jobless workers stay afloat. Such investments helped prevent an increase in poverty similar to the one that followed the Great Recession but did not change the persisting gaps between white people and Black and Hispanic people. (see Figure 1)

Figure 1



The official poverty rate shows wide racial disparities have persisted for the past 3 decades

Official poverty measure by race and ethnicity, 1990–2021



Hover or click to see values. Shaded areas represent recessions.

Source: Authors' calculations based on the official poverty measure using the 1990–2021 Current Population Survey's Annual Social and Economic Supplement. See Sarah Flood and others, "Integrated Public Use Microdata

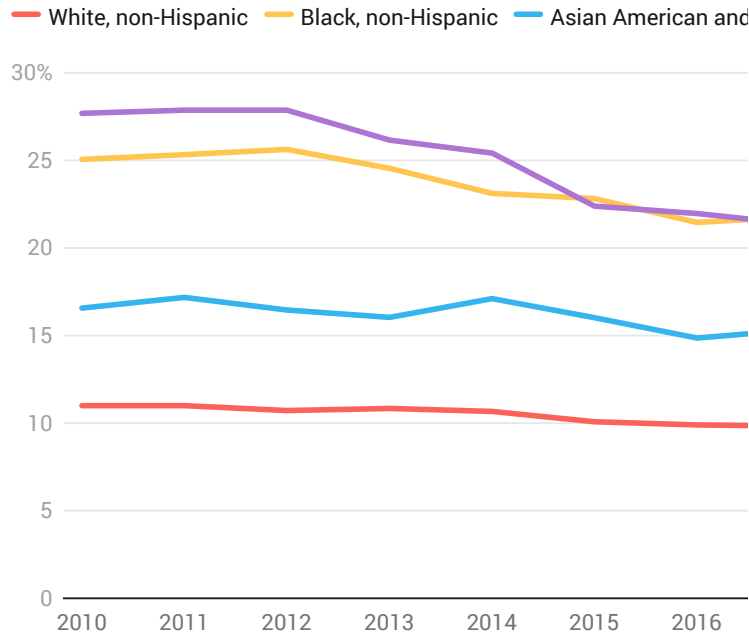
Importantly, the OPM only looks at before-tax cash income. When looking at the SPM to see how investments into tax and noncash benefits, such as CTC and food assistance expansions, have affected poverty, rates for Black and Hispanic people actually dropped by 3.5 percentage points and 2.8 percentage points, respectively, from 2020 to 2021—record-low levels since at least 2010. (see Figure 2)

Figure 2



After accounting for government benefits, the supplemental poverty rate still shows wide racial disparities despite historic lows

Supplemental poverty measure by race and ethnicity, 2010–2021



Hover or click to see values. Shaded areas represent recessions.

Source: Authors' calculations based on the supplemental poverty measure using the 1990–2021 Current Population Survey's Annual Social and Economic

For the first time in more than a decade, supplemental poverty rates for Black and Hispanic people were both under twice the supplemental poverty rate for white people, while gaps in official poverty rates did not break this threshold. These trends, shown in Figure 3, exemplify the strong and immediate impact that investments in low-income families can have on long-standing racial disparities in poverty rates.

Figure 3



Disparities in the Black and Hispanic poverty rates persisted in 2021

U.S. poverty rates according to the official poverty measure (OPM) and the supplemental poverty measure (SPM), by race and ethnicity

	OPM	SPM
Black, non-Hispanic	11.2%	19.3%
Hispanic	11.2%	17.1%
White, non-Hispanic	5.7%	8.1%
Asian American and Pacific Islander, non-Hispanic	9.6%	9.4%
Overall	7.8%	11.6%

Poverty among Asian American and Pacific Islander people has proved to be an outlier in these trends. It increased under both poverty measures from 2020 to 2021, though the Census Bureau notes that only the change in the OPM was statistically significant. When looking at poverty among various Asian ethnicities, however, it is clear that experiences vary widely among different ethnicities. As shown in Figure 4, poverty rates have increased among Indian, Chinese, and Korean people and decreased among Filipino, Japanese, and Vietnamese people. Although using yearly data to compare these populations means that the sample sizes are small and prone to inaccuracies, previous analysis combining multiple years of data supports the idea that these groups vary in everything from poverty rates and income to education level and health insurance coverage.

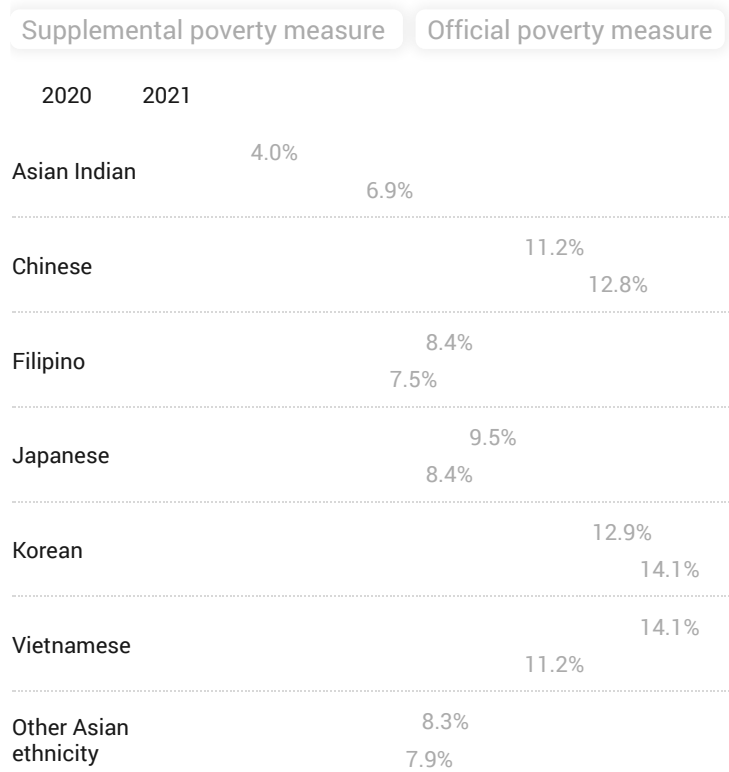
Figure 4



Poverty rates vary widely among the Asian American population

U.S. poverty rates in 2020 and 2021 according to the official poverty measure (OPM) and supplemental poverty measure (SPM), by Asian ethnicity

Click buttons to compare SPM and OPM poverty rates.



Source: Authors' calculations based on the SPM using the 1990–2021 Current

Women of color face greater inequities

While overall poverty numbers have decreased for people of color, persistent disparities remain for women of color. In 2021, Black women continued to experience the highest poverty rates of any group as measured by both the OPM and the SPM, while Hispanic women experienced the second-highest rates. (see Figure 7)

However, the trend in the SPM (see Figure 10) reveals that recent economic supports have helped close this gap, as differences between the SPM for men and women of the same race or ethnicity are each at or below 0.4 percent. For Black Americans in particular, the SPM rates have hit parity, meaning that Black men and women experienced equal levels of poverty in 2021 when factoring in government benefits, including those from the Supplemental Nutrition Assistance Program (SNAP), the CTC, and other supports that were expanded in 2021 in response to the COVID-19 pandemic.

Despite progress in reducing poverty within these communities, however, gender and racial wage gaps, occupational segregation, and a lack of family-centered policies such as access to paid leave and affordable child care prevent meaningful closure of racial and ethnic poverty gaps. In addition, recent laws banning and restricting abortions in many states upon the overturning of Roe v.

Wade risk reversing progress in future years, as women of color, particularly Latinas and Black women, are set to lose access to abortions at disproportionate rates. Studies have shown that restricting access to abortion can harm women's economic security, leading to increased exits from the workforce and moves to lower-paying jobs, while also increasing child poverty rates. These things are compounded by the fact that the majority of states with abortion bans have minimum wage rates at the federal floor of \$7.25 per hour.

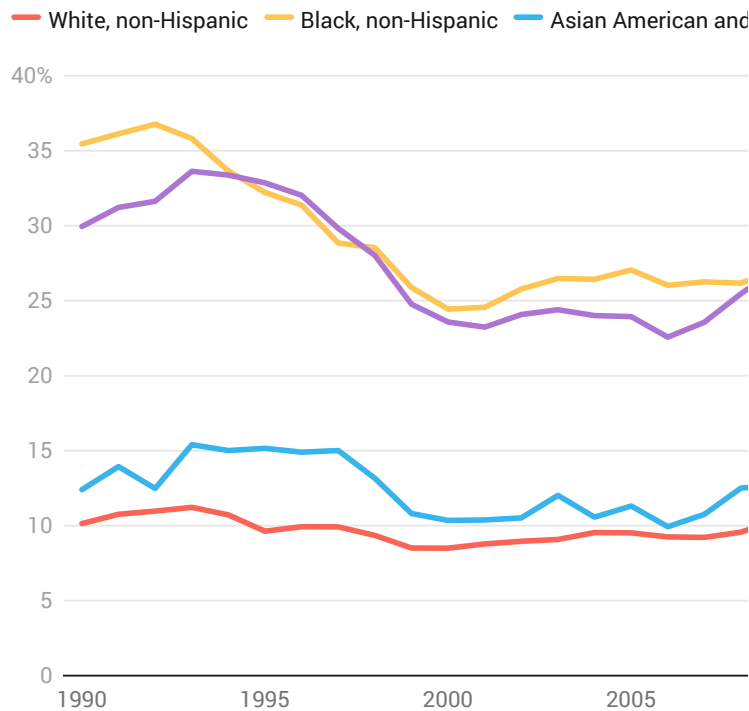
Overall, while official poverty rates have gradually declined for Black and Hispanic women over the past 30 years, they are still far higher than the rate for white women. (see Figure 5)

Figure 5



Black and Hispanic women continue to experience higher rates of poverty than white women

Official poverty measure among women by race and ethnicity, 1990–2021



Hover or click to see values. Shaded areas represent recessions.

Source: Authors' calculations based on the official poverty measure using the 1990–2021 Current Population Survey's Annual Social and Economic

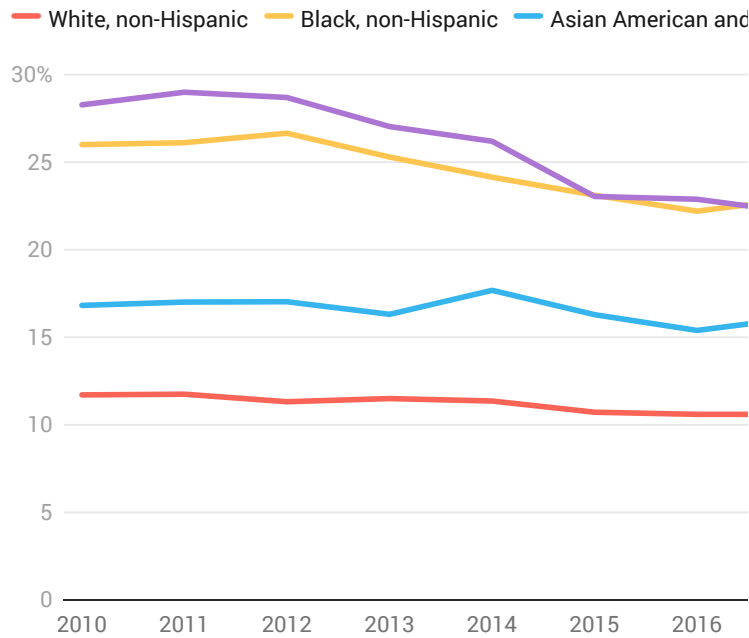
In the past two years, supplemental poverty rates for women of color have declined further than official poverty rates (see Figure 6), due in part to successful expansion of government programs.

Figure 6



The supplemental poverty rate decreased more significantly for Black and Hispanic women than for white and Asian women in 2021

Supplemental poverty measure among women by race and ethnicity, 2010–2021



Hover or click to see values. Shaded areas represent recessions.

Source: Authors' calculations based on the supplemental poverty measure using the 1990–2021 Current Population Survey's Annual Social and Economic

Despite these overall trends, women of color continued to experience the highest rates of poverty in 2021. Overall, the poverty rates of Black and Hispanic women were more than double those of white, non-Hispanic women under the OPM and roughly double under the SPM. (see Figure 7)

Figure 7



Disparities in poverty rates by race, ethnicity, and gender remained stark in 2021

U.S. poverty rates according to the official poverty measure (OPM) and the supplemental poverty measure (SPM)

	OPM	SPM
Men		
Black, non-Hispanic	11.2%	17.6%
Hispanic	11.1%	15.5%
White, non-Hispanic	5.5%	7.4%
Asian American and Pacific Islander, non-Hispanic	9.4%	8.9%
All	7.6%	10.5%
Women		
Black, non-Hispanic	11.2%	20.9%
Hispanic	11.2%	18.8%
White, non-Hispanic	5.9%	8.9%
Asian American and Pacific Islander, non-Hispanic	9.7%	9.9%

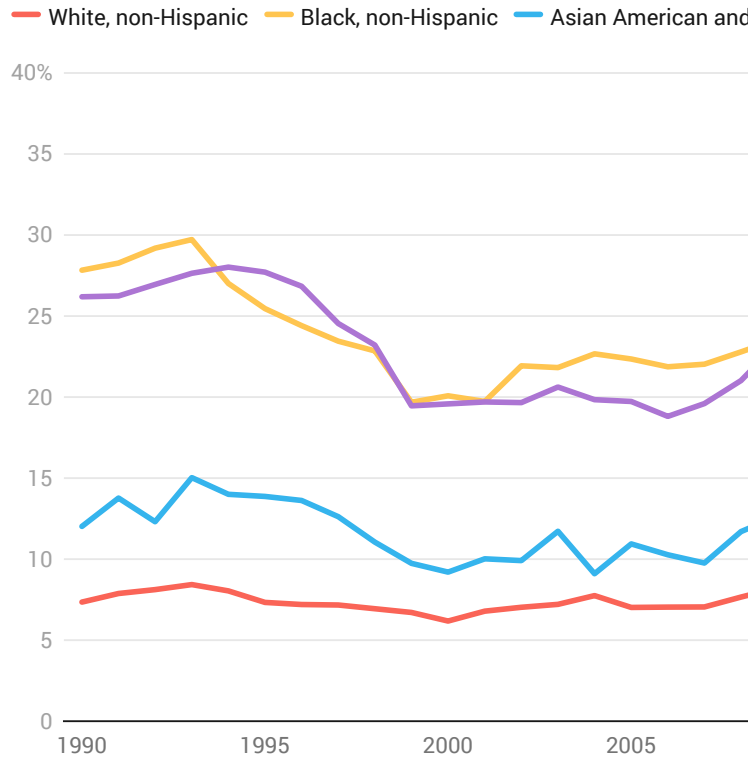
Men of color have experienced similar declines in poverty over the past several decades. Yet as Figure 8 shows, while the official poverty rate has decreased by more than 10 percentage points for both Black and Hispanic men since 1990, it continues to far exceed the rate for white men.

Figure 8



Twice as many Black and Hispanic men are in poverty as white men

Official poverty measure among men by race and ethnicity, 1990–2021



Hover or click to see values. Shaded areas represent recessions.

Source: Authors' calculations based on the official poverty measure using the 1990–2021 Current Population Survey's Annual Social and Economic Supplement. See Sarah Flood and others, "Integrated Public Use Microdata Series. 2021 Current Population Survey. Annual Social and Economic

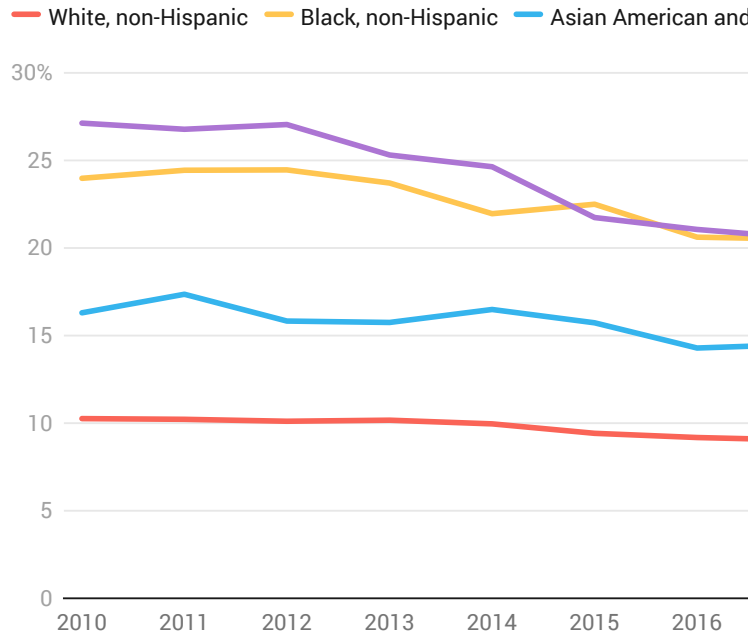
Meanwhile, supplemental poverty rates have declined by 13 percentage points and 16 percentage points for Black and Hispanic men, respectively, since 2010, yet are still double the rates for white men. (see Figure 9)

Figure 9



The supplemental poverty rate decreased more significantly for Black and Hispanic men than for white and Asian men in 2021

Supplemental poverty measure among men by race and ethnicity, 2010–2021



Hover or click to see values. Shaded areas represent recessions.

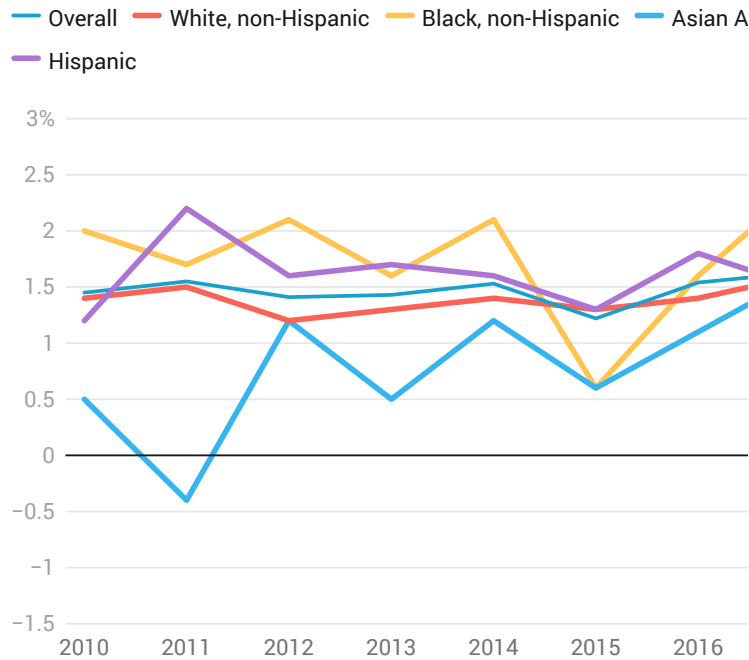
Critically, the gender disparities in poverty that have persisted for decades in communities of color continue to close. Under the SPM, differences for men and women of the same race or ethnicity are each below 1 percent. (see Figure 10)

Figure 10



Persistent gender disparities in poverty within communities of color narrowed in 2021

The differences in the supplemental poverty measure by gender and race and ethnicity, 2010–2021



Hover or click to see values. Shaded areas represent recessions.

Figure shows the calculated difference between male SPM and female SPM for each given race and ethnicity in a given year.

Source: Authors' calculations based on the supplemental poverty measure

So while closing persistent poverty gaps for women is critical, the data reveal that policymakers must do more to close the entrenched gaps that exist for both men and women of color—both to maximize the potential of the U.S. economy and to provide equitable opportunity and standards of living for all.

Racial wage gaps help entrench cycles of poverty

One of the most extensive causes of poverty gaps along racial lines is the racial wage and income gap. Occupational segregation, or when one demographic group is overrepresented or underrepresented in a certain job category, helps explain how men and women of color make up a significant portion of the lowest-paying occupations in the United States. Black and Hispanic workers' concentration in low-paying jobs affects their economic security and their ability to break generational cycles of poverty. These groups are also hit hardest by inflation, which keeps lower-paid workers from experiencing any real wage growth through which to improve their economic situations.

The latest Census Bureau data from 2021 reveal that these persistent wage gaps continue to leave workers of color behind. As shown in Figure 11, despite some growth from 2020 to 2021, median household incomes for Black and Hispanic households are far behind those of both non-Hispanic white and Asian households.

Figure 11



Despite increased incomes, Black and Hispanic households continued to earn less in 2021

Median household income by race and ethnicity and overall, 2020–2021

	2020	2021
Overall	\$68,010	\$70,784
White alone, non-Hispanic	\$75,392	\$77,999
Hispanic	\$55,427	\$57,981
Black alone	\$46,025	\$48,297
Asian alone	\$95,177	\$101,418

Source: U.S. Census Bureau. "Historical Income Tables: Households. Table H-5.

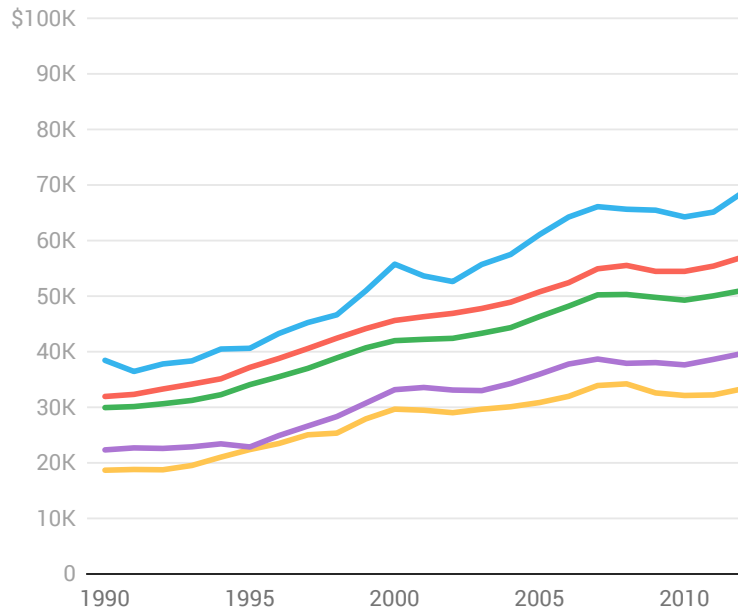
These gaps have persisted for decades. Since 1990, Black and Hispanic households' median income has remained between 55 percent and 75 percent of white household income. (see Figure 12) In 2021, Black households earned 62 percent of what white households earned, while Hispanic households earned 74 percent.

Figure 12



Black and Hispanic households continue to earn almost half as much as white households

Median household income by race and ethnicity, 1990–2021



Hover or click to see values. Shaded areas represent recessions. Shaded areas represent recessions.

Before the 2002 data release, the U.S. Census Bureau's data collection did not allow for people to claim they were more than one race, meaning people of multiple races could be grouped with people of one race. Starting in the 2002 data and in subsequent years, people could select multiple races; the data set the authors use from this period includes only people from the selected race

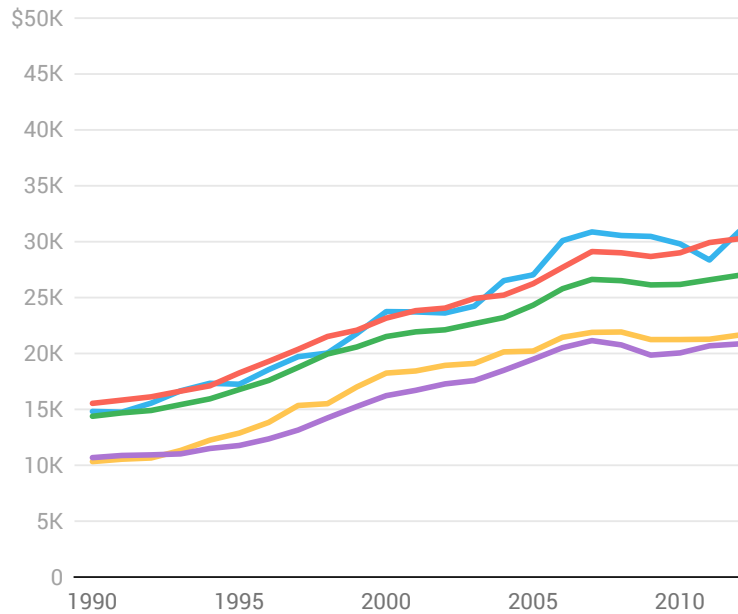
On an individual basis, Black and Hispanic individuals have historically lagged behind white and Asian Americans in income. (see Figure 13)

Figure 13



Individual income by race and ethnicity shows that clear wage gaps persist

Median individual income by race and ethnicity, 1990–2021



1 Recessions

Hover or click to see values.

Before the 2002 data release, the U.S. Census Bureau's data collection did not allow for people to claim they were more than one race, meaning people of multiple races could be grouped with people of one race. Starting in the 2002 data and in subsequent years, people could select multiple races; the data set the authors use from this period includes only people from the selected race alone.

And despite strong gains in median income for Black and Hispanic people from 2020 to 2021, median income for both groups still significantly trails behind median income for white, non-Hispanic people (see Figure 14), who have historically had greater concentration in high-wage jobs and positions of power within workplaces and institutions.

Figure 14



Black and Hispanic wage gains in 2021 did not meaningfully close income gaps

Median individual income by race and ethnicity, 2020–2021

	2020	2021
Overall	\$35,855	\$37,522
White alone, non-Hispanic	\$40,113	\$41,529
Black alone	\$28,824	\$30,968
Hispanic	\$27,959	\$30,989
Asian alone	\$41,978	\$44,127

Source: U.S. Census Bureau, "Historical Income Tables: People, Table P-4. Race and Hispanic Origin of People (Both Sexes Combined) by Median and Mean Income: 1947 to 2021," available at <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-people.html> (last accessed

This disparity is particularly true for women of color, who more often shoulder caregiving responsibilities.

Gaps in food insecurity are largely unchanged

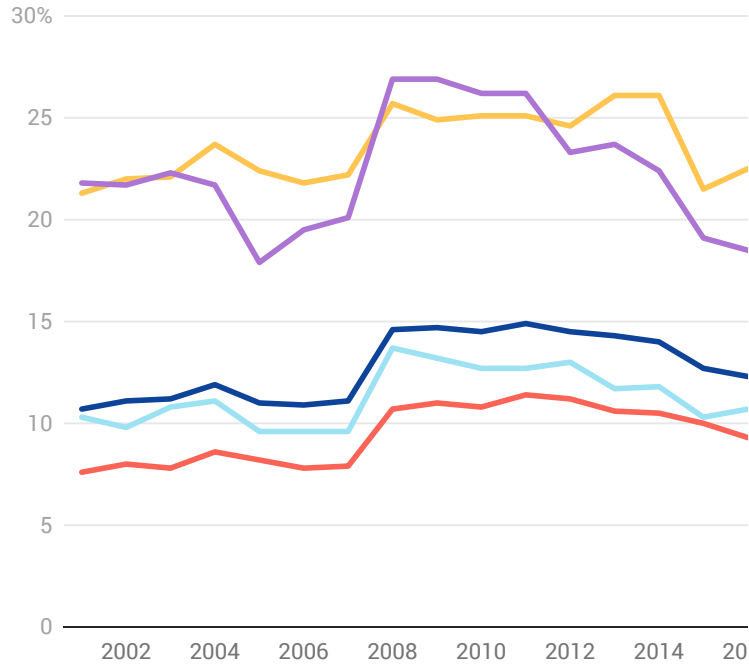
According to the latest data released by the USDA, food insecurity in 2021 dropped to 19.8 percent among the Black population. This was the only racial or ethnic group to experience a statistically significant change from 2020. The 2021 fiscal stimulus played a large role in this decrease, most notably through the expanded CTC, which helped decrease food insecurity among families with children, and the multitude of ways in which the USDA increased access to food assistance, including enhanced benefits in SNAP and programs dedicated to help feed young children and students. The stimulus prevented a sustained spike in food insecurity like the one seen during and after the Great Recession. (see Figure 15)

Figure 15



For the past two decades, Black and Hispanic households have been twice as likely to experience food insecurity as white households

Household food insecurity by race and ethnicity, 2001–2021



Hover or click to see values. Shaded areas represent recessions.

According to the U.S. Department of Agriculture, the 'Other, non-Hispanic' category consists of people from the following groups: American Indian, Alaska Native, Asian, Hawaiian, Pacific Islander, and people of multiple races.

The food insecurity rate for white people, while statistically unchanged from 2020, remains nearly one-third the rate for Black people and less than half the rate for Hispanic people, at 7 percent. (see Figure 16)

Figure 16



Black and Hispanic households experienced higher rates of food insecurity than did other households in 2021

Household food insecurity rates by race and ethnicity, 2020–2021

	2020	2021
Overall	10.5%	10.2%
White, non-Hispanic	7.1%	7.0%
Hispanic	17.2%	16.2%
Black, non-Hispanic	21.7%	19.8%
Other or multiple races, non-Hispanic	8.8%	10.2%

Structural inequities such as those in [incarceration rates](#), [employment practices](#), and [food access](#) have made decreasing food insecurity among people of color difficult, as they limit access to sufficient resources and better jobs that pay higher wages.

Conclusion

2021 was a landmark year in the fight against poverty and for economic resiliency in light of continuing COVID-19 impacts. Moving forward, policymakers should learn from these victories and build on them. The persistence of poverty, income, and food insecurity gaps demonstrates that efforts to strengthen economic security for all are still a work in progress—one that cannot continue without sustained investments in low-income communities and a stronger safety net. Policies such as renewing the now-expired enhanced CTC, increased investments in child care, fair wage and employment laws, access to paid leave, and expanded support for food assistance can go a long way toward reshaping the traditionally inequitable gaps that have held the American economy back for decades.

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Inclusive Economy

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2024 MICHIGAN ECONOMIC ANALYSIS REPORT



MICHIGAN
Center for Data
and Analytics

2024 Michigan Economic Analysis Report

July 2025

About the Cover

The current the Ludington North Breakwater Light was built in 1924, fabricated of steel plates over a steel skeleton. This four-sided, white pyramidal tower was built with four porthole windows on each of the three decks. The unusual shape was designed to deflect the strong waves of Lake Michigan. A fourth-order Fresnel lens, manufactured in the United States rather than France, was installed in the new station's lantern.

The North Breakwater Light was automated in 1972, and the Fresnel lens (now on display at the Port of Ludington Maritime Museum) was replaced in 1995.

*Photo: Adobe Stock
Text courtesy of Visit Ludington*



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Executive Summary

In 2024, the size of Michigan's labor force and number of payroll jobs grew to their highest levels in over 20 years. Wages recorded real improvements, as average hourly earnings outpaced inflation last year. These positive gains were dampened by a sharp rise in unemployment, which increased at a much faster pace than the nation, pushing Michigan's unemployment rate to one of the highest in the country.

Unemployment

- After three years of declines, Michigan's annual average unemployment rate rose to 4.7 percent in 2024. This was due to a substantial rise in the number of unemployed people.
- Michigan's jobless rate remained consistently higher than the national unemployment rate for the twenty-year period from 2004 to 2024.
- Michigan's labor force topped 5 million in 2024, the highest level since 2001.
- Michigan's labor force participation rate rose to 61.8 percent in 2024, similar to its pre-pandemic rate of 61.9 in 2019. The U.S. participation rate remained below pre-pandemic levels.

Workforce Demographics

- In 2024, the labor force participation rate for Black workers in Michigan surpassed the white participation rate for the first time in at least 20 years.
- Michigan unemployment rates for males (5.4 percent) increased much faster than for females (3.7 percent) in 2024, creating a larger-than-usual gap.
- The unemployment rate gap in Michigan between white workers (4.0 percent) and Black workers (7.6 percent) widened in 2024, after having a historically narrow gap of only 2.4 percentage points in 2023.

Payroll Jobs

- In 2024, Michigan had the most payroll jobs in over 20 years. However, despite four consecutive years of employment growth in the state, Michigan's average growth rate is slowing down.

- Michigan's 2024 annual average employment growth rate of 0.6 percent was seven-tenths of a percentage point below the national rate of 1.3 percent.
- Six of Michigan's 11 major industry sectors grew in 2024. *Private education and health services* had the strongest gains, while the auto-related industries of *Manufacturing* and *Professional and business services* showed the greatest job losses over the year.

Wages

- Michigan's 2024 minimum wage ranked 29th in the U.S. With the February 2025 increase to \$12.48, the state's ranking climbed to 18th.
- Michigan's average hourly earnings increased more than inflation in 2024, giving workers the first meaningful increase in real wages since 2020.
- Approximately 622,000 jobs in Michigan paid \$15 per hour or less in 2024, accounting for just over 14 percent of total state employment.

Job Demand

- Michigan job openings and online job advertisements both fell in 2024.
- While overall job ads in Michigan decreased, 23 of the top 50 advertised occupations recorded an increase in ads since December 2023.
- As the number of unemployed individuals in Michigan grew significantly throughout 2024, those available to work far outpaced the number of open positions.

Michigan's Labor Force, Employment, and Unemployment

■ **Shibani Putatunda**, Economic Specialist

After a 2023 labor market with metrics that exceeded multiple 2019 indicators, Michigan's 2024 workforce exhibited slightly lower levels, largely due to an expansion in the number of unemployed throughout the year.

This section examines the health of Michigan's labor market through some of the state's broad workforce measures such as the unemployment rate, total employment, and labor force.

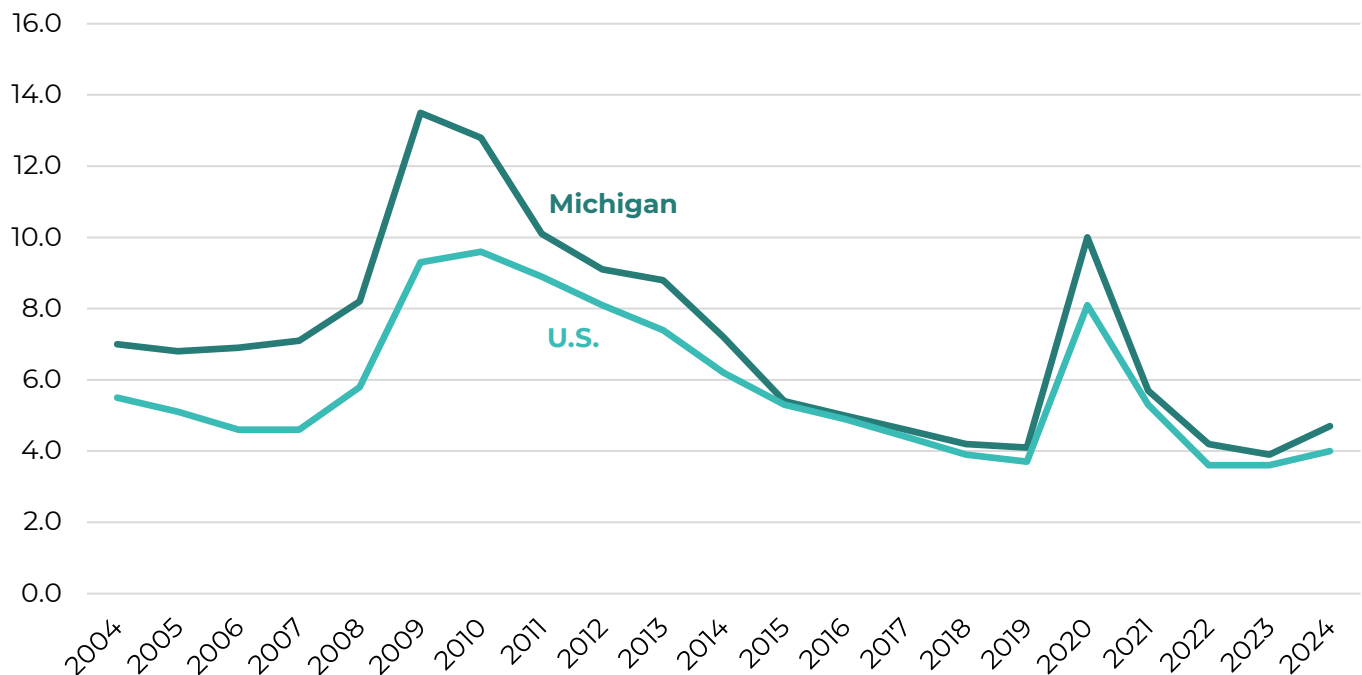
Unemployment Rate

Data Note: Michigan's Local Area Unemployment Statistics program (LAUS) provides economic indicators for the state, including employment, unemployment, labor force, and official unemployment rate estimates. The unemployment rate is a key economic indicator that is calculated by measuring the percentage of the labor force who are unemployed but actively looking for work.

During the twenty-year period from 2004 to 2024, Michigan's unemployment rate remained

Michigan's unemployment rate consistently exceeded the national jobless rate over the past twenty years

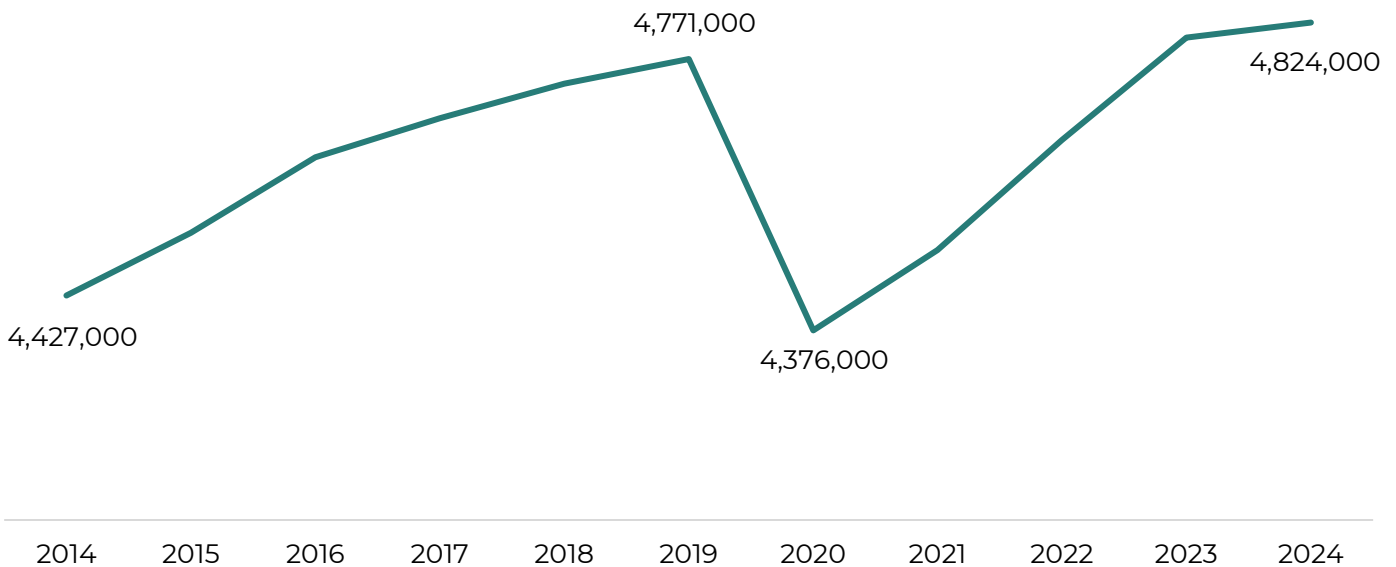
Michigan and U.S. Unemployment Rates, 2004-2024



Source: Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

Michigan's employment growth rates slowed substantially in 2024.

Michigan Annual Average Total Employment, 2014-2024



Source: Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

consistently higher than the national jobless rate. The largest differences between the two metrics occurred during 2009 and 2010, largely due to the Great Recession, and in more recent years, 2020 (due to the COVID-19 pandemic). The statewide unemployment rate consistently fell from 2020 to 2023 from 10.0 to 3.9 percent, a decrease of 6.1 percentage points, before rising by eight-tenths of a percentage point in 2024. Michigan's 2024 annual unemployment rate of 4.7 percent was 0.7 percentage points higher than the national jobless rate of 4.0 percent.

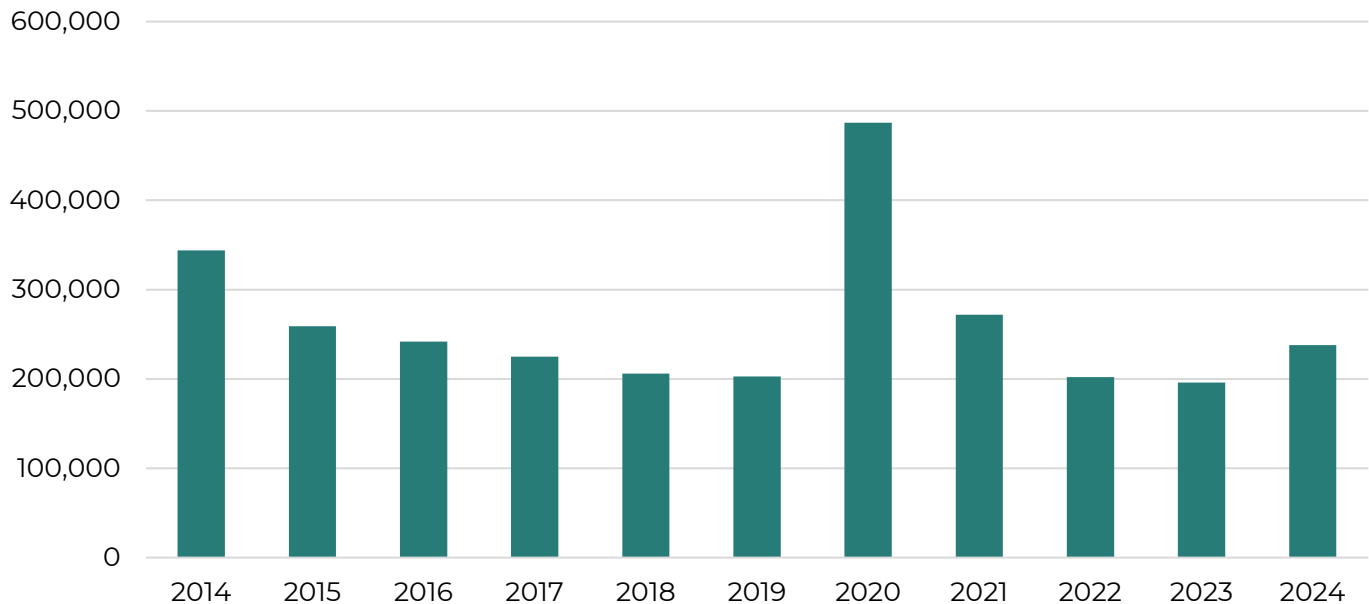
Michigan had the fifth highest annual average jobless rate out of all U.S. states during 2024, behind Nevada, California, Kentucky, and Illinois. This is an increase compared to 2023, when Michigan tied with West Virginia for the tenth highest unemployment rate among all states.

Employment

Michigan's annual average total employment level rose steadily from 2014 through 2019 before falling by nearly 400,000, or 8.3 percent, during 2020. Between 2021 and 2024, employment in the state continued to consistently grow, with an average employment gain of 112,000 per year. However, the employment growth rate slowed down considerably during 2024, with employment edging up by 22,000, or 0.5 percent, over the year. In comparison, Michigan's number of employed rose by nearly 150,000, or 3.2 percent, between 2022 and 2023. The national growth rate for the number of employed also fell in 2024, with employment rising by 1.7 percent in 2023, but only edging up by 0.2 percent during 2024.

The number of unemployed Michigan residents expanded in 2024.

Michigan's Annual Average Total Unemployment, 2014-2024



Source: Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

Unemployment

Data Note: The number of unemployed includes Michigan residents who are not currently working but are actively seeking employment. Individuals who are not actively looking for work are not counted as unemployed, and instead are considered “out of the labor force.”

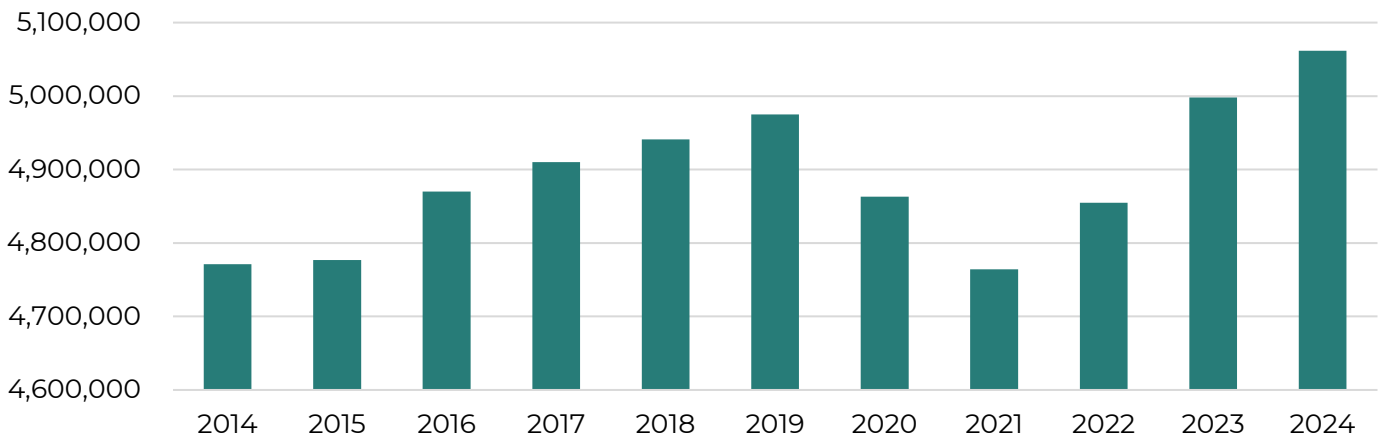
Michigan's total unemployment level decreased consistently between 2014 and 2019, with an average decline of nearly 36,000 per year. After a nearly 140 percent increase during the 2020 recession, unemployment receded by 215,000, or 44.1 percent in 2021.

After three consecutive years of decreases in the number of unemployed in Michigan from 2021 to 2023, the statewide unemployment total expanded by 42,000, or 21.4 percent, between 2023 and 2024. This was nearly double the increase of the national number of unemployed people over the year (11.2 percent).



Michigan's 2024 labor force level reached its highest point since 2001.

Michigan's Annual Average Workforce, 2014-2024



Source: Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

Workforce

Data Note: Michigan's labor force includes individuals in the civilian noninstitutionalized population who are 16 or older and are employed or are unemployed and seeking employment.

Aside from the years that were most impacted by the pandemic, Michigan's annual labor force expanded every year from 2014 to 2024. Between 2023 and 2024, Michigan's labor force advanced by 64,000, or 1.3 percent. In 2024, the statewide workforce reached its highest level since 2001.

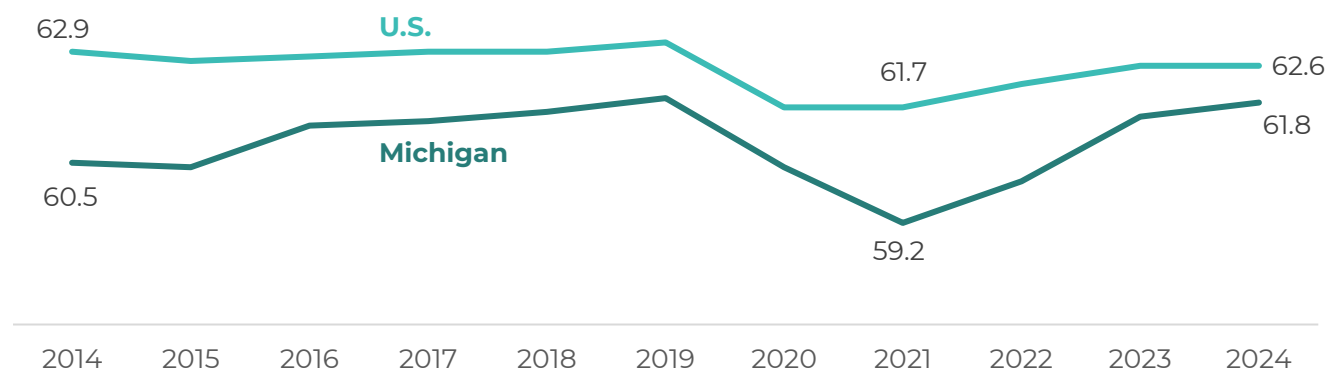
Labor Force Participation Rate

Data Note: The labor force participation rate demonstrates the number of people in the workforce as a percent of the total population.

Michigan's workforce participation rate consistently rose from 2022 to 2024. Between 2020 and 2024, the state labor force participation rate rose by 1.4 percentage points to 61.8 percent. This was the largest workforce participation rate observed in the state since its 2019 rate of 61.9 percent. In 2024, Michigan had the 33rd largest

Michigan's total workforce participation rate saw a four-year high during 2024.

Michigan and U.S. Annual Workforce Participation Rates, 2014-2024



Source: Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

workforce participation rate out of all states, behind Pennsylvania and California with rates of 62.1 percent each.

Unemployment rates continued to climb in early 2025

Michigan's workforce expanded during the early months of 2025, largely due to an increase in the total number of unemployed. A comparison of the annual average for 2024 and seasonally adjusted monthly data for March 2025 reveals that total unemployment in the state rose by 41,000 (17.2 percent), between the annual average for 2024 and March 2025. Total employment in the state declined by 2,000 (0.0 percent), and Michigan's labor force advanced by 39,000 (0.8 percent). Between the annual average for 2024 and March 2025, Michigan's jobless rate rose by 0.8 percentage points to 5.5 percent.

Conclusion

After a historically low jobless rate during 2023, Michigan's 2024 labor market demonstrated larger levels of total unemployment and a notably larger annual jobless rate. Although employment and the state workforce both advanced, the number of unemployed people also rose considerably by 21.4 percent, resulting in an eight-tenths of a percentage point increase in the annual jobless rate. Michigan labor force participation expanded consistently from 2021 to 2024, resulting in a four-year high rate of 61.8 percent.



Michigan Labor Market Data by Demographic Group

■ **Dylan Schafer**, Federal-State Program Manager

Reviewing labor market trends among different demographic populations can highlight disparities among these groups. Demographic data for all states are published as an annual average by the U.S. Bureau of Labor Statistics once a year. This data comes from the Current Population Survey, which is a different source than the standard monthly labor market information containing Michigan's official unemployment rate, labor force, and payroll jobs. Comparisons should not be made with monthly data, as the demographic information presented here is a December 12-month average from 2019 to 2024 for Michigan and the U.S.

Unemployment Rate by Gender

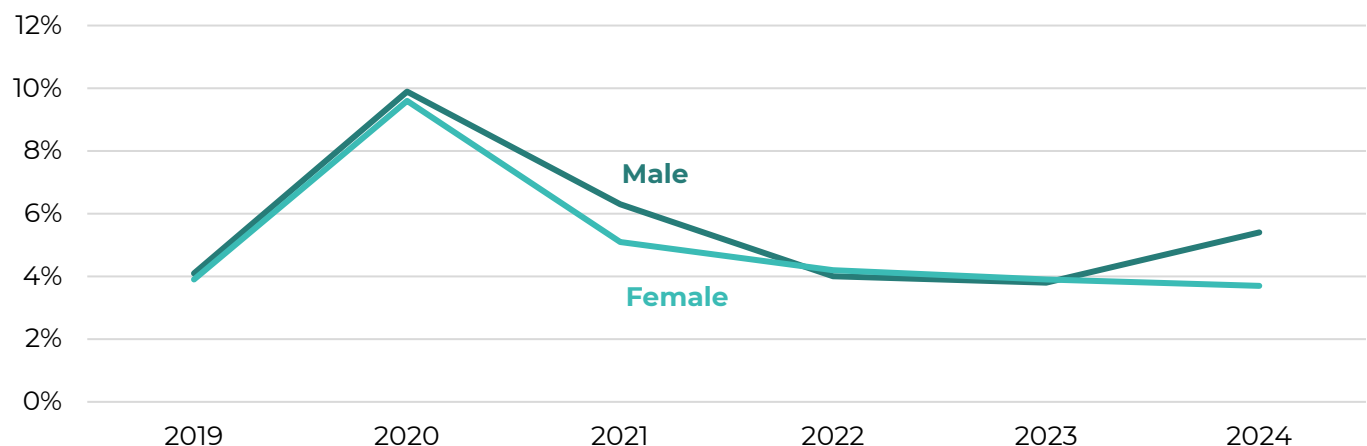
According to 12-month moving average data from the Current Population Survey, unemployment rates for both males and

females ages 16 and older in Michigan have fallen considerably from the highs of 2020. Unemployment rates declined from 2020 to 2023, with the male rate falling 6.1 percentage points over the period, while the female rate declined by 5.7 percentage points. By 2024 the male unemployment rate began to increase, with rates rising from 3.8 percent in 2023 to 5.4 percent in 2024. The female jobless rate continued to decline, with the rate decreasing 0.2 percentage points from 2023 to 2024, down to 3.7 percent.

Unemployment rates for females have generally followed a similar trend to that of males in recent years, with the female rate typically being lower apart from 2022 and 2023. By 2024, the gap between the male and female jobless rates began to increase, with the male jobless rate sitting 1.7 percentage points higher. This was a significant increase from the 0.1 percentage point gap between males and females just a year earlier.

The gap between male and female jobless rates widened in 2024.

Michigan Annual Average Unemployment Rates by Gender



Source: Current Population Survey, U.S. Bureau of Labor Statistics

Unemployment rates for males and females at the national level have shown similar trends to that of Michigan. Nationally, male and female jobless rates fell between 2020 and 2022, with the male jobless rate experiencing a period of increase from 2022 to 2024. At the national level, female unemployment rates continued to decline through 2023 before increasing slightly in 2024.

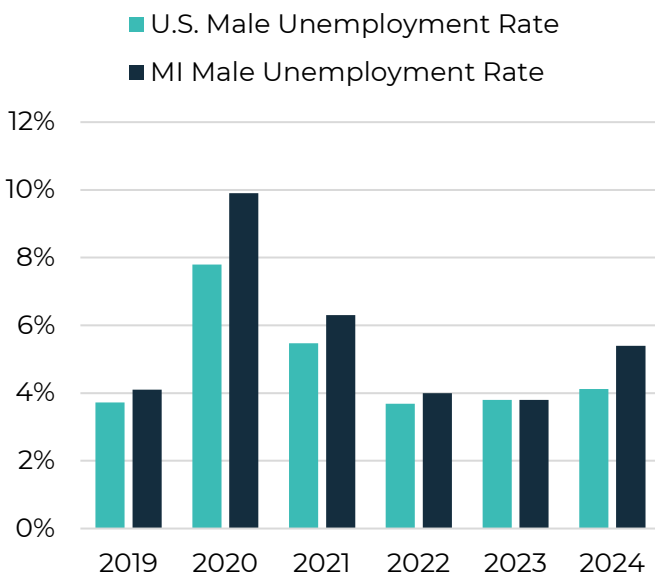
The male jobless rate in Michigan from 2019 to 2022 was slightly higher than the national rate, with the largest separation occurring in 2020, when the male jobless rate in Michigan was 2.1 percentage points higher than the national average. However, in 2023 the male jobless rate of 3.8 percent in Michigan matched the U.S. male rate. In 2024, the gap began to widen again, with Michigan's male jobless rate 1.3 percentage points higher than the national rate. Like males in the state, females



in Michigan have generally had higher unemployment rates than the national average in recent years. Only in 2021 and 2024 did Michigan's female unemployment rate fall below the national average.

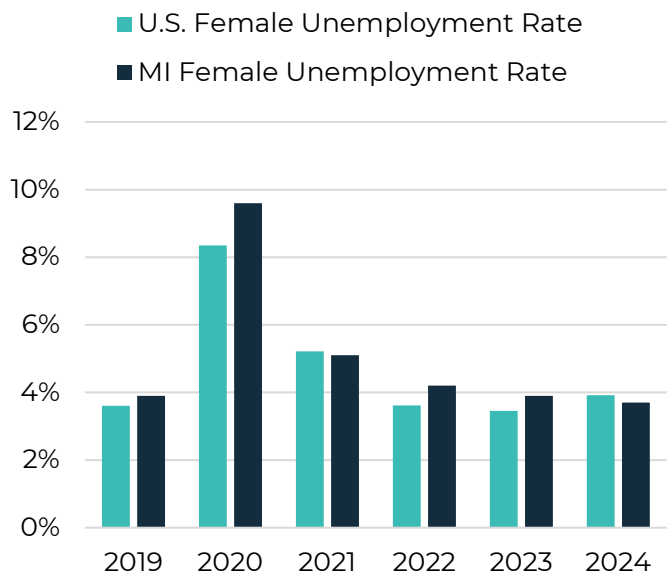
Michigan's male jobless rate has typically been higher than the national rate in recent years.

Michigan and U.S. Male Unemployment Rates



Female jobless rates in Michigan usually exceeded the national rate in recent years.

Michigan and U.S. Female Unemployment Rates



Source: Current Population Survey, U.S. Bureau of Labor Statistics

Labor Force Participation by Gender

The labor force participation for males in Michigan is historically greater than the rate for females. From 2019 to 2024, male workforce participation in Michigan averaged 9.5 percentage points higher than the female participation rate. From 2023 to 2024, the state’s male labor force participation declined by 0.9 percentage points, down to 66.3 percent. In contrast, female participation rose 0.2 percentage points to 57.5 percent.

From 2019 to 2024, Michigan’s male labor force participation rate was consistently lower than the national rate each year. On average, the male participation rate in Michigan was 2.3 percentage points below than the U.S. rate for males over the period. The state’s female workforce participation rate was largely equal to the national rate in recent years, except for 2021 and 2022, when Michigan’s female labor force participation rate was 2.0 percentage points lower than the national rate. Between 2023 and 2024, male labor force participation declined in the U.S. and Michigan, while female participation advanced for both.

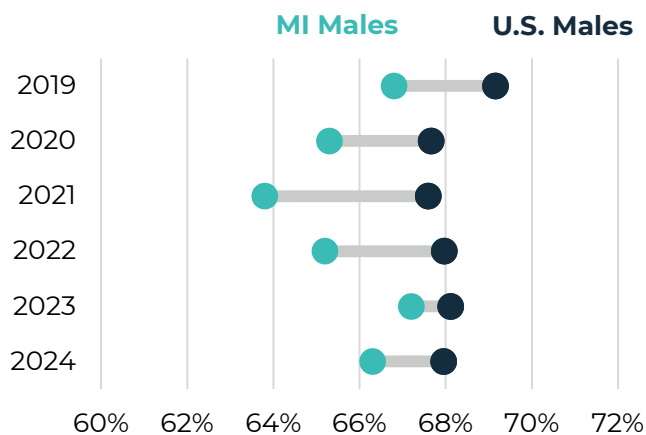
Unemployment Rate by Race

Michigan jobless rates for Black workforce participants ages 16 and older were consistently higher than unemployment rates for white individuals from 2019 to 2024. In 2019, the Black unemployment rate was 3.8 percentage points greater than the white jobless rate. By 2020, the gap between the two demographic groups increased significantly, with the Black unemployment rate 10.7 percentage points higher than the white rate. In subsequent years, the gap in unemployment rates began to narrow, with the Black jobless rate 3.6 percentage points higher than the white unemployment rate in 2024.

From 2019 to 2024, unemployment rates for white and Black individuals in Michigan were greater than similar national rates. The gap between the Michigan and U.S. jobless rates for white workforce participants was at its greatest in 2020, with Michigan’s rate 1.1 percentage points higher. Similarly, in 2020, the Black unemployment rate in Michigan was 7.7 percentage points higher than the national average. The gap in

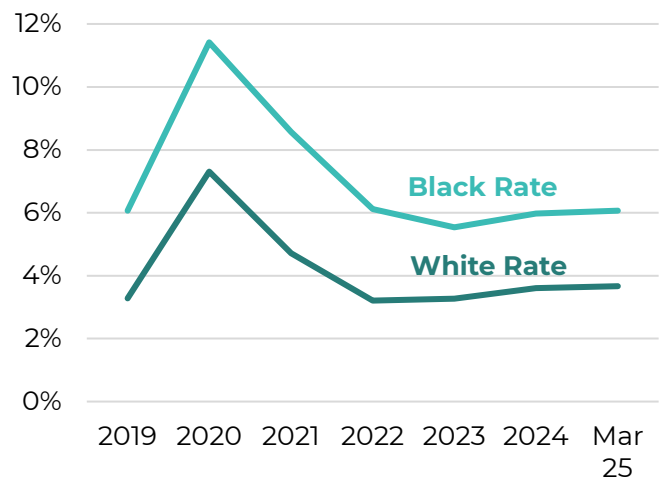
Labor Force Participation rates for males were consistently lower in Michigan than in the U.S.

Michigan and U.S. Male Labor Force Participation Rates



The gap between Black and white jobless rates in Michigan have narrowed since the highs of 2020.

Michigan Unemployment Rates by Race



Source: Current Population Survey, U.S. Bureau of Labor Statistics

unemployment rates between and Michigan and the U.S. for these two groups has narrowed in subsequent years. In 2024, white and Black unemployment rates in Michigan were just 0.4 and 1.6 percentage points higher, respectively, than national rates.

Labor Force Participation Rate by Race

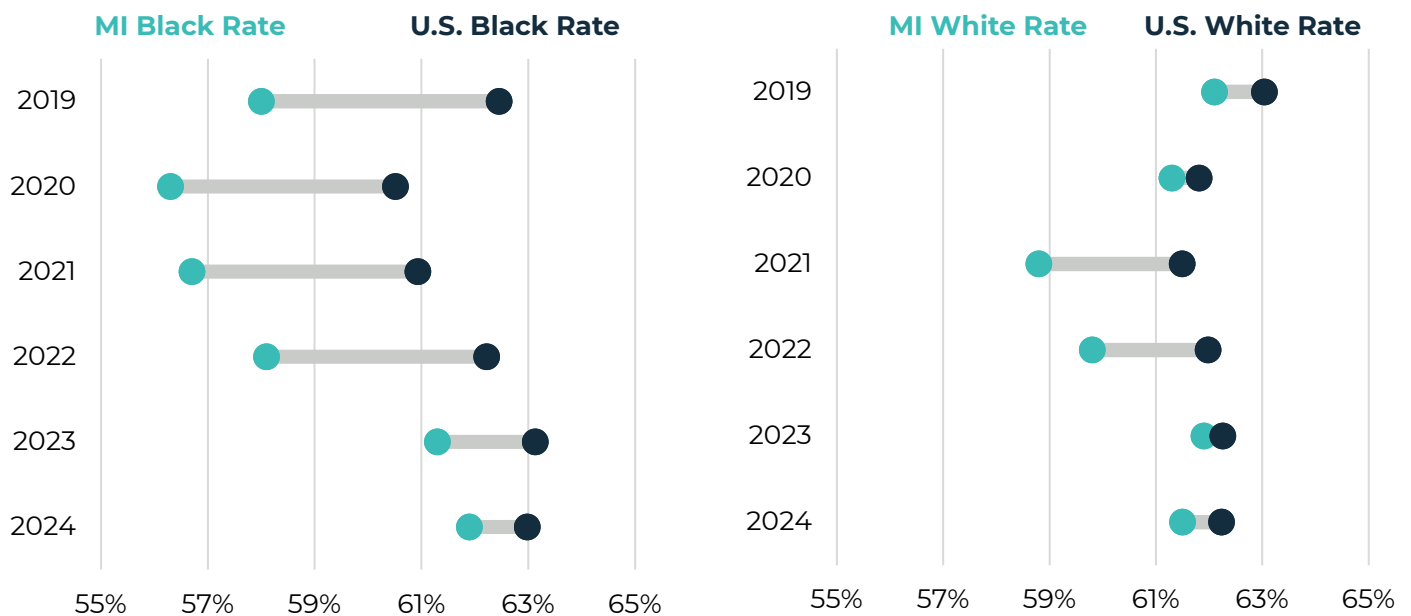
Workforce participation for white individuals in Michigan has generally been higher than for Black individuals. From 2019 to 2024, labor force participation rates among white individuals have been relatively flat, except for 2021 and 2022 when rates saw a slight decline. Black individuals in Michigan have recently experienced an uptick in workforce participation, with rates rising year-over-year since the lows of 2020. Workforce participation for white individuals declined by 0.4 percentage

points from 2023 to 2024, while Black workforce participation rose by 0.6 percentage points. As a result, Black workforce participation surpassed the white labor force participation rate in 2024.

Labor force participation rates for Black and white individuals in Michigan were consistently lower than the national average from 2019 to 2024. In the U.S., workforce participation for white individuals was typically less than one percentage point higher than in Michigan, apart from 2021 and 2022, when Michigan's rate saw temporary decline. Black labor force participation rates in Michigan were over four percentage points lower than the national average from 2019 to 2022. However, in 2023 and 2024, the gap between Black participation rates in the U.S. and Michigan narrowed as Black workforce participation rates in Michigan continued to rise.

Labor force participation rates for Black individuals in Michigan have risen closer to the national average in recent years.

Michigan and U.S. Labor Force Participation by Race



Source: Current Population Survey, U.S. Bureau of Labor Statistics



Preliminary 2025 Data

According to 12-month moving average data for March 2025 (April 2024-March 2025), male and female jobless rates in Michigan have seen an uptick, with unemployment rates increasing 0.5 percentage points since 2024 for both groups. Labor force participation rates for females declined slightly by 0.3 percentage points since 2024, while male participation rates rose 0.1 percentage point. Between 2024 and the 12 months ending in March 2025, Michigan's Black and white unemployment rates have risen by 1.9 and 0.2 percentage points, respectively. Labor force participation rates have declined slightly since 2024, with the Black rate decreasing by 0.1 percentage point, while the white rate fell by 0.2 percentage points.

Conclusion

Demographic data for four of Michigan's key groups has shown varying levels of change in recent years. The female unemployment rate declined slightly from 2023 to 2024, while the male rate saw a notable uptick. Workforce participation for males continued to outpace the average participation rate for females in Michigan during 2024. Michigan's Black unemployment rate has typically been higher than the white jobless rate, but in recent years, the gap between the two groups has narrowed. An increase in Black labor force participation, with a decline among white workers, resulted in the Black rate surpassing the white rate in 2024.

Industry Job Trends in Michigan

■ **Reima Nasser**, Economic Analyst

Within the last few decades, Michigan’s economy has undergone significant change. Each year since the 2020 recession, nonfarm payroll employment has increased. Although growth has slowed in recent years, the recovery was still much faster than after the Great Recession. Analyzing current employment data provides a better understanding of Michigan’s labor market in the context of total statewide payroll jobs and industry-level employment.

Data Note: Data on employment by industry is produced through the Current Employment Statistics program, which is published by the Bureau of Labor Statistics in cooperation with the Michigan Center for Data and Analytics.

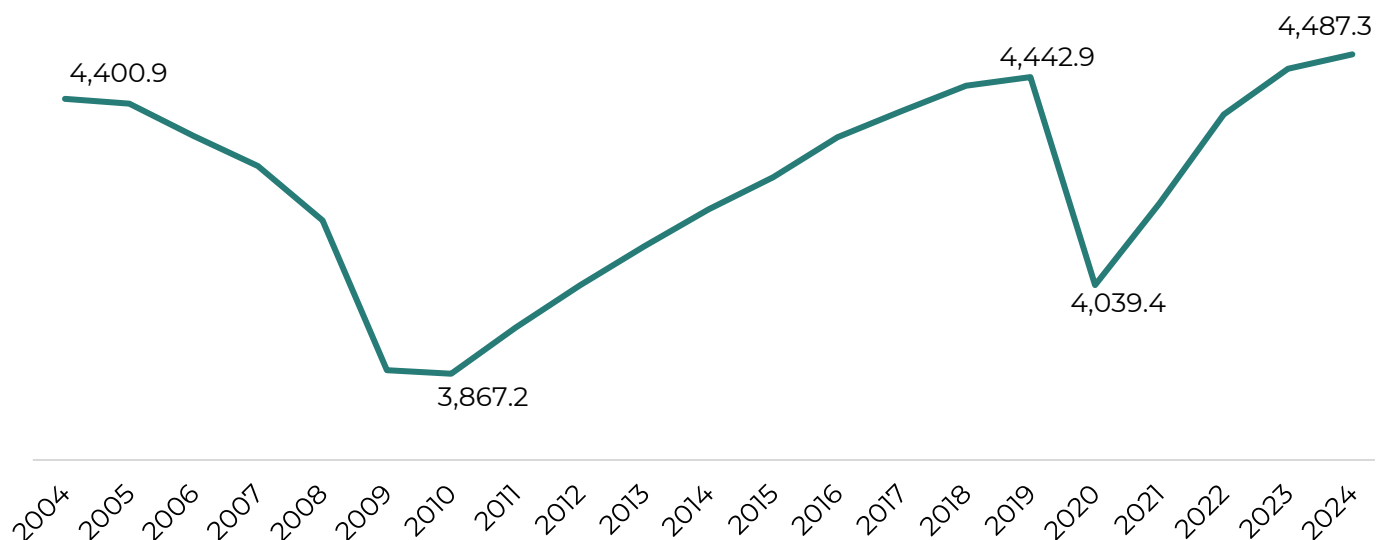
Statewide Nonfarm Job Trends

Annual average payroll employment in Michigan rose by 0.6 percent, or 27,900, in 2024. While this gain marked the fourth consecutive year of annual job growth in the state, this rate was 1.4 percentage points below Michigan’s 2023 annual average growth rate of 2.0 percent. From 2016 to 2019, average job growth was 1.1 percent, less than half the 2.7 percent growth rate observed in the four-year period following the pandemic. While the pace of annual job growth slowed this year, Michigan payroll jobs averaged 4,487,300 in 2024, marking the highest annual average payroll job level in over 20 years.

In the U.S., annual average employment advanced by 1.3 percent in 2024, nine-tenths of a percentage point lower than the 2023 annual rate increase (2.2 percent). The Michigan average growth rate was seven-tenths of a percentage point below the national rate in 2024. This is a

Michigan annual average jobs advanced for the fourth consecutive year.

Annual Average Total Nonfarm Payroll Jobs in Michigan (Data in Thousands)



Source: Current Employment Statistics, U.S. Bureau of Labor Statistics

recurring trend, as Michigan’s job growth rate has been lower than the U.S. in eight of the past 10 years.

Across the nation, all 50 states recorded annual average job gains in 2024. Payroll employment growth ranged from 0.1 percent in Massachusetts to 2.1 percent in Alaska during the year. On an annual basis, Michigan tied Ohio for the sixth smallest average change rate in the nation. Additionally, six of 10 states with the smallest annual average job change were in the Midwest, suggesting a slowdown across the region overall.

Industry Job Trends

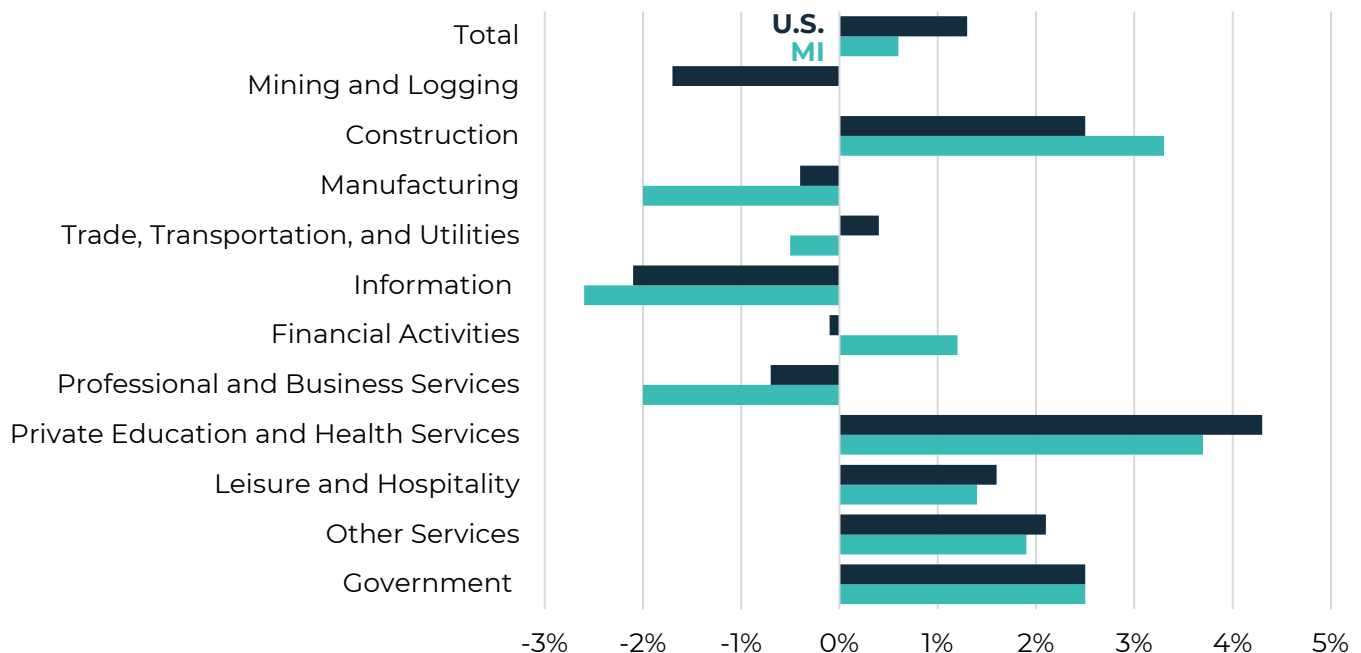
In 2024, annual average employment advanced in six of 11 Michigan major industry sectors. The strongest average employment gains were seen in *Private education and health services* (+25,400), *Government* (+15,200), and *Construction* (+6,300). Job additions within *Private education*

and health services were primarily driven by increases in *Health care and social assistance* (+22,600). Nearly all employment growth within *Government* was the result of job expansions within the *Local government* (+11,800) subsector. Conversely, four major statewide industries saw declining payrolls in 2024, with the greatest job losses reported in *Professional and business services* (-12,800) and *Manufacturing* (-12,300) this year, while employment in *Mining and logging* remained unchanged over the same period.

Over the year, the U.S. experienced payroll job growth similar to Michigan. On a percentage basis, the most significant average rate changes were recorded in the *Private education and health services* (+4.3 percent) and the *Government* and *Construction* sectors, with both industries recording a similar change rate at 2.5 percent. In 2024, only two major Michigan industries surpassed the job growth rates of their national sector counterparts: *Financial*

Michigan showed stronger job growth than the U.S. in *Financial activities* and *Construction*

2024 Annual Average Total Nonfarm Payroll Jobs in Michigan and the U.S. (Data in Thousands)



Source: Current Employment Statistics, U.S. Bureau of Labor Statistics

activities and *Construction*. The *Government* sector in Michigan and the U.S. noted the same change rate between 2023 and 2024 (2.5 percent), while *Information* saw the greatest reduction in average payroll employment (-2.6 and -2.1 percent, respectively) across the state and nation.

2024 Industry Highlights

Between 2023 and 2024, annual average jobs in Michigan's ***Mining and logging*** sector were unchanged. Over the year, 11 other states observed a similar trend.

Annual average jobs within ***Construction*** grew by 3.3 percent in Michigan, two-tenths of a percentage point shy of 2023's growth rate. In 2024, 39 states recorded employment growth within *Construction*.

Average ***Manufacturing*** employment declined for the first time in three years (-2.0 percent), as both *Durable goods* (-2.5 percent) and *Nondurable goods* (-0.5 percent) reported job losses in 2024.

After three consecutive years of average job growth, employment in ***Trade, transportation, and utilities*** decreased in Michigan in 2024 (-0.5 percent).

Average payroll jobs within the state's ***Information*** sector receded by 2.6 percent. In 2024, 42 states recorded declining annual average payroll employment within this industry.

Michigan and Oklahoma tied for the third-largest annual average employment growth in ***Financial activities*** nationwide (+1.2 percent).

Seven of the 10 states with the smallest changes in ***Professional and business services*** jobs were in the Midwest, with Michigan noting a 2.0 percent decline between 2023 and 2024.

Statewide average ***Private education and health services*** jobs increased by 3.7 percent. In 2024, all 50 states noted average job growth in this sector.

Average employment within Michigan's ***Leisure and hospitality*** sector rose by 1.4 percent in 2024, 3.4 percentage points below its 2023 average growth rate. All states but Nevada saw lower annual rate changes in *Leisure and hospitality* in 2024 compared to 2023.

Average jobs within Michigan's ***Other services*** sector rose for the fourth consecutive year in 2024 (+1.9 percent).

In 2024, all states except for Idaho recorded annual job additions within ***Government***. Average employment within Michigan's *Government* sector advanced by 2.5 percent, making it one of four states with a change rate equal to the U.S. average.

Michigan continued to see positive payroll jobs growth in the early months of 2025.

Industries such as *Private education and health*, *Leisure and hospitality*, and *Construction* continue to show strength, while *Manufacturing* and *Professional and business services* are still down jobs over the year.

Conclusion

Michigan's labor market continues to make strides, with average payroll employment reaching its highest level in 20 years. While the recent trend of annual rate changes suggests a slowdown in the state and nation, total nonfarm payroll jobs and several major industry sectors showed positive employment trends in 2024.

Wage Changes in Michigan

■ **Yen Archer**, Economic Specialist

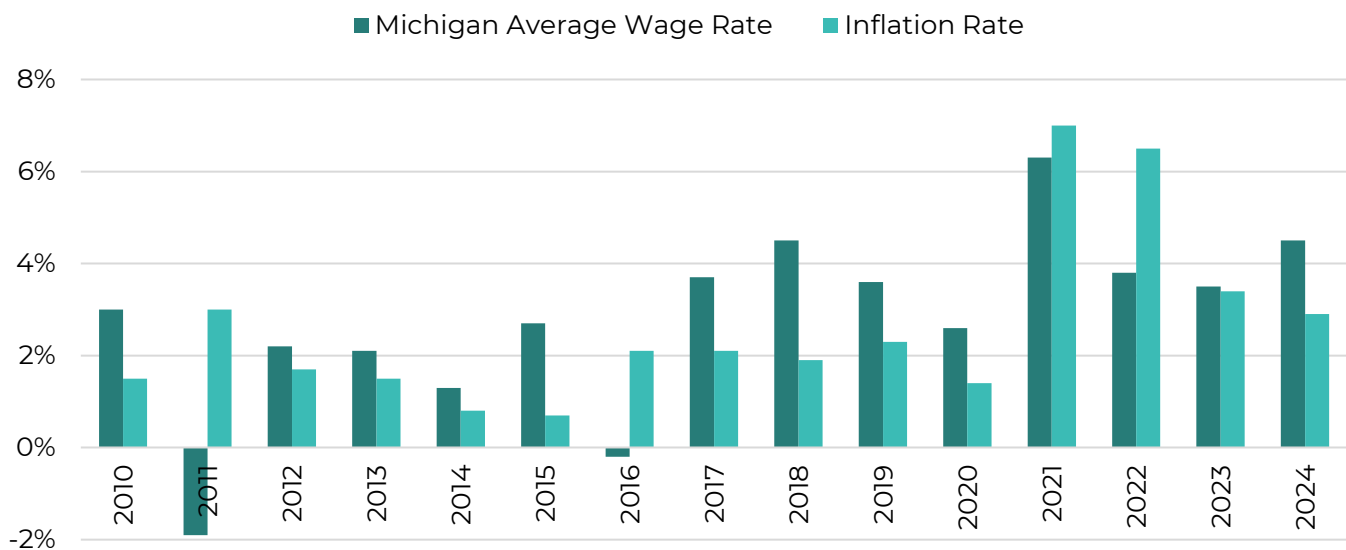
Michigan's average hourly earnings for private workers increased steadily throughout 2024, peaking at \$33.30 per hour in December—a 4.5 percent increase from December 2023, when it was \$31.86. The U.S. annual inflation rate was 2.9 percent for the 12 months ending in December 2024, indicating a 1.6 percent real wage increase in 2024 for Michigan workers. The increase in Michigan average hourly earnings for 2023 was essentially even with inflation that year, making 2024 the first time since 2020 when the average worker experienced a real gain in their earnings. In the past 10 years (2015-2024), inflation-adjusted (real) earnings have grown in seven years.

Michigan's Median Wage Ranks in the Middle Among States

Since 2010, Michigan's median wage has remained below the national median wage, typically by 1 to 3 percent. In 2024, Michigan's median wage was \$23.22 per hour, about 2.4 percent lower than the national median of \$23.80 per hour. Michigan's median wage ranked 26th out of all 50 states and Washington D.C. in 2024, and 27th in 2023, marking its lowest rankings in the past two decades. In 2004, Michigan's median wage was nearly 8 percent higher than the national median and ranked 12th. Since then, it has gradually declined. In the 10-state¹ Midwest region, Michigan's median wage has consistently ranked fifth, below Wisconsin and above Ohio, for the past three years.

Michigan's recent increase in inflation-adjusted earnings have returned average hourly earnings back to 2019 levels.

Annual Inflation Rate and Michigan Average Wage Rate, from 2010 to 2024

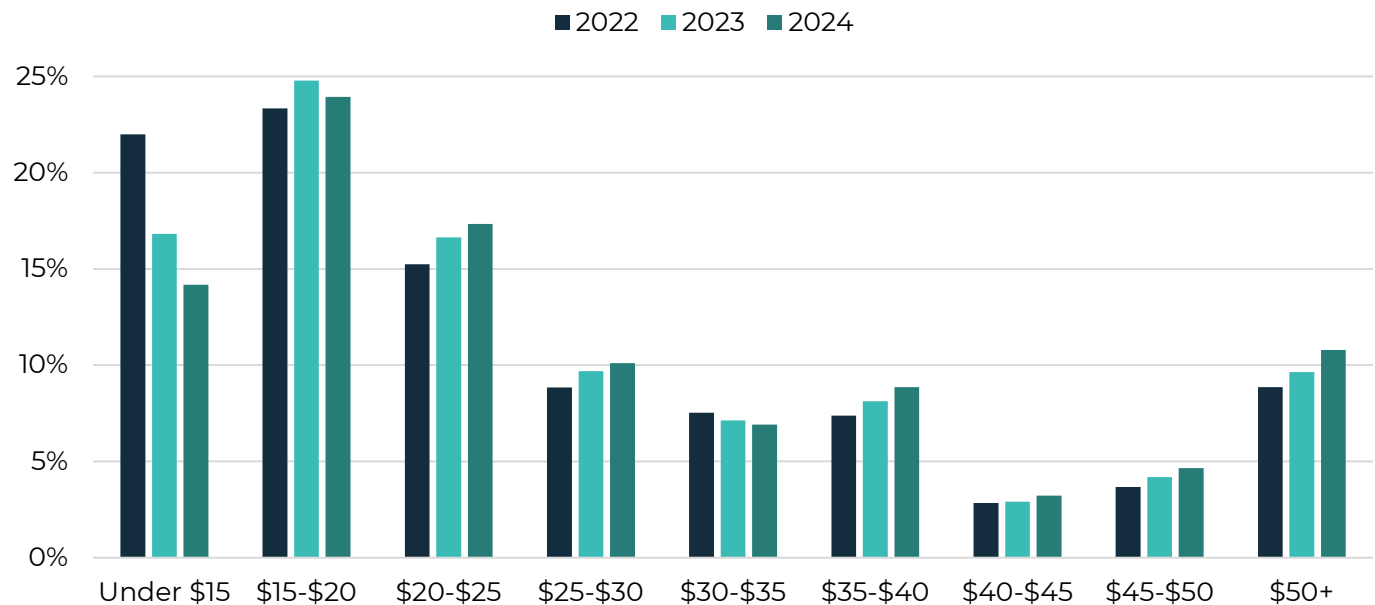


Source: Occupational Employment and Wage Statistics, U.S. Bureau of Labor Statistics

¹Midwest region as defined by the BLS: Illinois, Indiana, Iowa, Michigan, Minnesota, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

The Michigan job market is experiencing a shift towards higher wage ranges.

Distribution of Michigan Jobs by Hourly Wage, 2022-2024



Source: Occupational Employment and Wage Statistics, U.S. Bureau of Labor Statistics

More Michigan Jobs are Moving into Higher Wage Ranges

The Michigan job market has continued to shift toward mid-range and higher wages in recent years. The number of jobs paying under \$15 per hour has dropped significantly to around 14.2 percent of all state jobs in 2024, down from over 22 percent in 2022. The share of jobs in the \$15-\$20 range remained the most common in the past three years, representing 23 to 25 percent of all jobs. More than 50 percent of occupations in Michigan fell within the \$15-\$30 per hour range, representing over 2.2 million jobs—highlighting a continued shift away from lower-paying jobs. In 2024, each \$5 wage segment from \$35 per hour to over \$50 per hour experienced more than a 10 percent increase in occupations, marking significant gains compared to previous years. The over-\$50-per-hour wage bracket saw the largest increase in job share from 2023 to 2024, with employment rising by over 54,000, showing wage gains for higher-paying occupations as well.

Minimum Wage Development and Lower-end Wages

As of January 2024, eight states along with Washington D.C. had a minimum wage exceeding \$15 per hour, while 29 states had minimum wages below \$12 per hour. Michigan ranked 29th highest among states and D.C., with a minimum wage of \$10.33 per hour. The increase in Michigan's minimum wage to \$12.48 in February 2025 will impact roughly four percent of jobs in the state and make Michigan a top 20 state for having the highest minimum wage. From 2019 to 2024, Michigan's minimum wage grew gradually, rising by roughly 2-2.3 percent each year from \$9.45 per hour to \$10.33 per hour, before a sharp 20.8 percent jump to \$12.48 in 2025. This shift reflects a significant adjustment in the state's wage structure. In 2024, approximately 622,000 jobs in Michigan paid \$15 per hour or less, accounting for just over 14 percent of total state employment. Although Michigan's minimum wage was ranked in the lower tier nationally in

2024, its 10th percentile wage (10 percent of all occupations make at least this much) of \$14.22 per hour was close to the national 10th percentile wage of \$14.42 per hour, suggesting that overall wage growth in the state has outpaced increases in the required minimum wage.

High-wage and Low-wage Occupations

Among high-wage occupations, Michigan had a strong concentration in *Architecture and engineering* occupations, which accounted for 2.9 percent of total employment—the highest concentration for this group in the nation. In 2024, the median wage for this group was \$46.24 per hour, just over 1 percent below the national median and more than 19 percent lower than California, the top-paying state. Michigan ranked 17th among all states in median wages for this occupational group. Along with *Architecture and engineering*, *Management, Computer and mathematical*, *Legal*, and *Healthcare practitioners and technical* were the top five high-wage occupational groups. Most low-wage workers in Michigan were employed in *Food preparation and serving related* occupations with a median wage of \$14.95 per hour, *Personal Care* and *Service* occupations (\$15.20 per hour), and *Building and grounds cleaning and maintenance* occupations (\$17.30 per hour).

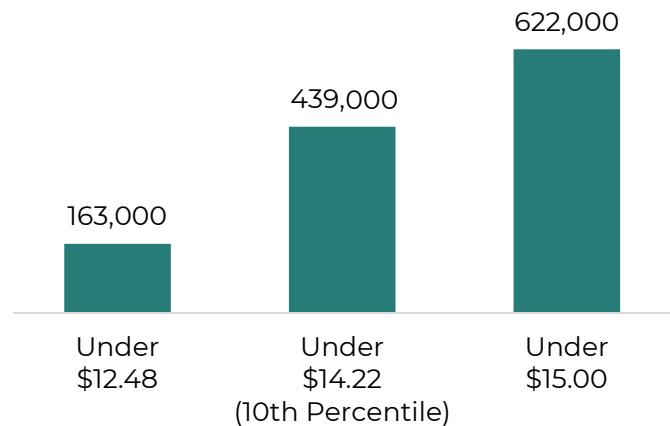
Wage Growth Trends Continue in 2025

Michigan's average hourly earnings for private workers have been relatively flat in the early months of 2025, while inflation continues to rise at a steady pace. The trend of real wage growth experienced in 2023 and 2024 will be reversed in 2025 if inflation continues to outpace wage growth.

Between May 2024 and May 2025, every major industry in the state recorded gains in average hourly earnings. The top three industries were *Leisure and hospitality* (+9.0 percent), *Information* (+7.8 percent), and *Financial*

Over 622,000 Jobs in Michigan Paid Under \$15 per Hour in 2024.

Total Jobs Earning Under Dollar Thresholds



Source: Occupational Employment and Wage Statistics, U.S. Bureau of Labor Statistics

activities (+7.3 percent), all outpacing the overall state average. Positive wage growth spread among all industries is a good sign for the overall health of state wage trends.

Conclusion

In 2024, wages in Michigan rose across all levels. The increase in the minimum wage, coupled with general wage trends and demand for labor, has notably reduced the number of workers earning less than \$15 per hour. With the average wage growing faster than inflation, workers experienced real gains in their earnings. Furthermore, there was a slight increase in the percentage of occupations in the state earning over \$50 per hour, reflecting a broader trend of wage growth.

Demand for Workers in Michigan

■ **Krystal Jones**, Economic Analyst

Michigan’s labor market experienced a decline in the demand for workers in 2024. This came as both online job advertisements and average job openings fell over the year. As the number of unemployed individuals grew, those available to work far outpaced the number of open positions on average.

Average Annual Job Openings Declined in 2024

Job openings were down on average in 2024, according to the state Job Openings and Labor Turnover Survey (JOLTS). Michigan averaged approximately 36,000 fewer monthly job openings in 2024 (222,000) than in 2023 (258,000). As a result, the job openings rate, a measure of job openings as a percentage of employment, fell to 4.7 percent. This was a notable drop from the 5.5 percent average rate in

2023. Michigan’s job openings rate was equal to the national average in 2024 and recorded the 13th lowest rate among other states.

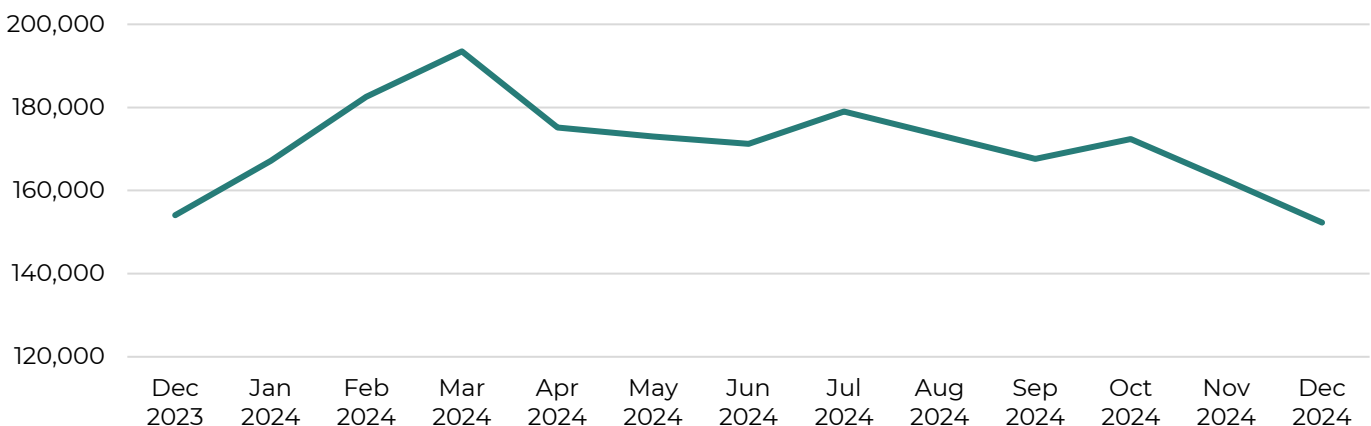
Total Job Advertisements were Down Over the Year

According to Help Wanted Online (HWOL) data, there were roughly 152,000 unique online job advertisements in Michigan in December 2024. This was a 1.2 percent decline in postings from December 2023 (154,000 ads).

Despite the decline in overall ads, several occupations and industries saw growth in online postings. Of the top 50 most advertised occupations in 2024, 23 experienced an increase in unique job advertisements over the year. The largest percent increase came from *Stockers and order fillers* (+32.0 percent), which recorded 2,060 unique job advertisements in December 2024. Other notable increases over the year included *Security guards* (+25.7 percent) and *Sales representatives, wholesale and manufacturing*,

Total Job Advertisements in Michigan declined by 1.2 percent from December 2023.

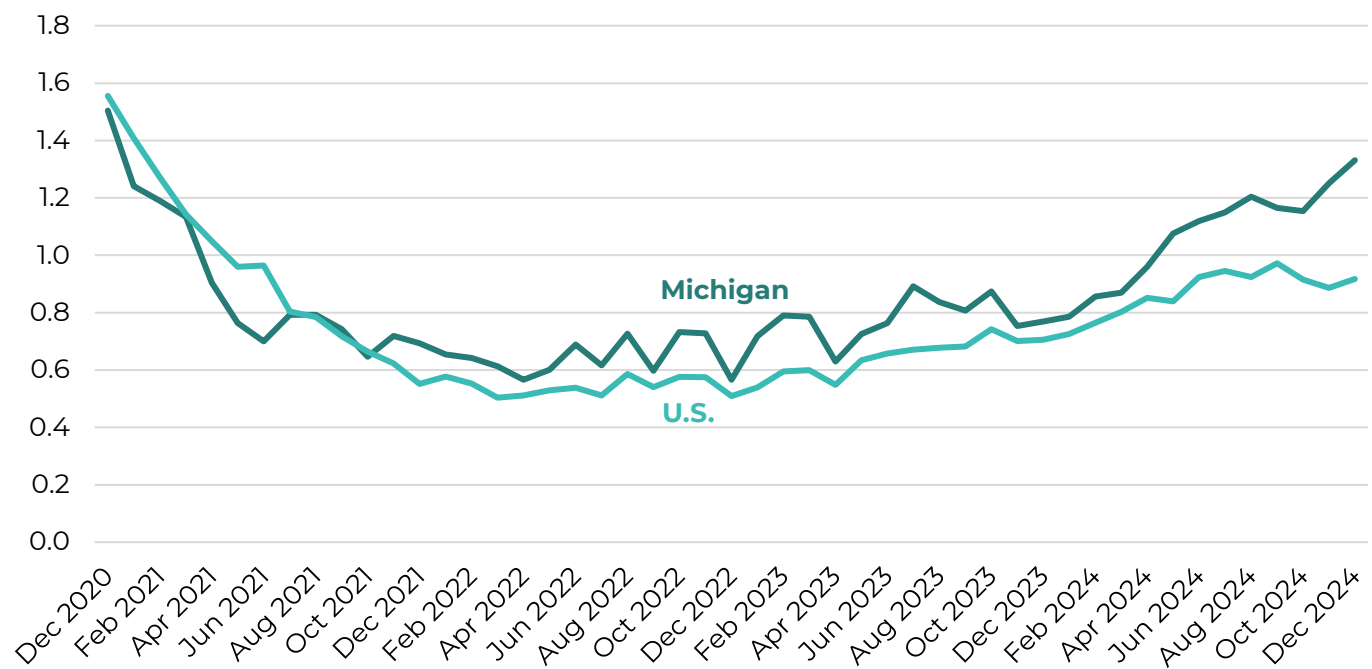
Michigan Total Online Job Advertisements



Source: Help Wanted OnLine, Lightcast Developer

The Michigan unemployed persons to job openings ratio reached a four-year high in 2024.

Michigan and U.S. Unemployed Persons to Job Openings Ratio



Source: Job Openings and Labor Turnover Survey and Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

except technical and scientific products (+23.7 percent). Conversely, some occupations that experienced a significant decline during this time were *Maids and housekeeping cleaners* (-25.6 percent), *Production workers, all other* (-22.0 percent), and *Laborers and freight, stock, and material movers, hand* (-19.7 percent).

December 2024 data for detailed industries showed large gains in job advertisements over the year for *General freight trucking, long-distance, truckload* (+97.4 percent); *Automotive parts and accessories retailers* (+62.6 percent); and *Security guards and patrol services* (+52.8 percent). Of the industries that declined in job advertisements, *All other miscellaneous ambulatory health care services* experienced the largest decrease in ads (-39.1 percent); followed by *Religious organizations* (-36.1 percent); and *Hotels (except casinos) and motels* (-26.7 percent).

Ratio of Unemployed People to Openings Reached a Four-Year High

The Job Openings and Labor Turnover Survey's (JOLTS) data on the unemployed persons to job openings ratio paints a similar picture of falling labor demand. In December 2024, this metric reached 1.33, its highest since December 2020 (1.50). On average, Michigan recorded a ratio of 1.07 in 2024, a notable jump from its 0.77 average in 2023. A ratio greater than 1.0 indicates that the number of individuals available to work exceeds the available jobs. In the last eight consecutive months of 2024 and on average, Michigan's ratio exceeded 1.0 in this metric, which can be interpreted as the state's worker supply exceeding its demand across this period. Michigan's unemployed to job openings ratio was second highest among other states in December of 2024, behind California (1.57). On



average for 2024, Michigan recorded the fifth highest average ratio among states.

There were no significant changes among the remaining labor demand metrics included in the JOLTS survey. The separations rate (3.3 percent) and labor turnover rate (6.8 percent) were equal to their 2023 averages, while the hires rate (3.6 percent) surpassed the 2023 average (3.5 percent), and the quits rate (2.0 percent) fell below 2023 (2.1 percent). The observed marginal change in some metrics and lack of change in others over the year also pointed to a cooling labor market, as fewer individuals separated from their jobs and hires remained virtually the same.

Job Demand in Early 2025

In the first quarter of 2025, job advertisements ticked up with a total of 169,120 unique advertisements recorded in March. Similarly, the job openings rate also saw an increase. After falling to 4.2 percent in December 2024, Michigan

registered a job openings rate of 4.7 percent in March 2025. The unemployed persons to job openings ratio was recorded at 1.24 in March 2025. While this was a drop from December 2024 (1.33), Michigan remained substantially above the national ratio (0.98), and fifth highest among other states. Another notable change during this time was the labor turnover rate, which jumped to 7.6 percent in March.

Conclusion

Data from both HWOL and JOLTS pointed to a softening in labor demand over the past year. Individuals available to work exceeded the number of available jobs in both metrics. While there were increases across certain industries and occupations, total job advertisements declined in 2024. Though the trend has shifted in the first quarter of 2025, indicators from the past year have all pointed to a continued decline in demand for workers in Michigan.



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Living In The Cold: Addressing The Inequalities Of Heating Energy Poverty In Winter

EXPERT VOICE · OCT 18, 2023

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Climate Science

Energy Innovation partners with the independent nonprofit [Aspen Global Change Institute](#) (AGCI) to provide climate and energy research updates. The research synopsis below comes from AGCI's Emily Jack-Scott and Liz Carver. A full list of AGCI's updates is [available online](#).



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Winter is coming, and people across the country have started turning on their heat to take the edge off the cold. With clear memories of last winter's high heating costs and this season's prices [predicted](#) to remain at near-record levels, many are resisting as long as possible before finally flipping the switch on their thermostats.

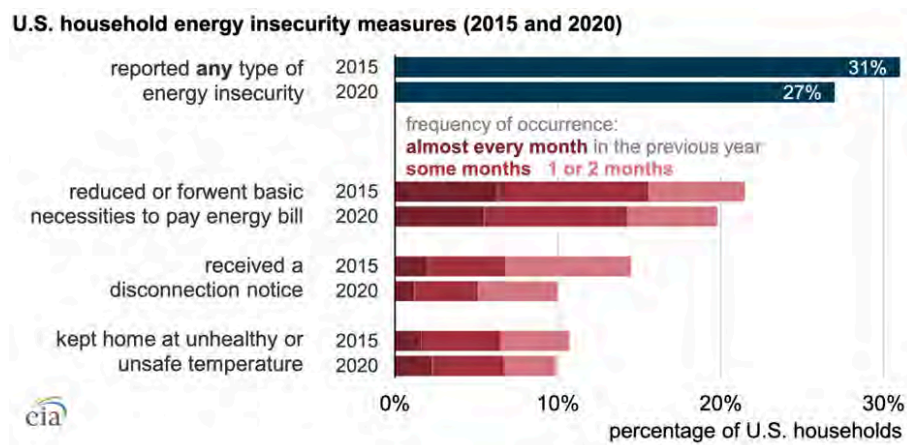


Figure 1: Source: U.S. Energy Information Administration, [Residential Energy Consumption Survey \(RECS\)](#).

The impacts on both psychological and physical health and the economic toll of insufficient heat in winter is staggering and leaves an intergenerational wake. Household members, especially children and the elderly, suffer more from poor health (including an uptick in respiratory illnesses), have higher rates of anxiety and depression, and incur more trips to the hospital. Children are more likely to exhibit rule-breaking behaviors, such as skipping school. Physical and financial stress compound, and domestic disturbances and abuse rise. And the most extreme cases of energy insecurity result in injury or death due to unsafe temperatures or from using ovens or stoves as primary or secondary heat sources.

The energy transition from fossil fuels to renewable energy presents a critical opportunity to rectify this energy injustice. But to realize that potential, recent research calls upon policymakers to pay attention to important gaps in the ways heating energy burden and poverty are measured, and how policy prescriptions can be designed and implemented to address energy burden inequities, lest they inadvertently exacerbate energy insecurity in the transition.

Who is impacted by home energy poverty?

An uptick in research over the last decade has confirmed what many households have known for decades: low-income households pay a much higher percentage of their income on heating costs than higher-income households.

The energy burden of heating and cooling is often based on the percentage of a household's income spent

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more than 10 percent of their income on energy (which constitutes a “severe energy burden”)—that’s nearly 16 million people in this the U.S. paying over a tenth of their limited income on energy costs.

The report also illustrates the disproportionate distribution of energy burden by income level, race and ethnicity, age, and housing type. Inequities in energy burden are shouldered by low-income households (even more pronounced among low-income seniors and those with disabilities); Native American, Black, and Hispanic households; renters; and low-income multifamily housing units and manufactured homes (both of which have notoriously poor weatherization) (Figure 2).

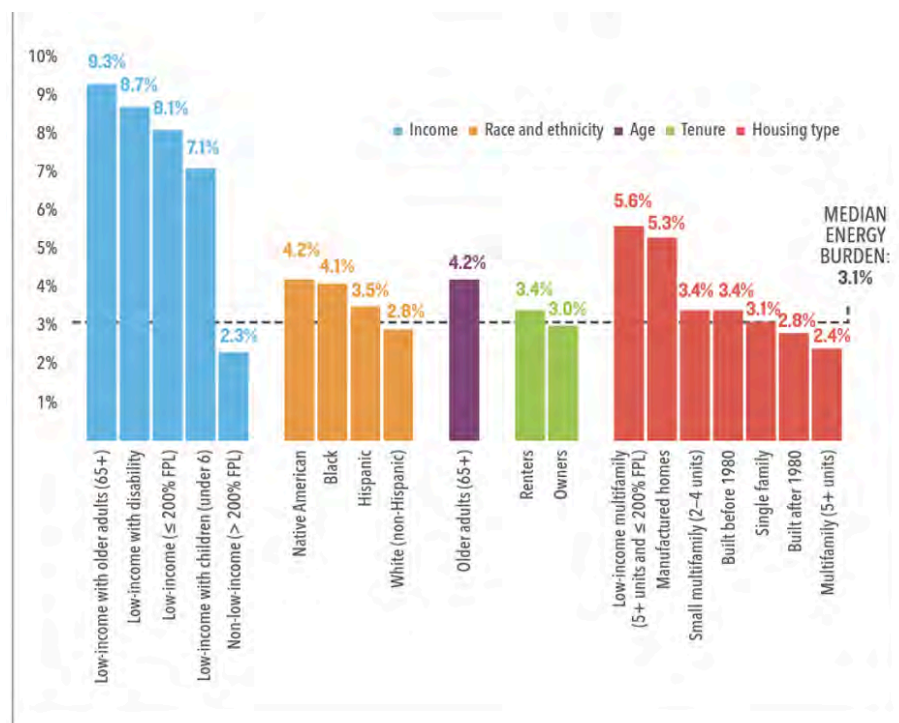


Figure 2: National energy burdens across subgroups (i.e., income, race and ethnicity, age, tenure, and housing type) compared to the national median energy burden. Source: Dreho et al., 2020.

Historical policies and social context strongly influence today’s distribution of energy poverty. Redlining policies that limited mortgages for communities of color, especially Black Americans, have a lasting legacy evidenced in today’s heating inequities. In a 2022 [paper](#) in *Energy Research and Social Science* led by Benjamin Goldstein, the authors examined household energy usage intensity and carbon emissions against household race and historical policies.

They found that energy use intensity is significantly higher in historically redlined districts, which are still predominantly African American neighborhoods. African Americans are also more likely to be renters than homeowners and are more likely to be in energy-inefficient housing. There have been very few incentives for landlords to invest in efficiency or weatherization programs, since the utility cost for heating and cooling is usually the responsibility of renters (what is frequently referred to as the “split-incentive” problem).

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How energy poverty is measured

So how can we ensure the accountability of policies and programs aimed at reducing energy poverty and addressing these inequities?

Another recent [paper](#) published in *Energy Policy*, led by author Luling Huang, points to the critical need to more accurately quantify levels of energy poverty. Traditional approaches to assessing energy poverty have largely fallen into two buckets: 1) asking consumers to self-assess the financial burden of heating and cooling their homes, or 2) using indicators or proxies such as how much energy is consumed, how much consumers spend on energy, building energy efficiency, and household income.

But as Huang's findings confirm, both of these approaches fail to adequately capture the extent to which households limit their heating energy usage in order to reduce costs. Huang and colleagues measured heating and cooling usage in direct response to temperature changes, and analyzed consumption patterns against census income data to assess inequities. They found that a significant percentage of households exhibited dangerous levels of "energy limiting behavior" each year, but were not being captured by traditional metrics.

Huang and colleagues found low-income households frequently turn on heating units earlier in the winter than their higher-income counterparts (Figure 3). While this may seem counter to the assumption that low-income households are more apt to limit their heating due to financial constraints, the authors point to the substandard insulation and efficiency of many affordable housing options, which necessitate earlier and longer winter heating periods, as the likely cause.

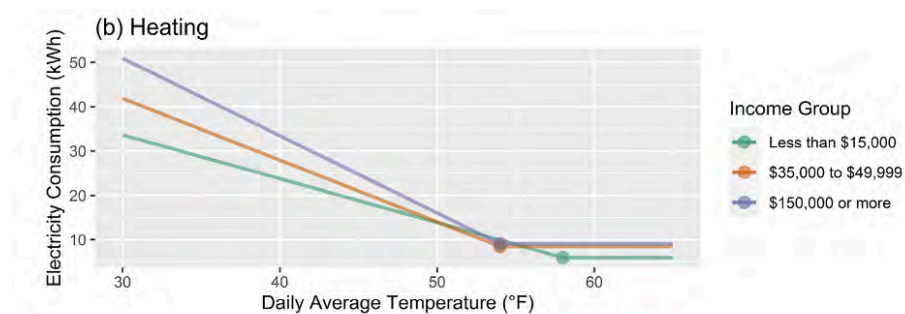


Figure 3. "Electricity use as a function of daily average temperature by three income groups. The Green, orange, and purple lines represent Income Group-Less than \$15,000, Income Group-\$35,000 to\$49,999, and Income Group-\$150,000 or more, respectively. For heating, electricity consumption when daily average temperature = 30 °F is the median daily average consumption of an income group in February 2021 when electricity consumption peaked in that heating season. Filled circle represents the median balance point of an income group. The horizontal segment represents the median baseload of an income group." Source: Huang et al., 2023.

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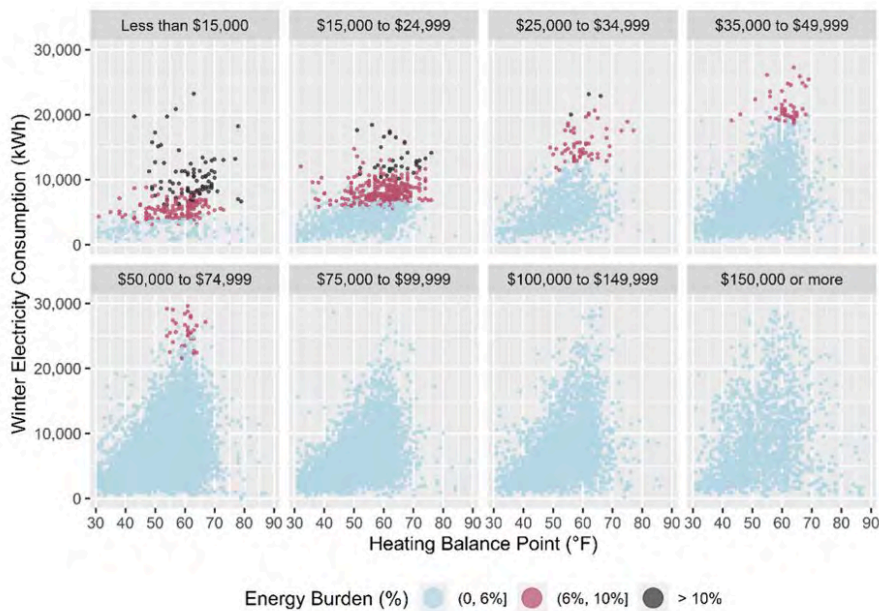


Figure 4. “Relationships among heating balance point, electricity consumption in heating season, and energy burden by income groups. Each data point represents one household. Each panel corresponds to one income group. Electricity consumption is calculated as the sum of electricity consumption in heating season (eight months). Energy burden is calculated as the ratio of electricity bill over the median income of the Census block group that a household belongs to. The blue, red, and black dots represent energy burden levels of 6% or below (low energy burden), between 6% and 10% (high energy burden), and higher than 10% (severe energy burden), respectively.” Source: Huang et al., 2023.

In Figure 4, the “heating balance point” on the x-axis indicates the outdoor temperature at which households were compelled to turn on heating units throughout winter. Note the significant number of households (each dot) that have heating units on when the outside temperature is in the 30s and 40s, but are consuming very little electricity (y-axis). When a household is in this situation, they are clearly rationing heating electricity and suffering the psychological, health, and socio-economic impacts of insufficient heating.

Huang and colleagues calculated the percentage of the study households living in these conditions totaled a whopping 24 percent of the study population, the majority of whom would *not* have been captured by traditional energy burden metrics. Because these households had so severely limited their electricity consumption, their costs wouldn’t have exceeded the traditional threshold of “low energy burden” (less than 6 percent income spent on energy).

What are U.S. policymakers doing to try to reduce energy poverty in the transition to renewable energy?

These nuances in who endures energy poverty and how that burden is tracked are critical for improving

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funded effort to provide assistance for home energy bills, and WAP can provide whole-house weatherization resources for low-income households, but eligibility for both is currently based on income level. The same is true for many state-funded energy assistance programs.

Huang and colleagues encourage policymakers to go beyond using household income as the only eligibility criteria for assistance programs, since this can result in the oversight of compounding factors of housing type, race, and the nuances of financial stress, regardless of income. Huang suggests installing and using smart meters to properly monitor heating burden and insecurity within households. Energy assistance programs can then receive alerts when energy limiting behaviors reach levels of concern, and better tailor their support to vulnerable households.

The landmark [Inflation Reduction Act \(IRA\) of 2022](#) includes \$391 billion for a variety of programs, incentives, and tax credits to accelerate a clean energy transition, decarbonize the economy, and mitigate climate change. Several of these programs can help reduce energy poverty by making energy-efficient home upgrades and renewable energy adoption more accessible to low- and middle-income families.

As Goldstein and colleagues underscore in their paper, one of the biggest barriers for the communities most affected by energy insecurity is limited availability of upfront capital to invest in energy-saving upgrades or renewable installations, and insufficient tax liability to benefit from tax credit incentives. Policies that decrease upfront costs through direct consumer incentives, such as instant rebates, are especially helpful.

In response to this need, the IRA allocated nearly \$9 billion for states and Tribes to design and implement two [Home Energy Rebate Programs](#) to accelerate the adoption of residential energy efficiency and renewable energy systems. The [Home Efficiency Rebates](#) program provides instant rebates to homeowners and landlords of single- and multi-family homes for performance-based, whole-home energy efficiency and electrification upgrades, without income restrictions.

The [Home Electrification and Appliance Rebates program](#) provides direct rebates of up to 100 percent to help low- and middle-income households purchase and install energy-efficient electric appliances, such as heat pumps, water heaters, and stoves. Huang and colleagues specifically point to the IRA's rebate programs as "a major step forward to help households (especially low-to-middle-income households) to improve energy efficiency at home."

Beyond the direct rebate programs, the IRA allocates \$3 billion for Environmental and Climate Justice Block Grants, which can be used to fund community-led projects in historically underserved communities, including initiatives to reduce energy costs through renewable energy or energy efficiency. Another IRA program provides \$1 billion in funding to increase energy efficiency in affordable housing.

As these new programs are rolled out, it is critically important to ensure that they truly benefit energy insecure households. Policymakers at the metro, state, and federal levels will need to hold landlords accountable to make sure that subsidized energy efficiency and renewable energy improvements don't result in "renovictions," as energy upgrade costs are passed along to renters, making rents unaffordable. Goldstein points to possible solutions, such as allowing tenants (and landlords) to pay for retrofits through

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Energy burden, insecurity measurements of household income spent on energy expenses, and energy limiting behaviors must also be closely monitored to ensure that weatherization, efficiency, and renewable energy projects effectively reduce energy insecurity for vulnerable communities.

Goldstein et al. and Huang et al. both point to the need to expand investment at the federal and state levels to mitigate the impacts *and* drivers of energy poverty. In addition to assistance programs, Huang and colleagues point to the need for general investment in infrastructure and jobs to address the root of inequitable energy burdens and improve everyday living conditions.

Featured research:

Drehobl, A., Ross, L. and Ayala, R., 2020. How high are household energy burdens. *An Assessment of National and Metropolitan Energy Burdens across the US*.

Goldstein, B., Reames, T.G. and Newell, J.P., 2022. Racial inequity in household energy efficiency and carbon emissions in the United States: An emissions paradox. *Energy Research & Social Science*, 84, p.102365.

Huang, L., Nock, D., Cong, S. and Qiu, Y.L., 2023. Inequalities across cooling and heating in households: Energy equity gaps. *Energy Policy*, 182, p.113748.

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“Robbing Peter to Pay Paul”: Economic and Cultural Explanations for How Lower-Income Families Manage Debt

Laura M. Tach, *Cornell University*

Sara Sternberg Greene, *Harvard University*

This article builds upon classic economic perspectives of financial behavior by applying the narrative identity perspective of cultural sociology to explain how lower-income families respond to indebtedness. Drawing on in-depth qualitative interviews with 194 lower-income household heads, we show that debt management strategies are influenced by a desire to promote a financially responsible, self-sufficient social identity. Families are reluctant to ask for assistance when faced with economic hardship because it undermines this identity. Because the need to pay on debts is less acute than the need to pay for regular monthly expenses like rent or groceries, debts receive a lower priority in the monthly budget and families typically juggle their debts in private rather than turning to social networks for assistance. In some cases, however, debts take on special meanings and are handled differently. Respondents prioritize debts when they perceive payment as affirming a self-sufficient or upwardly mobile identity, but they reject and ignore debts they view as unfair or unjust. Because the private coping strategies families employ trap them in costly cycles of indebtedness and hinder future mobility prospects, debt management strategies are consequential for long-term financial well-being. Keywords: financial behavior; debt; economic mobility; economic coping strategies; qualitative methods.

Lower-income families have always faced barriers to economic mobility, but the types of barriers they face have changed with the expansion of credit markets. Historically, disadvantaged households lacked access to credit as a tool for economic mobility or income smoothing, so they had few debts even though experiences of economic hardship were common (Katz 1996; Liebow 1967; Stack 1974). This changed during the 1980s with the deregulation of the credit industry and expansion of credit markets. Although offering unprecedented opportunities to use credit to promote economic stability and mobility, consumer debt skyrocketed as a result of these changes (Bird, Hagstrom, and Wild 1997; Draut and Silva 2003; Lyons 2003; Weller 2006), contributing to widening wealth inequality and making indebtedness a key source of stratification in contemporary American society (Leicht 2012). In fact, by 2006, the richest 10 percent of Americans held two-thirds of the nation’s wealth, while the bottom fifth had a *negative* net worth (Mishel, Bernstein, and Allegretto 2007).

The expansion of credit markets increased indebtedness across the income distribution, but this has been particularly problematic for lower-income families (Lyons 2003). These families have found it increasingly difficult to pay their debt obligations because their assets and earnings have not grown as they did for wealthier Americans (Mishel, Bernstein, and Shierholz 2009). They have also faced additional economic risks as income volatility rose, medical costs skyrocketed, and the social safety net eroded. As a result, by 2004, almost half of very-low-income families

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(with annual incomes under \$10,000) and over one quarter of low- and moderate-income families (\$10,000 to \$50,000) spent more than 40 percent of their take-home income to pay off debt (Weller 2006). The sources of lower-income families' debts also place them at a disadvantage relative to more affluent families, as they are less likely to have investment debt, such as mortgages, and more likely to have high-interest or unsecured debt, such as credit cards (Aizcorbe, Kennickell, and Moore 2003).¹

Despite the rising prevalence of indebtedness, sociologists have devoted little attention to how households manage this growing source of financial strain. Instead, economic theories have dominated the academic and policy understanding of the debt behaviors of low-income households. Economic models of financial behavior characterize much of the indebtedness of the poor as "irrational," and attribute their financial behaviors to "psychological errors." This work has not studied the social contexts in which debts are accrued or repaid or the meanings individuals attribute to their indebtedness. Sociologists have not devoted substantial empirical attention to these questions either, but perspectives within cultural sociology suggest that the social and financial identities held by lower-income families should influence their behavioral responses to debt.

In the present study, we build on classic economic perspectives of financial behavior by applying the narrative identity perspective of cultural sociology to explain how lower-income families respond to indebtedness. Drawing on in-depth qualitative interviews with the household heads of 194 lower-income families (with annual incomes under \$40,000 in 2007), we show that families' debt management strategies are influenced by their desire to promote a financially responsible, self-sufficient social identity. Families are reluctant to ask for assistance when faced with economic hardship because it undermines this identity. The need to pay on debts is often less acute than the need to pay for regular monthly expenses like rent or groceries, so debts receive a lower priority in the monthly budget and families juggle their debts in private rather than turning to social networks for assistance. In some cases, however, debts take on special meanings for respondents and they handle them differently as a result. They prioritize debts when they perceive payment as affirming a self-sufficient and upwardly mobile identity, but they reject and ignore debts that are perceived as unjust or unfair. Thus, the strategies that families use to manage their debts are grounded in cultural narratives of self-sufficiency and responsibility.

Background

Models of Debt Behavior

Economists have dominated the study of individual financial decision making. The traditional *rational actor model* of behavior posits that individuals are "rational, hold coherent, well-informed beliefs, and pursue their goals effectively, with little systematic error and no need for help" (Mullainathan and Shafir 2009:121). Under this model, taking on debt is a rational response to certain life conditions, such as financing future mobility in the form of education or smoothing consumption temporarily following a drop in income. Traditional economic models also assume that money is completely fungible—that all money is equal and interchangeable. Thus, the rational actor model would predict that individuals treat all dollars owed as equivalent and pay off their debts to minimize their total cost; in most cases, this means prioritizing debts with the highest interest rates and balances.

Recent developments in behavioral economics have criticized the rational actor model, drawing on psychological principles to argue that human behavior is not fully rational but context

1. The percent of low-income families with credit cards increased from 20 percent in 1983 to 40 percent in 2001 and the proportion of low-income families with credit card balances more than twice their monthly incomes went from 1 in 30 to 1 in 8 during that period (Draut and Silva 2003).

dependent (Mullainathan and Shafir 2009; Thaler and Sunstein 2008; Tversky and Kahneman 1974). In this view, individuals are strongly influenced by situational factors; they do not perceive and interpret the world around them objectively. Although the recognition of contextual influences is theoretically important, the *behavioral economic model* of debt behavior continues to characterize deviations from rational action in terms of psychological “errors.” For example, behavioral economists have noted that individuals revert to default options even when they are not the optimal choice; they discount future behaviors, placing less value on their status in the future than in the present; and they are loss averse, valuing an object more when it is in their possession than when it is not (Thaler and Sunstein 2008; Tversky and Kahneman 1974). Most recently, behavioral economists have noted that such psychological errors may be more costly for the poor, as they have less financial cushion to shield them in the wake of such errors (Blank and Barr 2009; Mullainathan and Shafir 2009). The behavioral economic perspective has become influential in the policy world, informing policies targeted at improving the savings and spending decision making of the poor (see, for example, Thaler and Sunstein 2008).

Despite its sensitivity to contextual factors, the behavioral economic model has a limited understanding of the *actual social contexts* in which the poor navigate their financial lives. Behavioral economists often manipulate contexts in laboratories or other controlled experimental settings, overlooking the importance of social identities and subjective meanings developed in the real world for explaining behavior. Thus, they cannot explain why individuals respond heterogeneously to the same “objective” situations. Behavioral economists have improperly and unfavorably characterized culture as an explanation for behavior, often using the outdated “culture of poverty” thesis of the 1960s. For example, Sendhil Mullainathan and Eldar Shafir (2009) recently argued that cultural models of behavior “attribute a variety of psychological and attitudinal shortcomings to the poor, presumed to be endemic, that render the views of the poor misguided and ill informed, their behaviors impulsive and lacking, and their choices fallible, that leave them in need of paternalistic guidance” (p. 121).

The field of cultural sociology has made significant advances since the culture of poverty thesis fell out of favor (see Lamont and 2008; Small, Harding, and Lamont 2010 for reviews). It now provides a nuanced set of perspectives to understand how context influences individual perceptions and decisions. Individuals develop an understanding of themselves and their surroundings that can be observed in the personal narratives, or stories, they tell. These narratives, in turn, shape their actions (Ewick and Silbey 2003; Polletta 2006; Somers 1994). This *narrative identity perspective* argues that, when faced with multiple courses of action, people will pursue the path that is most consistent with their personal narratives and self-conceptions, rather than a path that might seem most rational to an outsider (Lamont and Small 2008). In this framework, the narratives one has developed to make sense of one’s life guide one’s actions, rather than rational calculations or cognitive biases. Narratives have been used to understand a diverse array of actions related to social mobility (Abelmann 2003; Portes and Rumbaut 2001; Young 2004), but to our knowledge they have not been used to explain variation in financial behaviors related to debt. For our purposes, the narrative identity perspective predicts that individuals take actions towards their debts that support, rather than undermine, the financial identities they have developed. We can observe these financial self-conceptions through the personal narratives they recount.

Prior Research on Financial Behavior

Despite the advances sociologists have made in theorizing the behaviors of the poor, they largely have overlooked how social identities may affect financial decision making. One notable exception is the work of Viviana Zelizer (1994) who, in an historical analysis of housewives, gang members, and prostitutes (among others), found that people earmark different currencies for particular types of social interactions, and respond with anger to the misuse of monies for the wrong circumstances or within inappropriate social relations. This directly challenges the rational

actor model's assumption that money is fungible. And unlike the behavioral economic model's focus on psychological influences, Zelizer shows that the determination of an appropriate or inappropriate use of money is highly dependent upon the social relations in which the transaction was embedded and the social identities of those involved.

The empirical work of poverty scholars has largely overlooked Zelizer's cultural insights in their studies of the financial behaviors of the poor, particularly those related to debt. Most sociological research on debt has used quantitative data to examine disparities in wealth and debt by race, class, and age (Conley 1999, 2001; Keister 2000a, 2000b, 2004; Keister and Moller 2000; Oliver and Shapiro 1995) or to trace the trajectories of debt and wealth accumulation over the life cycle and its consequences for economic mobility (Lundy 2011; McCloud and Dwyer 2011; Shefrin and Thaler 1988). Although this work has provided important information about the enormous disparities in debts and assets between advantaged and disadvantaged social groups and the structural sources of these disparities, it has not explored the micro-level decision-making processes families use to manage their debts.

In contrast, qualitative work on the economic coping strategies of the poor has largely ignored debt. In their seminal work *Making Ends Meet* (1997), which details the economic coping strategies of low-income single mothers on welfare and in the low-wage labor market, Kathryn Edin and Laura Lein found that current and former welfare recipients generated extra income by working at side jobs and by obtaining assistance from members of their social networks, community groups, and local charities. Other researchers have corroborated these results, finding that low-income families draw on networks, supplemental employment, and nonprofit assistance to mitigate material hardship (Hill and Kauff 2001; Mistry and Lowe 2006; Polit, London, and Martinez 2000). Rashmita Mistry and Edward Lowe (2006) found that families distinguish between spending on "basics," "extras," and "big ticket items," and these types of spending hold different meanings. For example, keeping abreast of monthly bills was associated with feeling "okay," but modest extras and bigger ticket items were associated with feelings of pride and accomplishment. Because of this, mothers were motivated to find ways to not only secure their basic needs but also to be able to afford some modest extra spending, such as eating out or buying something special for their children. In this way, the feelings associated with different expenditures influenced the strategies mothers used to obtain them.

One striking feature of these in-depth accounts of financial behaviors among lower-income families is that debt is virtually absent from them. There are several reasons why this might be the case. First, respondents may not have been asked about debt, so it did not come up in the interviews. If respondents did not initiate the topic of debt when discussing economic coping strategies, perhaps it was because they viewed the process of making ends meet on a monthly basis differently than they viewed their outstanding debts. A second possibility is that populations who have been interviewed about economic coping strategies were typically the most disadvantaged, often current or former welfare recipients. These families may not have qualified for credit cards or they may have received free medical assistance and subsidized housing, resulting in very little debt. If this is the case, the problems of indebtedness may reach higher up the income ladder than the populations traditionally studied in the literature on economic coping strategies. Indebtedness may also have become more common for this population following welfare reform and credit deregulation (Littwin 2008).

Indeed, there is evidence to support this latter explanation. In *The Missing Class* (2007), Katherine Newman and Victor Tan Chen follow nine families they classify as the "near poor;" those who live in households earning incomes between \$20,000 and \$40,000 for a family of four. Newman and Chen note that the families they study are about twice as likely as poor families to have credit cards, and they provide accounts of the toll credit card debt has taken on the families. While their goal was not a detailed analysis of debt coping strategies, they do describe economic coping strategies used by individual families, including reliance on social networks and credit cards (Newman and Chen 2007:67-69). In addition to Newman and Chen's work, Deborah Thorne and Leon Anderson (2006) studied the role of stigma in the decision to file for bankruptcy

among married couples. Research shows that bankruptcy is a debt management strategy utilized primarily by the middle class, not the poor (Warren 2003; Warren and Thorne 2012). These in-depth examinations of the near poor and middle class are an important foundation for the present study, which provides a detailed examination of the range of debt coping strategies utilized by the poor and near poor.

In the present study, we use the narrative identity perspective to explain lower-income families' financial behavior, focusing on how they understand and manage their indebtedness. Using interview data, we first document levels and types of indebtedness and then analyze the sources of financial support families utilized to assist with their debt burdens. We find that respondents aspired to financially responsible, self-sufficient social identities, and were reluctant to rely on formal or informal assistance for their debts. Instead, they developed an extensive set of personal coping strategies to manage their bills in private. Next, we categorize the varied personal debt coping strategies families adopted and examine their motivations for using each strategy. We conclude by discussing the implications of these private debt coping strategies for the reproduction of social inequalities and for asset-building and debt-reduction policies.

Data and Method

We draw our data from in-depth qualitative interviews with the household heads of 194 lower-income families with annual household incomes under \$40,000. Respondents were sampled from two cities—Boston, MA and Champaign-Urbana, IL—as part of a large study of families who received the Earned Income Tax Credit (EITC), a federal tax credit for which families qualify if they have earned income and children. The EITC provides an ideal sampling frame for reaching lower-income families, as the qualifying income limit in 2007 (when our data were collected) was \$37,783 for a family with two or more children. Take-up of the EITC is high among eligible families (over 75 percent), suggesting that this sampling frame covers most lower-income families (Plueger 2009). The two sites were selected to capture variation in urbanicity and cost of living, although our analyses revealed few differences between the two sites regarding indebtedness, so we combine them in our analyses.

We first sampled respondents at random sampling intervals from three types of locations at each site during January to April of 2007—for-profit tax preparation sites, nonprofit tax preparation sites, and Head Start centers—and conducted a short survey with those who filed an Earned Income Credit (EIC) schedule.² We sought a racially and ethnically diverse sample, so we sampled tax preparation sites and Head Start centers based on the racial and ethnic composition of the communities they served. Respondents completed a short survey asking for basic demographic and economic information and contact information for follow-up in-depth interviews.

In the second phase, we selected a stratified random sample of survey respondents for in-depth interviews about six months after they were initially interviewed. The sample was stratified by site (79 in Champaign-Urbana and 115 in Boston), by race/ethnicity (even numbers of white and black households in Champaign-Urbana and even numbers of white, black, and Hispanic households in Boston), and by family structure (within each city and racial/ethnic subgroup, we sampled three single household heads for every one married couple filing their taxes jointly). Response rates for both phases of sampling were over 90 percent.

2. Sampling intervals were randomly scheduled on every day of the week in the morning, afternoon, and evening. We administered the surveys immediately after respondents filed their taxes. We also sampled families at area Head Start centers to help capture some households who did not use a for-profit or nonprofit agency to file, but prepared their taxes themselves. Roughly 70 percent of all EITC claimants file at a for-profit tax center, and the remaining 30 percent turn to family and friends, file themselves, or use the services of a nonprofit organization. Head Start centers were an effective recruitment site because the participating families are also mostly EITC eligible.

At both sites, a team of trained interviewers conducted the interviews with respondents following the initial surveys. All interviews were conducted in person; 90 percent took place in respondents' homes, the rest took place in public locations such as coffee shops, fast food restaurants, parks, or libraries. Interviews averaged 2.5 hours in length, ranging from 1.5 to 4.5 hours. During each interview, we asked both open- and close-ended questions about: income and expenses; financial knowledge and behavior; savings, debts, and assets; economic coping strategies; home and work life; housing and neighborhood; family background; and mobility aspirations. In addition, we collected detailed information about the type and amount of each source of income coming into the household from all family members; each type of expenditure made in the past month and the amount; the type and amount of each asset held; and the type and amount of each debt held including interest rates and balances. After collecting this detailed quantitative information on household budgets, we asked open-ended qualitative questions that elicited narratives about how each debt had been accrued, how respondents prioritized their expenses if they did not have enough income to cover them all, and the coping strategies they used to make ends meet.

All interviews were audio-recorded, transcribed, and coded into both numeric and thematic fields. We analyzed numeric information, such as the detailed accounting of debts, using quantitative techniques. Thematic qualitative data, such as the decision-making processes around debt accumulation and repayment, mobility goals, and the use of government assistance and social support were sorted into broad topical categories, coded inductively, and analyzed by examining patterns among the codes. To preserve confidentiality, all respondents and family members were assigned pseudonyms and potentially identifying details in the narratives presented below have been altered.

Table 1 presents the descriptive characteristics of respondents in our sample. Most of the household heads we interviewed were women. Our sample is evenly divided among blacks, whites, and Latinos, and roughly one-third of the households were married, consistent with our stratified sampling strategy. Households had, on average, about 2.5 children and household heads were on average 34 years old. About one quarter of the sample had a high school degree or less, and over half had completed at least some college, most often community college or a training program at a proprietary institution. The average annual household earnings in our sample was \$24,281 in Boston and \$21,672 in Champaign-Urbana, with an additional \$3,000 to \$4,000 in household income from government cash assistance, such as welfare, social security, and disability payments. Boston respondents had \$7,506, on average, in outstanding debt and Champaign-Urbana respondents had \$11,408. Debt-to-income ratios, a measure of debt burden, were 34 percent on average in Boston and 38 percent in Champaign-Urbana. There were few differences across our two sites, except that Boston had more foreign born respondents and more families residing in subsidized housing, while Champaign-Urbana had more homeowners, whose mortgages made total debt and debt-to-income ratios higher there than in Boston.

Results

Types of Debt

The vast majority of respondents in our sample reported they had debt, but the level and type of indebtedness varied considerably. Only 11 families (5.7 percent) had no outstanding debt. One-fourth of debtors owed less than \$800, while another quarter owed more than \$8,000. Families often had multiple types of debts. Just 14 percent of the sample had exactly one debt. Twenty-six percent of respondents had two kinds of debt, 23 percent had three kinds of debt, and 31 percent of the sample had four or more different types of debt.

Table 1 • Respondent Characteristics

	<i>Full Sample</i>	<i>Boston</i>	<i>Champaign-Urbana</i>
Sex			
Female	.86	.90	.80
Male	.14	.10	.20
Race/ethnicity			
Black	.44	.35	.58
White	.38	.35	.42
Latino	.18	.30	.00
Nativity			
Foreign born	.23	.35	.05
Current relationship status			
Married	.41	.39	.43
Unmarried	.59	.61	.57
Mean # children	2.48	2.46	2.51
Mean age	33.95	34.41	33.29
Housing status			
Homeowner	.14	.10	.20
Nonsubsidized renter	.29	.18	.44
Subsidized renter	.43	.60	.18
Other arrangement	.14	.12	.18
Employment status during past year			
Full time only	.48	.47	.49
Part time only	.32	.36	.26
Full and part time	.20	.17	.25
Educational attainment			
Less than high school	.10	.14	.04
High school/GED	.17	.14	.22
Some college	.33	.35	.30
Associate's degree	.29	.25	.35
Bachelor's degree	.09	.11	.07
Post-bachelor's degree	.03	.01	.07
Mean annual income			
Household earnings (\$)	23,219	24,281	21,672
Household income (earnings + government assistance) (\$)	26,881	27,781	25,570
Received SNAP in past year (%)	40	37	46
Mean debt amount (\$)	9,095	7,506	11,408
Mean debt-to-income ratio (%)	36	34	38
N	194	115	79

Notes: Values are proportions unless otherwise noted. Income values are in 2007 dollars. Annual earnings from jobs or self-employment. Government assistance from welfare, social security, disability, or other cash assistance.

Table 2 shows the percentage of respondents holding different types of debts and the average size of those debts. Credit card debt was the most common, with 60 percent of respondents reporting an average credit card balance of \$4,705. Many respondents were delinquent on utility and phone bills (42 percent), but these balances were comparatively small (\$873 on average). While relatively few respondents owned homes and had mortgage payments (13 percent), many had educational debt from various forms of higher education, ranging from trade and technical schools to community colleges (34 percent) with an average balance of \$8,312. Many respondents had taken out loans for cars (42 percent), owing an average of \$8,471. Medical debt was also common, with 25 percent of our sample owing an average of \$4,854 in medical bills.

Table 2 • Types and Amounts of Debt among Respondents

	<i>N with Debt</i>	<i>Percent with Debt</i>	<i>Mean (dollars)</i>	<i>Median (dollars)</i>	<i>SD (dollars)</i>	<i>Min (dollars)</i>	<i>Max (dollars)</i>
No debt	11	5.7					
Credit card	115	59.6	4,705	1,430	8,795	150	52,000
Car loan	80	41.5	8,741	7,500	7,923	99	30,000
Utilities	80	41.5	873	250	1,234	50	3,500
Education	65	33.7	8,312	4,000	13,324	450	81,000
Medical	49	25.4	4,854	1,250	9,608	80	40,000
Mortgage	25	13.0	196,700	103,500	174,695	2,500	500,000
Bank	23	11.9	1,664	700	2,826	68	8,000
Family/friend	16	8.3	533	500	251	300	800
Back rent	11	5.7	6,970	4,000	7,638	1,500	20,000
Home goods	11	5.7	1,299	1,000	2,312	50	6,000
Other car costs	9	4.7	1,550	1,550	1,061	800	2,300
Nonbank Loans	6	3.1	10,765	9,050	19,490	1,000	40,000
Legal bills	4	2.1	1,000	1,000	601	50	900
Other	15	7.8	9,050	4,000	11,950	600	17,500

Notes: Mean, median, standard deviation, min, and max based on respondents who held that type of debt. Total $N = 194$.

Finally, 12 percent of respondents owed money to banks for personal loans. Smaller numbers of families owed money to family or friends,³ or had other outstanding bills related to rent or legal fees.

Narratives of Self-Sufficiency

Respondents espoused a strong desire to be financially self-reliant despite their fragile financial conditions. Consistent with findings from other studies (e.g., Littwin 2008), they were reluctant to rely on financial support from extended kin or friendship networks, and felt even worse about relying upon government cash assistance. Being able to achieve self-sufficiency was a considerable source of pride, while being forced to turn to network, and especially government, support was often a matter of shame. As Tessa Morales, a white married mother of three told us, her experience on welfare was

terrible. I'll never do it again. It was the worst experience . . . I went and got a job and got off of it [welfare]. Got off and worked ever since . . . It was terrible. I'll never go back to them places again. Never. It's not for me . . . I was so embarrassed . . . I would never go back . . . I swore I would work the rest of my life. I didn't care how I worked or where I worked, I would never go back there again. Never. And I didn't.

Tessa's quote reveals the shame virtually all of our respondents associated with receiving welfare, which motivated a strong drive to be employed and to avoid being dependent. Another respondent, Pedro Rios, a married Hispanic father of four who works as a facilities manager at a local school, echoed this desire to be self-sufficient, the importance of working in order to "be somebody," and the need to model this for his children:

I told [my wife] I don't want my kid supported by welfare . . . at the time I was working and I was making good money. I mean, not good money, enough money to pay my bills, so I don't like to take advantage . . . So I told her, forget about that. I mean, I'm working. I'm making money . . . [So] far I like to stay away from that [welfare] . . . We gotta show the kids in the future that you gotta work hard to be somebody someday . . . I like to progress, I like to work, I like to, you know, get what I get without somebody giving it to me.

3. This includes only those loans where there was an expectation that they be paid back; many more respondents received informal monetary and nonmonetary support from their friends and relatives.

Pedro's desire to "get what I get without somebody giving it to me" is consistent with a large body of research showing that welfare is highly stigmatized in the United States because it is perceived to conflict with American values of self-reliance and the belief that able-bodied individuals should work (DeParle 2004; Ellwood 1988; Gilens 1999; Katz 1993).

Although welfare was by far the most stigmatized form of dependence among respondents in our sample, they also felt uncomfortable relying on their social networks for assistance because it conflicted with their ideals of self-sufficiency. Mack Clark, a white married father of two, told us that "it's depending on other people, that's what it is . . . and I like to depend on myself." Echoing this sentiment, Bryn Gamble, a single mother who works as a receptionist for an insurance company, told us "I'm not lazy. I like my own. I really don't like for people to help me unless I really need it." And Chantelle Woodward, a single mother of two who works as a medical assistant, declared:

I just can't find myself sitting home all the time and not doing nothing and watching the same shows, that's not the lifestyle that I chose to live . . . I'm a role model for my daughters. I don't want them to get into that to where it's okay to just stay home and rely on others and don't work and don't think about responsibilities . . . I'm a role model for them and I want them to know in order to get things in life you have to earn it, you have to go out there and get it. It's not gonna just come to you.

We heard similar sentiments from the vast majority of respondents in our sample, who espoused values of self-reliance and responsibility.

Respondents were reluctant to rely on their social networks for financial support, but they often found themselves in situations where they had to ask for help, given their unpredictable financial circumstances. When we asked about borrowing money from family or friends, one respondent, a black single mother of two who worked as a nursing assistant, gave a response typical of many:

I try not to borrow or I don't—well, I don't like to borrow anyway. I mean that would be the last option that I opt to is asking someone else. That's just me personally. I'd rather wait, or try to wait out, and see if I can find another way to get it.

Similarly, another respondent answered our question by saying, "Yeah, that's when I have to break down and have to ask, if it's *really* like needed wise, I'll have to ask like a sibling or something." When pushed about how many times that has happened, she said "probably twice if anything." Consistent with these quotes, most respondents made it clear to us that they used their networks only as a last resort.

Respondents' descriptions of asking for help revealed that they drew on their network resources only when they were in dire need of basic necessities that had an immediate impact on their well-being. In fact, 75 percent of respondents in our sample had relied on their social networks at some point in the recent past for help with basic necessities including food, shelter, or staple items for their children. In contrast, only 12 percent used network assistance to help with their bills and debts. When they asked for help with bills and debts, it was often because nonpayment would result in an immediate detrimental effect on their well-being, such as keeping a service like heat or electricity from being disconnected after months of nonpayment.

For example, when asked how she had managed being unable to pay a bill in the last six months, LaWanda, a black single mother who works as an emergency medical technician, told us:

How do I manage that? Stress, scream, cry, pray. There have been a few times where maybe—I think the electricity bill or the phone bill, you know, they send me that 72- hour notice they're gonna shut it off and it's like oh, mommy, you got \$20?

This quote reveals LaWanda's preference to deal with her bills in private through stress, screaming, crying, and praying, preferring to wait to ask for help until not paying on a bill would

cause material discomfort for her family. Similarly, when we asked how she prioritized her bills when she couldn't pay all of them, Genice, a single mother of two boys, said:

It depends on what the bill is and how bad it should be paid, so it all depends on how bad it is and how bad it need to be paid. Because like my car note . . . maybe I might ask my dad, "dad can you, I borrow this so I can go back to work and get this [pay]check" and then I will give it [the paycheck] back to him. So, I mean, if it's a desperate need, a cry for help, then yeah. But, other than that, no.

Like most of our respondents, Genice waited until the need was "desperate" or a "cry for help" before she asks for assistance; in this case she needed to pay the outstanding balance on her car insurance so that she could use the car to get to work.

Respondents' narratives revealed that their disdain for government assistance and their reluctance to use social networks for financial assistance was rooted in a desire to maintain a self-sufficient, financially independent identity. This desire was often in conflict with economic reality, however, and respondents were often confronted with situations in which they did not have enough money to make ends meet. They turned to government assistance programs and their social networks for help with immediate and pressing material needs, which were most often related to food, shelter, and necessities for the children. Debts and bills usually received a lower priority because nonpayment would not have immediate repercussions on their material well-being; only when nonpayment threatened material well-being, such as having utilities shut off or not being able to get to work, was it acceptable to ask network members for assistance. As a result, debts were usually dealt with in private even when assistance from networks or nonprofits was available, and families developed an extensive set of personal coping strategies to manage their bills on their own. Their desire to promote a responsible, self-sufficient identity also shaped the coping strategies they adopted towards particular debts.

Debt Coping Strategies

The personal coping strategies families used to manage their bills are described in Table 3. We separate out "assistance" strategies, such as relying on government, nonprofit, and network

Table 3 • Debt Management Strategies

<i>Strategy</i>	<i>Percent of Debts Managed by</i>	<i>Examples</i>
Assistance strategies		
Social networks	11.8	Borrow from family or friends
Nonprofit assistance	4.3	Get assistance from nonprofits
EITC refund	28.9	Use EITC refund to pay
Individualized strategies		
Debt juggling	26.9	Skip a bill or rotate bills Pay off one bill with credit card or take out loan to pay bills Pay less than minimum
Ignore/reject	15.6	Reject responsibility Ignore it Misinformation
Pay on time	21.9	Pay amount due Pay more than the minimum
Employment	9.5	Take on extra shifts or hours Work extra jobs
Go without	5.0	Hold off on purchases Go without certain services

Note: Percentages are based on the 558 instances of current or recent debt identified in our sample. Values add up to more than 100 because some respondents used more than one strategy to manage a particular debt.

Table 4 • Percentage of Families Utilizing Debt Management Strategies, by Family Income

	Under \$16,000	\$16,000-\$26,000	\$26,000-\$40,000
Social networks	14	12	7
Nonprofit assistance	3	6	3
Go without	4	6	5
Ignore/reject	18	18	10
Debt juggling	35	29	21
Employment	12	9	10
Pay on time	13	18	32
Use EITC refund	32	26	31

Note: Values add up to more than 100 because families can use more than one strategy to manage a particular debt.

support, from “individualized” strategies families developed to cope with debt on their own. The three most common of these individualized strategies were: (1) debt juggling, which involved skipping or rotating bill payments each month, (2) paying on time, which involved paying the full amount due or more than the minimum, and (3) ignoring or rejecting a debt, which involved complete nonpayment.

The payment strategy a respondent adopted towards a particular debt was based in part upon his or her financial situation and ability to pay. Table 4 shows the payment strategies used by respondents based on their household income, with our sample divided into equal thirds. Not surprisingly, those with more disposable income were more likely to pay all of their debts on time or to pay more than the minimum. Just 13 percent of the debts held by families with incomes less than \$16,000 were paid on time, compared to 18 percent of the debts among families with incomes between \$16,000 and \$26,000, and 32 percent of the debts among families with incomes over \$26,000.

What is even more striking about Table 4, however, is the great *heterogeneity* of debt management strategies employed by families of similar economic standing. There is more variation within income groups than across them, suggesting that the ability to pay is not the only factor driving decisions about how to manage one’s debts. In addition, we found that the *same family* often used different debt management strategies to handle different debts, ignoring some while juggling others, for example. In fact, only 16 percent of families in our sample used one debt management strategy consistently for all their debts. Twenty-seven percent of respondents used two strategies, 26 percent used three, and 28 percent used four or more strategies to handle various debts.

Table 5 summarizes the various combinations of management strategies employed by families in our sample. Of respondents who used each management strategy, it shows the percentage that also used each of the other strategies. This table highlights the vast heterogeneity in approaches

Table 5 • Combinations of Debt Management Strategies Utilized by Respondents

Of Respondents Who Used	Percent Who also Used					
	Networks	Nonprofits	Ignore/Reject	Juggling	Pay on Time	EITC Refund
Networks	—	12	35	47	32	60
Nonprofits	32	—	55	45	41	55
Ignore/reject	32	18	—	55	26	54
Juggling	28	10	36	—	48	69
Pay on time	22	10	20	55	—	53
EITC refund	34	11	33	67	44	—

used by respondents in our sample, and they often utilized strategies that were quite inconsistent with one another. Note, for example, that 36 percent of respondents who juggled one or more of their bills also ignored at least one of their bills. And of respondents who paid consistently on one bill, 20 percent ignored another bill.

To understand the sources of this heterogeneity in approaches to debt management, we examined the narratives and rationales within respondents' qualitative accounts of their debts and debt payment strategies. We found that the coping strategies families used were not only a function of their ability to pay or the result of a rational calculation of how to reduce their debt burden most efficiently; rather, debt management strategies were adopted based on larger narrative identities through which families understood their debts. Most debts were understood within a narrative of making ends meet, in which debt payments were a portion of the many bills that must be paid each month. These debts were juggled on a rotating basis that prevented them from going into collections but also prevented families from making much progress in paying them off. In contrast, debts that symbolized perceived injustices were often ignored or rejected; paying on them would signify acceptance of unfair circumstances and acknowledging mistakes, while ignoring them allowed respondents to mentally absolve responsibility and preserve their identities as financially responsible individuals. Finally, debts that were understood as part of a journey towards a desired identity or social mobility goal were paid most consistently, sometimes even at the expense of other material necessities, because payment resonated with respondents' positive aspirational identities.

The Making Ends Meet Narrative: Juggling Debts. When income was inadequate, the most common individual approach to paying outstanding debts was to juggle them, a practice one respondent aptly described as "robbing Peter to pay Paul." In fact, 27 percent of our respondents reported juggling at least one debt payment, including paying on one debt in one month and a different debt in another month, paying on one debt for a spurt of time and then stopping for a while, paying just part of the total amount due on each bill. Families who used these strategies were constantly thinking about their debts and making efforts to pay them, but often they were not able to make long-term progress on paying debts off with this approach. Instead, they juggled them to keep them from going into collections or default; they "got by," but did not make progress towards goals or feel anger or resentment towards lenders. Most families who adopted juggling strategies like these viewed their debt payments as part of the delicate balancing act of making ends meet each month. There were often fewer immediate repercussions for not paying one's debts, so they took lower priority than regular monthly expenses like rent or groceries. Every couple months respondents would come up short on cash and would not be able to pay the full monthly installments due on all of their debts. When this happened, they would deploy the debt juggling strategies of partial or rotating payments. When we asked Bryn Gamble, a white single mother who cohabited with her daughter's father, for example, how she paid on her bills, she told us "I'm not giving them any more than they need. As [my mom] used to say, like I have to rob Peter to pay Paul. Like I have to take from one bill to pay another bill."

Coral Nicholson, a widow with a 15-year old son who works as a medical assistant, described how this strategy worked for her: "Right now the regular phone is cut off, power bill is doubled, so it's like I'm paying Paul for Peter, like from week-to-week. I wish I could just have one whole month where I could pay every bill on time in the entire amount. But with me I can't, it's always something, I have to pay on it or make arrangement to pay this date or what have you . . . Like with the phone bill I wait till it gets to the part where you get the disconnection notice and then I'll call." Similarly, Gloria Diaz, a black single mother of two, told us "[I'm] just surviving. I would have to choose . . . like one month I'll pay my bill and I would leave one without paying, next month that's the one I have to pay." Like many respondents, Gwen Bickford, a white single mother of two who was recently laid off from her job as a

receptionist at a tanning salon, told us her priorities were basic necessities; it was pointless to try to pay on other bills with a limited income:

Rent comes before everything and I mean as long as my kids have food and clothes on their back and stuff, you know, I don't—I try not to stress myself out thinkin' of those things [bills] because right now at this point in time like I can't just even prioritize a bill because it's like I really have no income comin' in.

These quotes reveal how families viewed the debts they were juggling—they were part of a balancing act of making ends meet on a tight monthly budget by focusing on basic necessities and putting off bills that have few immediate repercussions. A debt would “jump up” on the list of priorities if it started to affect their material well-being, such as when they were told that their electricity or phone service would be disconnected. As one respondent told us, “I’m always a month behind, but I, you know, I give them what it takes to keep it on . . . It never gets turned off.” Respondents who juggled debts talked about these debts in their narratives of how they “get by,” not in their narratives about goals, aspirations, or economic mobility. They also did not speak about them with anger.

The Injustice Narrative: Ignoring Debt. In some instances, debts took on special meanings and were excluded from the bundle of expenses involved in the narrative of making ends meet. In particular, families ignored or stopped paying on debts that were damaging to their identities as financially responsible individuals, which occurred when they were angry at the circumstances under which the debt had been accrued, how they were treated, or when a debt was too large and overwhelming to handle. This happened to Claire Haynes, who got her first credit card when she was 18, shortly after she gave birth to her first daughter, Hailey. She got the card from a mail advertisement sent to her apartment. She qualified for a \$300 credit limit on the card, but unfortunately Claire never got to use it. She told us

When I got it, [there] was like 40-something dollars available. So you already owe them like \$250 when you first get the card . . . And there was a \$35 late fee, and [an] over the limit fee. If you got a late fee, you immediately went over the limit . . . They give you a \$300 card, but they take out an \$80 annual fee and they take out a one-time [activation] fee. By the time they're done taking all the fees off the card, you only got like \$40 to spend. So then I called them, and I was like . . . I haven't even used the card. I'm like, you know what? I don't even want it. And they were like, well fine, then don't use it. But I didn't know it was still accumulating all this time. I told them I didn't want the card. But [they] never closed it, so it still kept going up. And then finally I called them, and I was like listen. If you don't make the charges stop now, I'm going to sue you because I don't want it. I never knew they had cards like that.

Now 25 years old, Claire still has this credit card that she refuses to pay but it now has an \$840 balance, even though she never charged a penny to it. She was angry enough that she threatened to sue them, but she never actually took action; she simply ignores the debt.

Other respondents voiced similar anger at being “duped” by credit card companies and, like Claire, rejected the debt, or the portion of the debt, they deemed unfair. Corine Samuels, a black single mother who takes care of both her daughter and granddaughter, told us she got a similar \$300 credit card, but

I only got a hundred. [The credit card company] took out all the fees . . . what was it, \$85 annual fee, this fee and that fee and then they only got a \$100, and now you tell me I owe you \$5,000! . . . if I go to court I'm giving [them] back \$300, [they] ain't getting no \$5,000.

Similarly, another respondent told us how he started out with a card with a \$300 limit, but the bill was now over \$600 with interest: “So I didn't spend more than 300, it's just that that's all the interest. They were trying to tell me 600 and something, which I told them that they weren't gonna get, especially since my credit limit was 300 and I never got to 300. So they can take the six and wish for it all they want.”

Some respondents initially tried to pay on these debts, only to become discouraged by the compounding interest rates and late fees that swamped their modest payment attempts. They felt like they couldn't make a dent in the debt even when paying the amount due on their bill each month, as a financially responsible person should do, which ultimately led them to stop paying. For example, Nathan, a bus driver, and his wife, Maryam, who live with their five children in public housing, used to use a credit card for regular grocery shopping, clothes for the kids, and other monthly expenses. One day, Nathan went over the credit limit without realizing it, and according to Nathan, the credit card company charged him \$39 every month that he was over the limit. He kept putting the minimum amount due towards the bill every month, but the balance never went down given the recurring charges and interest. Finally, Nathan said, "I keep paying, but this guy [the card] is never finished. I said forget it; I'm not going to pay it . . ." When we asked him how much the balance was on the card now, he said "I don't know right now, I ignore them." He went on to say "I was willing to pay, but these guys the over limit by \$39, \$39. I kept telling them, cut it off please, please. Nothing. Listen, it's better not to pay." Although he initially tried to pay, Nathan ended up frustrated and finally noncompliant when his efforts at paying the bill seemed to do nothing to reduce the debt.

These respondents are not alone in their frustration. Stories of being "duped" by credit card companies—by hidden fees, late fees, over-limit fees, and astronomical interest rates—were pervasive, and this perceived injustice often translated into reluctance to pay on the debt or outright rejection of it. Although credit cards were the most common types of debt to be ignored, others reported similar experiences with bank overdraft fees, cell phone companies, and even medical bills. In such cases, the perception of deceitful and harassing behaviors from lenders led people to reject the basis of the debt and allowed them to, at least psychologically, absolve themselves of the responsibility of repayment. Sometimes the rejection of the debt occurred swiftly and immediately, as was the case for Claire after she received her first astronomical credit card statement full of fees, but other times the rejection occurred after a longer period of good-faith effort, as was the case for Nathan after he finally discovered that his monthly payments were no match for the hidden interest rates on his credit card. While providing some modicum of dignity and peace of mind, ignoring such debts often had disastrous consequences for respondents' credit ratings and total debt balances, as late fees and nonpayment fees continued to accrue and bills were sent to collections agencies.

The Economic Mobility Narrative: Prioritizing and Paying Consistently. Other debts were understood as special in a positive way, as part of the path towards achieving a positive financial identity or goal, such as owning a home. In these cases, families were motivated to pay off their debts and adopted disciplined budgeting and repayment strategies, even at the expense of basic necessities. Having a concrete economic or residential mobility goal for the future seemed to kick start a pattern of behavior in which families prioritized paying off their debts above almost everything else. Many of the respondents who adopted this approach were following what may be considered economically rational behavior, but in their narratives we discovered that what often moved a family from juggling their debts each month to prioritizing them and paying consistently was the crystallization of a mobility goal or desired social identity, such as becoming a homeowner. The power of this identity was evident in the fact that many families who were in no financial position to purchase a home were motivated to get their finances in order because of this dream, even if it was unlikely to be realized.

This is what happened to Monica Lourdes, a 42-year-old married Puerto Rican mother. After years of living in a cramped three bedroom apartment with her husband, three children, and the husband and child of her eldest daughter, Monica decided that it was time to get her own home so she could finally provide the space for her family that she always wanted. She told her husband "at the end of this year, we should be looking into getting the house." Monica and her husband owe about \$4,000 on three different credit cards, which they had been juggling

for years amongst the other monthly expenses. When we asked her about her plans for debt in the coming year, Monica said

Debt, I'm hoping to eliminate that word. I do want to get the home. I already took a homebuyer's class. I looked into . . . the Credit Smart program [offered through the city], where you take classes and they'll show you how to fix your credit, how to not fall into other traps, like credit cards, again . . . I'm hoping and praying and if everything turns out well by December we should be looking into buying the first home.

To reach this goal, they are no longer juggling debts; they are “paying bills left and right, left and right.” They have been trying to pay off their credit cards, and are cutting back on everything else to make this possible. While their incomes haven't changed, each family member goes to the food pantry once a week to get groceries, they have cut back on providing financial support to their other relatives, stopped buying DVDs, and Monica has tried to quit smoking because she “tallied up” how much it cost her. Monica is even thinking of getting a second job. When describing this she laughed and said, “You can tell I really want this house, right?” Monica's story illustrates many economically rational behaviors, including prioritizing her debts, seeking credit counseling, and possibly working more in order to save for a down payment on a house, but what motivated these changes in her debt management was the crystallization of her goal to become a homeowner.

Alyssa Jackson, a black divorced mother of six, also has her eye on a home in the future. Though she has not been able to cut back as much as Monica's family, she pays more than the minimum each month on her largest debt, a Visa credit card. When we asked her why she paid more than the minimum on that bill Alyssa told us it was “because I want one day to buy me a house, so I want to come up out of debt.” When we asked more about this strategy, she said “I'm trying to pay all my bills off. I'm trying to pull myself up out of debt so I can—I want a house one day. I want to pay for my own house instead of renting somebody else's house. I want to be taking that rent pay [and] putting it towards my house.”

Many families mentioned long-term economic and residential mobility goals as the motivating forces behind steady debt repayment, which often entailed sacrifice in other areas of life. Not all families were ultimately successful at reducing their debts after embarking on this strategy, but they took steps to educate themselves about how to achieve their goal. When they did this, they quickly learned that debt was standing in the way of getting a good mortgage or loan rate, and they had hurt their credit ratings by not paying on credit cards and other loans. To start improving their credit, families made personal payment plans so they could make consistent progress on their debts, started paying down their debts with the highest interest rates, and focused on improving their credit scores. At this point, the debt took on a new meaning. No longer was it part of a package of monthly expenses to deal with each month, it was now a barrier to achieving their goal and paying represented steps towards achieving it. In this way, the crystallization of a mobility goal led families to adopt the economically optimal practices they would need to achieve it. Sometimes it also motivated them to seek out assistance in paying on their debts, most often in the form of homeownership courses offered by local governments or nonprofit organizations. More often than not, however, families worked on paying off these debts with little assistance.

Government and Nonprofit Assistance. Few families in our sample received assistance with their debts or knew of public, private, or nonprofit resources to help them manage their debts. In part, this is because these types of assistance are rare (Thorne and Porter 2007). Nonprofit organizations offer a patchwork of financial literacy courses, but most of our respondents were not aware of such courses. Nor is debt assistance offered as part of participation in other types of government programs, like subsidized housing or food stamps.⁴ Although low-income families have access to

4. One exception to this is low-income homeownership programs, such as the Section 8 Homeownership Program and first time homebuyer courses offered by nonprofit homeownership agencies. Many of these programs offered financial literacy resources for low-income families.

nonprofit aid in the form of heating assistance, food pantries, and free tax preparation services, they do not have similar types of assistance for debt counseling at the institutions they typically turn to for help. Even though these programs pay for expenses that then free up funds to pay on debts, families do not understand the assistance they receive in this way nor did it help to educate them or develop payment strategies. In short, many of the forms of nonprofit and government assistance to which families could reluctantly turn when in need were simply not viable resources when it came to their debts.

There was one major exception to this lack of government assistance: tax time was seen by many as an ideal time to pay off outstanding debts. Most lower-income families qualify for a refundable tax credit in the form of the Earned Income Tax Credit (EITC), sometimes totaling several thousand dollars. This allows one to make a large enough payment to eliminate, or substantially reduce, debt, getting the debt collectors off of their backs, and giving them a “clean slate” again, at least for a while. In fact, 29 percent of the debts held by our respondents were paid on with the tax refund. Because of the sizable amount of the refund checks (on average several thousand dollars), those who did contribute some refund dollars to debt reduced their debt burdens by an average of 50 percent.

Why were respondents reluctant to rely on network assistance or government programs, but willing, and indeed eager, to rely on the EITC? Respondents in our sample did not view the EITC as a form of government assistance, like welfare, but rather as a cash bonus for working. This buttressed, rather than undermined, respondents’ self-conceptions as independent and responsible workers and parents. For example, many respondents discussed “earning” or “deserving” the refund because they “work hard.” Because families know that they receive the refund in part because they work, virtually all see the refund as something that they earned, rather than as a handout from the government. This perception is reinforced by the fact that the credit is lumped together in a single refund check with actual tax refund dollars from over-withholding, and because they claim their refund in tax offices like millions of more affluent families. A more detailed elaboration of how families view the EITC is outside the scope of this article and available elsewhere (Halpern-Meeckin et al. forthcoming; Mendenhall et al. 2012; Romich and Weisner 2000; Sternberg Greene 2013; Sykes et al. 2013); the key finding from this literature is that EITC recipients do not view the EITC as a government handout or form of dependence. This explains why our respondents were eager to claim the refund and used it to pay on their debts.

Discussion

Debt plays a key role in the reproduction of social inequalities (Conley 1999, 2001; Harris, Evans, and Beckett 2010; Keister 2000a, 2004; Oliver and Shapiro 1995; Shapiro 2004). While access to credit provides benefits to lower-income families, failure to repay can have negative consequences for social mobility by reducing job prospects, as many employers check credit reports when making hiring decisions (Bayot 2004), by limiting housing options that require credit checks (Thorne 2007), and by restricting access to banks and lending institutions for new accounts or offering less favorable terms for loans (Caskey 1994; Porter 2008). This traps debtors by preventing them from improving credit scores and by restricting access to consumption-smoothing credit (Squires 2004). Debt also increases material hardship by diverting resources towards its repayment rather than going to current consumption, savings, or asset accumulation.

Although the role of debt in reproducing inequality is clear, the meanings and coping strategies associated with debt were largely unexplored by previous research. We showed that families’ behavioral responses to their debts are related not only to their financial ability to pay, to “rational” cost-benefit calculations, or to psychological “errors,” but also to the varied social identities and personal narratives in which the debts were embedded. We identified three distinct narratives: the making ends meet narrative, the injustice narrative, and the economic mobility narrative.

A common thread through all of these narratives was the strong desire for families to maintain social identities as financially independent, responsible citizens.

These narratives influenced how families went about paying on their debts. Debts embedded within making ends meet narratives were seen as part of the total package of monthly expenses and payment was thus understood as part of the delicate juggling act of securing basic necessities on a limited budget. For debts that were embedded within injustice narratives, paying meant acknowledging failure or acquiescing to unfair circumstances. For example, paying on unanticipated late fees or overdraft fees meant implicitly accepting that they had been ignorant of the terms of the credit arrangement. These debts were most likely to be ignored. In contrast, debts that were seen as part of a journey towards economic mobility were more likely to be paid consistently or used as motivation to seek assistance. Payment provided a feeling of pride and accomplishment because respondents understood it as movement towards that goal or desired identity. While economic standing is clearly associated with the ability to pay on debts, our results suggest that this is a necessary but not a *sufficient* condition for debt repayment. Economic standing did not explain the great heterogeneity in strategies families adopted to manage their debts.

Families did use some of the strategies described in the sociological economic coping literature to help pay off debts—social network, government, and nonprofit agency assistance—but these strategies were significantly less common. Few families sought help from their social networks to help them repay their debts. Even though they did rely on friends and family to help with regular monthly expenses when they were in dire need, they did so at a cost to their personal pride and sense of independence. Thus, respondents only asked their networks for assistance with debts when nonpayment would have an immediate and detrimental effect on their material well-being. Since they were often able to put off paying down their debt, they did not feel the personal cost made it worth asking for help.

The strategies families used to deal with their debts were largely individualistic in focus, involving the rearrangement of existing money. In part, this is due to the fact that there is a comparatively extensive patchwork of governmental and nonprofit programs designed to help families make ends meet for food and shelter, through the provision of welfare and food stamps or through nonprofit energy assistance programs. The primary sources of assistance related to debt—bankruptcy, debt consolidation, credit counseling—were largely unutilized by the lower-income families in our study, consistent with national studies (Warren 2003; Warren and Thorne 2012). We identified one notable exception to this pattern, which was the large role of tax refunds, received through the Earned Income Tax Credit (EITC) and other refundable tax credits, in paying off debt. This is consistent with other research on the EITC, which has found that its primary use is to pay off debt (Mendenhall et al. 2012; Smeeding et al. 2000). The EITC was not viewed as a form of government assistance, but as a reward for working and parenting, so receipt was not damaging to self-worth in the same way as other government cash assistance like welfare.

Our results highlight how the narrative identity of cultural sociology can be used to understand the financial decision making of lower-income populations. We build upon previous work in economics and sociology by documenting how the social identities and personal narratives families developed to understand their financial situations influenced the actions they took towards their debts. Rather than pursuing only the most cost effective approaches to debt repayment, families adopted strategies for paying on their debts that were consistent with their personal narratives and that buttressed their identities as financially responsible and self-sufficient citizens. In addition, the process of narrativizing provided a means for respondents to resist or reinterpret the identities that had been ascribed to them by the creditor institutions. Some respondents used the narrative process as a form of psychological resistance against unjust creditors, while others used it as a form of psychological affirmation that bolstered their motivation to achieve their mobility goals.

Our findings add to the behavioral economic model of financial behavior. Despite its sensitivity to contextual factors, the behavioral economic model has a limited understanding of the

actual social contexts in which the poor navigate their financial lives because it develops and manipulates identities in controlled experimental settings rather than in the real world. Our work adds to this research tradition by describing how adults' desire to promote positive, financially self-sufficient identities influences their perceptions and management of debts; those framed as threatening this identity are most likely to be ignored while those framed as appealing to this identity are most likely to be paid consistently. Behavioral economic researchers could design experiments to test our study results and further understand their implications for program and policy design.

In terms of policy, our results indicate that appealing to positive, self-sufficient identities or offering rewards that further mobility goals could strongly "nudge" behaviors. For example, homeownership programs for low-income families that offer a combination of debt management services and homeownership preparation courses and services would be beneficial since the debt repayment piece of the program would be directly tied to a mobility goal. Additionally, college savings programs could be tied to debt repayment. Creditors may want to rethink some of their harshest tactics for collecting debts, and instead consider innovative programs that promote repayment with an eye towards promoting the mobility goals of those who owe. For example, they could offer incentives for repayment such as directing a small percentage of the amount repaid to college savings accounts. The federal government could offer such a program directly or could offer creditors incentives to create such programs.

A potential critique of our results is that families described the meanings they associated with debts as a post-hoc rationalization justifying their ability or inability to pay. The challenge to this critique is that it cannot explain why the *same respondent* took multiple approaches to managing their debts, such as simultaneously juggling some bills while completely ignoring others (which occurred with 36 percent of our respondents). Likewise, it does not explain why some families *could* pay on an outstanding debt but chose not to. Finally, it does not explain why some families changed their approaches to certain debts over time without concomitant changes in their financial circumstances, such as after deciding they wanted to own a home.

We also acknowledge several limitations of our data. First, our interviews were not longitudinal, so we could not follow families prospectively over time to determine how successful they were at paying off their debts in the long term. Instead, we had to rely on respondents' descriptions of what they were doing currently, what they planned to do, and what they had done in the past to categorize their approaches to debt repayment. Since we rely on families' self-reports, it is possible that families did not tell us about all of their debts, that they over- or underrepresented their total amount of debt, or that they over- or underemphasized some coping strategies they used to address their debt. Our study focuses on the lower part of the income distribution, so we cannot tell whether the circumstances we identified surrounding debt accumulation or the strategies used to repay them would apply to more affluent families. Future research might uncover interesting commonalities or differences across social strata. Additionally, our interviews took place before the recession that began in 2008. The crisis highlighted many of the predatory and exploitative lending practices experienced by families in our study and made it more difficult for families obtain credit, although it did little to ease the debt burdens of lower-income families. Finally, our sample consists of families who received the EITC, which allowed us to target a lower-income sample, but we miss the approximately 25 percent of income-eligible families who do not claim the EITC refund and who may be systematically distinct from those who are eligible and do claim. Additionally, focusing on the EITC-eligible population restricts the age range of our sample to households with children, which means that very old and very young households and childless adults will be underrepresented. It also restricts the sample to those who are employed, who may differ from the lowest-income individuals who have no earned income. If these groups are somehow more or less advantaged than the families who do claim the refund, this could bias the overall distribution of debt management strategies we observed.

Cultural influences on debt behaviors have important implications for economic policy. While many credit card companies employ aggressive, and often misleading, advertising approaches to sign up new users, our results suggest that these debts are the ones respondents were most resistant to paying off if they perceived them as unfair. While these practices are quite lucrative for credit card companies, in some cases they may backfire. Yet families attempted to pay off all kinds of debts when they were motivated by a socioeconomic mobility goal. Once they took steps to achieve that desired goal, they learned that debt stood in the way. The most common example of this was aspirations of homeownership, which motivated families to prioritize their bills and make serious efforts to pay them off, even if it meant sacrificing basic necessities. Based on these findings, financial education and outreach, increased transparency by creditors, and savings and repayment programs that appeal to the positive self-identities and mobility goals of debtors could be successful policy strategies for motivating families to reduce debt and improve savings and spending behavior.

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**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.

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

Benefit Amount	Percent Received		
	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

Screener

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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- 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

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 |
|--|--------|-------|---------------------------------|---------------|
| 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 wood because you were unable to pay for a delivery? | 01 YES | 02 NO | 07 DOES NOT HAVE DELIVERED FUEL | 08 DON'T KNOW |
| | 01 YES | 02 NO | 07 DOES NOT HAVE DELIVERED FUEL | 08 DON'T KNOW |
| | 01 YES | 02 NO | 07 DOES NOT HAVE DELIVERED FUEL | 08 DON'T KNOW |
| | 01 YES | 02 NO | 07 DOES NOT HAVE DELIVERED FUEL | 08 DON'T KNOW |
| | 01 YES | 02 NO | 07 DOES NOT HAVE DELIVERED FUEL | 08 DON'T KNOW |
| 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 |
|--|-----|----|------------|---------|
| C14. Did (STATE SPECIFIC LIHEAP NAME) help you to restore use of your main source of heat? | YES | NO | DON'T KNOW | 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?

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

(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 |
|--|-----|----|------------|---------|
| C17. Did you have to use candles or lanterns because you didn't have lights? | YES | NO | DON'T KNOW | REFUSED |

(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 |
|---|-----|----|------------|---------|
| 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? | YES | NO | DON'T KNOW | REFUSED |

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

Appendix A: Survey Instrument

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

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.



Article

Exploring the Nexus of Energy Burden, Social Capital, and Environmental Quality in Shaping Health in US Counties

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Abstract: The United States spends more on health care than any other OECD country, yet the nation's health is declining. Recent research has identified multiple sources for this decline, including one's position in social and economic structures, environmental quality, and individual and collective social capital. This paper assesses the primary hypotheses that the health effects of household energy burden, social capital and environmental quality on aggregated community health levels remain while controlling for other determinants. The analysis moves beyond prior research by integrating multiple secondary data sources to assess those effects across US counties. Three indicators of public health are analyzed (premature mortality, self-reported health, and life expectancy). The county-level energy burden is measured by the percent of household income spent on housing energy bills for low- and moderate-income households. In addition to energy burden, social capital, environmental quality and other determinants are included in the analysis. The results produced by multivariate regression models support the primary hypotheses, even while a number of control variables also have a significant effect on health. The paper concludes that public health is associated with a complex nexus of factors, including environmental quality and social capital, and that energy burden needs to be among the considerations.

Keywords: energy burden; social capital; environmental quality; public health; social determinants of health



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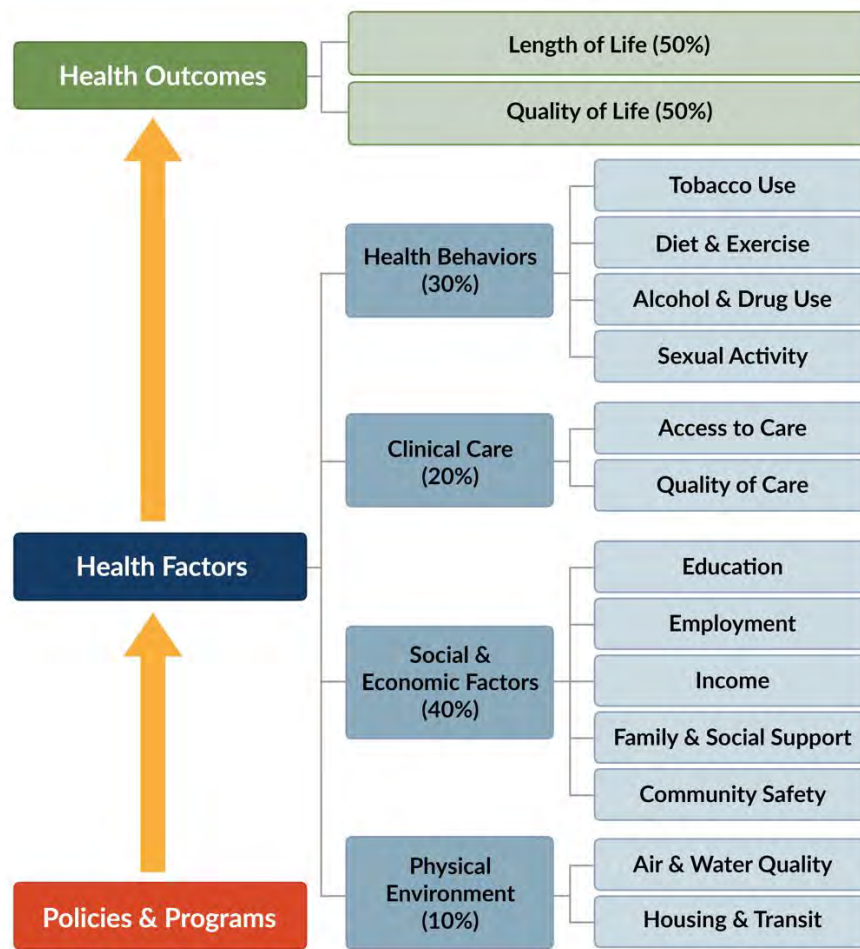
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1. Introduction

The United States spends more on health care than any other OECD country. Despite this spending, many health outcomes are moving in the wrong direction. Life expectancy is declining, and chronic diseases, suicide rates, and other negative health outcomes are increasing [1]. Researchers and practitioners alike acknowledge the multitude of factors that determine health [2–4]. While access to and quality of health care is important, particularly if someone is ill, broader social, economic, and environmental factors also combine in ways to profoundly shape health and well-being across the life course [5,6]. This paper relies upon insights from the Social Determinants of Health (SDoH) framework as a context within which to better understand how a range of structural factors influence public health in US Counties. Figure 1 outlines the contours of this approach to understanding health. In this conceptual framework, health behaviors and clinical care contribute to public health, but notably, social, economic, and environmental factors also are important explanations for health outcomes across populations.



County Health Rankings model © 2014 UWPHI

Figure 1. The conceptual framework outlining the social determinants of population health [7].

County Health Rankings model © 2014 UWPHI

While there has been considerable research conducted in order to better understand the social determinants of health, more work is needed to further identify how multiple, overlapping determinants may shape health. This paper examines the need for different health outcomes in US communities: age-adjusted premature mortality, self-reported health, and life expectancy. Comparing patterns of determinants across these three outcomes helps to identify consistent and critical factors that shape public health. In particular, in addition to standard social determinants, this research examines the impact of energy burden, social capital, and environmental quality on all three health outcomes.

1.1. Energy Burden and Health

Prior research underscores the important relationship between wealth (to which energy burden is linked)—or lack thereof—and health [8–10]. A growing body of research suggests that access to affordable household energy is essential for maintaining good health [11,12]. However, energy poverty (that is, insufficient wealth to provide adequate access to energy) is a distinct challenge that threatens a household's ability to adequately maintain those energy services. The US Energy Information Administration estimates that one in three US households experience some form of energy poverty [13]. Similarly, one in three US households experience some form of energy poverty [13]. Similarly, it also is important to further understand how this particular type of relative resource availability is connected to public health. Energy burden is one measure of energy poverty and a potentially important addition to the determinants of public health [14–17]. Energy burden reflects household expenditure on energy utilities relative to the household's gross income capacity [18]. Disproportionate distributions of energy burden (both positive and

negative) are evident in particular positions in social and economic systems, such as wealth, education, race or ethnic origin.

Recent research has shown that low income households and households of color spend less on energy overall, yet, they spend a higher proportion of income on energy, and they also spend more on energy per square foot of their domicile [19]. Relative to the concern of this paper, families that have trouble paying their energy bills may sacrifice nutrition, medicine, and other necessities in order to avoid shutoff. More than 25 million US households reduce or forgo food or medicine in order to pay energy costs [13]. Additionally, nearly 13 million US households experience leaving their homes at unhealthy temperatures [13]. Living in underheated homes puts adolescents at double the risk of respiratory problems and at five times the risk of mental health problems [20]. Furthermore, “... living in homes that are not properly heated or cooled increases cases of asthma, respiratory problems, heart disease, arthritis, and rheumatism” [13,21–24]. Analyzing how energy burden, as an economic stressor, impacts health is important in that it can inform policy interventions that may improve public health.

1.2. Social Capital and Health

Social capital—the individual and collective resource that emanates from trust and reciprocity-based networks—is one of the most frequently identified sources of variation in public health [25]. Indeed, community social capital is an established and important determinant of health and well-being [25–35]. Social capital has been shown to have broad-based impacts on public health levels even in the context of other forces that effect health, namely economic stress and socio-demographic variables, such as income and education [36]. The networks providing social capital offer mutual support, opportunities for collaboration and an avenue for health-related activities and information that can enhance well-being. Higher levels of social capital are consistently linked to positive health outcomes; this relationship holds hold across a range of health outcomes regardless of how social capital is measured [37–43].

1.3. Environmental Quality and Health

Past research indicates that environmental quality also is linked to health. Decades of research have firmly established that environmental quality is a consistent determinant of health and that environmental quality is a major concern for both public health officials and the general public in the US. [44–46]. An extensive body of research has demonstrated the adverse health outcomes associated with poor environmental quality (in particular, air pollution exposure, specifically PM_{2.5} or particulate matter ≤ 2.5 in aerodynamic diameter) is an important predictor of health levels [47–52]. Epidemiological evidence shows air pollution effects on neuropsychological development and impairment as well as on cognitive deficits and behavioral impairment in children and the elderly [50]. Some populations are at greater risk of mortality from the effects of poor environmental quality. For instance, older individuals with comorbidities such as myocardial infarction or diabetes are at greater risk of death associated with high exposure to PM_{2.5} [47]. The risk of hospital admission and death from cardiovascular causes increase significantly with increased concentrations of PM_{2.5} [48,49,51,52]. Moreover, increasing evidence suggests racial/ethnic minorities and low socioeconomic status populations experience greater exposure to PM_{2.5}, which may contribute to racial/ethnic and socioeconomic disparities in the adverse health outcomes associated with air pollution exposure [53–55].

1.4. SDoH Control Variables

The SDoH conceptual framework suggests that there are several other critical drivers of health over and above the three described earlier [5]. While these other factors are not the main focus of the research reported in this paper, they are nonetheless important to consider. Thus, income inequality, housing quality, food insecurity, educational attainment, and access to health care all have been shown to contribute to health outcomes [2,4,9,56].

In the US there are large and persistent racial disparities in health [57,58]. Discrimination and structural and cultural racism remain a fundamental cause shaping population health [58–60].

1.5. Expectations

Of the three variables of interest, energy burden is the least studied for its relationship with public health, particularly in the US context. In order to fully understand how energy burden connects to health, it is necessary to control for important competing explanations of health. This study moves beyond previous research by placing the effects of energy burden empirically within the context of the SDoH framework, by expanding the empirical setting to more than 2000 counties in the US (not only the larger cities subset most frequently studied), and by considering multiple measures of public health outcomes in US counties. Understanding the impact of energy burden on health outcomes is important. Given the complex nature of health, the critical question remains: does energy burden affect public health outcomes over and above the independent influence of social capital, environmental quality and other social determinants of health?

In order to focus this research, the present study of energy burdens, social capital, environmental quality and public health engages the following hypotheses:

Hypothesis 1 (H1). *Higher levels of energy burden within a county will be associated with poorer health outcomes, even when controlling for social capital, environmental quality, and a range of important social determinants of health.*

Hypothesis 2 (H2). *Higher levels of social capital within a county will be associated with better health outcomes, even when controlling for energy burden, environmental quality, and a range of established social determinants of health.*

Hypothesis 3 (H3). *Poorer environmental quality will be associated with poorer health outcomes within a county, even when controlling for energy burden, social capital, and a range of established social determinants of health.*

2. Materials and Methods

A range of existing county-level secondary data sources are employed here in order to better understand the complex structural determinants of public health. Multiple data sets are merged using County FIPS codes. The present research begins by collecting information on three different health outcomes across all US counties. The analysis relies on the County Health Rankings and Roadmap (CHRR) project for the measures of health and many of the variables noted in the SDoH framework. The CHRR data are augmented with other county-level secondary data sets reporting social capital and energy burden.

2.1. Data and Variables

Table 1 describes the variables used in this analysis. Health is a multifaceted concept not easily captured in a single empirical measure. Therefore, three different measures of health are employed in the models as separate dependent variables: premature mortality; self-reported health; and life expectancy. Premature mortality is a widely used indicator of population health. This is an age-adjusted variable where deaths that occur at younger ages are weighed more in the measure. Thus, premature mortality reports the number of deaths of county residents who are under 75 years. To compare across counties, this information is normalized by population and averaged across three years (2016–2018). In addition to premature mortality, the models used here also consider the percent of residents in a county who report fair or poor health. These data are found in the CHRR project and are drawn from the Center for Disease Control and Prevention's Behavioral Risk Factor Surveillance System. Self-reported health also is a widely employed indicator of health [61–63]. The final dependent variable is life expectancy, also reported in the CHRR

project. This information is drawn from the National Center for Health Statistics and is an age-adjusted measure reporting the average life expectancy in a county. While this research presents a cross-sectional analysis, the variables representing health outcomes are based on data collected between 2016 and 2018 (as noted in Table 1). To strengthen the research design, the data representing the independent variables are based on information collected that predates the health outcomes examined in this research.

Table 1. Description of variables.

Variable	Description
Premature Mortality	This is the age-adjusted measure of premature mortality, the number of deaths among residents in a county who are under the age of 75 per 100,000 population. Reported in County Health Rankings and Roadmap (CHRR) using data from the National Center for Health Statistics from 2016–2018.
Self-Rated Health	The percentage of adults, age adjusted, within a county reporting fair or poor health. This is estimated using representative population health data (the Centers for Disease Control and Prevention’s (CDC’s) Behavioral Risk Factor Surveillance System) collected in 2017.
Life Expectancy	This is an age-adjusted measure that reports the average number of years a person can expect to live. Life expectancy accounts for the number of deaths in a given time period and the number of people at risk of dying during that time period. Reported in CHRR using data from the National Center for Health Statistics from 2016 to 2018.
Energy Burden	The county-level average proportion of income spent on housing energy bills for low- and moderate-income households. This measure is calculated using county-level Low-Income Energy Affordability Data available from the US Department of Energy. This was reported in 2016.
Social Capital	An index score compiled from publicly available sources and updated in 2014 [64]. This is based on a principal component analysis of four county-level variables: (1) the aggregate number of associations per capita including civic association, bowling centers, public golf courses, fitness centers, sports, religious, political, labor, business, and professional organizations per 10,000 people; (2) non-profit organizations without an international focus; (3) voter turnout, and (4) 2000 census response rate.
Environmental Quality	Average level of PM _{2.5} in a county in 2014. Reported in the CHHR using data from the CDC’s Environmental Public Health Tracking Network.
Income Inequality	Using 5-year estimates, this is the ratio of household income at the 80th percentile to the income at the 20th percentile. Reported in CHHR using data from the American Community survey from 2014 to 2018.
Inadequate Housing	The percentage of households within a county that are overcrowded or lack kitchen or plumbing facilities. Reported in CHHR using data from the American Community survey from 2014 to 2018.
Non-Hispanic Black	The percent of non-Hispanic Black or African American residents in a county in 2014. Compiled from Census data and available via the CHRR program.
Healthy Food Access	The percentage of low-income residents who do not live close to a grocery store in 2015. These data are compiled from USDA Food Atlas and available via the CHRR.
Access to Physicians	The ratio of primary care providers to the population in the county (per 100,000 people). These data are compiled by the American Medical Association and available via the CHRR.
Education	The percentage of adults in a county that are age 25–44 with some post-secondary education. Reported in CHHR using data from the American Community survey from 2014–2018.

Most of the independent variables employed here also are drawn from the CHRR project. However, measures of energy burden originate from the US Department of Energy (DOE). The Low-Income Energy Affordability Data (LEAD) Tool, created by the DOE, presents data, maps and graphs for understanding housing and energy characteristics for low- and moderate-income (LMI) households. From the LEAD Tool, the average county-level energy burden variable is calculated for electricity, natural gas, and other fuel expenditures. The energy burden variable is the percentage of income spent on housing energy bills for LMI households, where LMI is defined as households earning between 0 and 80% of the Area Median Income (AMI). Energy burden data from the LEAD Tool have been used to explore the spatial distribution of energy vulnerability across the

US and correlations with mortality rates and various demographic and socioeconomic characteristics at the county level [65].

The social capital measure used here is based on previously published and archived data [64]. This index score is produced by a principal component analysis of four county-level variables: including per capita civic associations, non-profit organizations, voter turnout and census participation. This measure has been widely used and is considered a valid measure of county social capital [66]. The analysis also includes a measure of environmental quality; relying upon the CHRR project, it includes a measure of air quality, specifically the average level of PM_{2.5} in a county in 2014.

Using the SDoH framework as a guide, the analysis includes several control variables, all of which are extracted from the CHRR project. These measures include income inequality – a ratio of household income at the 80th percentile in the county compared to household income at the 20th percentile in the county [57]. Inadequate housing measures the percentage of households in a county that either experience over-crowding or inadequate plumbing. In the US, there are persistent racial disparities in health, therefore the analysis includes a measure of the percent of residents who identify as Non-Hispanic Black [58]. Access to healthy food and access to health care providers are also included as control variables and are found in the CHRR data set. The final control variable is educational attainment in the form of the percentage of adults with some post-secondary education.

These data are merged using County FIPS identifiers to construct a unique secondary data set that can examine the relative influence of energy burden, social capital, and environmental quality while controlling for other important determinants of health. Descriptive statistics are included in Appendix A.

2.2. Methods

This analysis explores how county-level factors shape health outcomes. In the US, counties are embedded within states and thus differences across states are likely to impact health. Therefore, this analysis uses a state fixed effect approach to model premature mortality, self-reported health and life expectancy. Preliminary diagnostics revealed spatial patterning in all three models making ordinary least squares (OLS) regression analysis inappropriate. Global Moran's I coefficient and its statistical significance were computed on model residuals to identify spatial autocorrelation [67]. For all three models, tests revealed a Moran's I, $p < 0.001$, indicating that model variables are in some way spatially clustered. Given such distributions, simple regression models would not account for spatially correlated errors and model results are likely to be biased. Therefore, this analysis uses spatial error regression models to provide the most robust parameter estimates.

The choice of a spatial error models (SEM), as opposed to a spatial lag approach, is based both on statistical and theoretical grounds [68]. SEM assumes that the explanatory variables alone do not account for the spatial autocorrelation. This analysis relies on county level aggregate data and as such, we are not able to account for individual health behaviors that are part of the SDoH conceptual framework. These omitted parameters are likely to have spatially correlated factors, making a SEM suitable.

The SEM takes the following form:

$$y = \alpha + \sum_k \beta_k X_k + \lambda W e + u \quad (1)$$

where y represents one of the three dependent variables (premature mortality, self-reported health or life expectancy), α is the constant, β is the coefficient for the k number of independent variables, λ is the spatial autoregressive coefficient, and W is the spatial weighting matrix, e is the random error term from OLS regression, and u is the spatially independent error term.

As the primary interest of this study is to understand how explanatory variables shape health outcomes, we rely on contiguity-based spatial weights. Contiguity-based spatial weights were estimated in Stata 16 using polygon map files from the US Census Bureau.

3. Results

Tables 2–4 present the results of the three analyses for factors shaping premature mortality, self-reported health, and life expectancy in US counties, respectively. The OLS model results are also presented for reference; the results of the independent variables are nearly the same. The SEM results are discussed hereafter. All three models highlight a consistent—and significant—relationship between energy burden and health. Communities that have more LMI households experiencing higher energy burdens also have poorer health outcomes. As energy burden increases so too do premature mortality rates within a county (Table 2). Across US counties, each unit of increase in LMI energy burden is associated with an average 240 more premature deaths per 100,000 people between 2016 and 2018. Similarly, as the energy burden increases across counties, each unit increase is associated with a seven percent increase in county residents that report experiencing fair or poor health (Table 3). Finally, each unit increase in energy burden is significantly associated with more than a five year decrease in county average life expectancy (Table 4).

Table 2. The results of spatial error models of factors shaping premature mortality in US counties.

Premature Mortality	OLS Model				Spatial Error Model			
	Coefficient	Std Error	95 % CI		Coefficient	Std Error	95 % CI	
Energy Burden	267.58	(25.42) ***	217.73	317.42	239.63	(26.45) ***	187.79	291.48
Social Capital	−3.28	(1.55) *	−6.31	−0.25	−2.10	(1.53)	−5.10	0.90
Environmental Quality	0.30	(1.43)	−2.50	3.11	−0.06	(1.65)	−3.30	3.17
Income Inequality	28.36	(2.36) ***	23.72	33.00	24.37	(2.27) ***	19.92	28.83
Inadequate Housing	99.70	(78.17)	−53.58	252.99	293.91	(77.68) ***	141.65	446.16
Non-Hispanic Black	71.31	(14.91) ***	42.08	100.54	102.38	(16.48) ***	70.08	134.67
Healthy Food Access	172.15	(22.34) ***	128.34	215.96	163.53	(21.54) ***	121.31	205.75
Access to Physicians	−15,557.55	(4773.23) **	−24,916.94	−6198.15	−16,171.95	(4485.64) ***	24,963.65	7380.25
Education	−277.47	(17.33) ***	−311.46	−243.48	−266.10	(16.86) ***	−299.15	−233.04
Constant	423.13	(23.07) ***	377.90	468.35	428.31	(25.85) ***	377.64	478.97
Lambda, λ					0.48	(0.03) ***	0.42	0.54
<i>n</i>	2871				2871			
R ²	0.60							
Adjusted R ²	0.59							
pseudo R ²					0.60			

Standard errors in parentheses; state fixed effects not shown. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. The results of spatial error models of factors shaping self-reported health in US counties.

Self-Reported Health	OLS Model				Spatial Error Model			
	Coefficient	Std Error	95 % CI		Coefficient	Std Error	95 % CI	
Energy Burden	7.65	(0.66) ***	6.27	8.87	7.39	(0.68) ***	6.06	8.73
Social Capital	−0.42	(0.04) ***	−0.54	−0.38	−0.42	(0.04) ***	−0.50	−0.35
Environmental Quality	−0.11	(0.04) **	−0.20	−0.05	−0.05	(0.04)	−0.14	0.03
Income Inequality	1.15	(0.06) ***	1.08	1.32	0.99	(0.06) ***	0.88	1.11
Inadequate Housing	37.03	(2.00) ***	33.72	41.70	34.31	(1.94) ***	30.50	38.11
Non-Hispanic Black	8.57	(0.39) ***	7.74	9.27	9.79	(0.43) ***	8.94	10.64
Healthy Food Access	4.41	(0.52) ***	3.69	5.97	3.55	(0.49) ***	2.59	4.51
Access to Physicians	−117.50	(119.80)	−498.17	−2.05	−133.27	(109.09)	−347.09	80.55
Education	−11.00	(0.43) ***	−11.60	−9.83	−10.25	(0.41) ***	−11.05	−9.45
Constant	19.00	(0.60) ***	17.63	20.00	18.71	(0.69) ***	17.37	20.06
Lambda, λ					0.58	(0.03) ***	0.53	0.64
<i>n</i>	2925				2925			
R ²	0.84							
Adjusted R ²	0.83							
pseudo R ²					0.84			

Standard errors in parentheses; state fixed effects not shown. ** $p < 0.01$, *** $p < 0.001$.

Table 4. The results of spatial error models of factors shaping life expectancy in US counties.

Life Expectancy	OLS Model				Spatial Error Model			
	Coefficient	Std Error	95 % CI		Coefficient	Std Error	95 % CI	
Energy Burden	−6.32	(0.71) ***	−7.72	−4.92	−5.63	(0.75) ***	−7.09	−4.17
Social Capital	0.23	(0.04) ***	0.13	0.31	0.21	(0.04) ***	0.12	0.29
Environmental Quality	−0.16	(0.04) ***	−0.24	−0.08	−0.19	(0.05) ***	−0.29	−0.10
Income Inequality	−0.63	(0.07) ***	−0.76	−0.50	−0.56	(0.06) ***	−0.68	−0.43
Inadequate Housing	4.07	(2.20)	0−0.24	8.40	−0.63	(2.19)	−4.93	3.66
Non-Hispanic Black	−1.23	(0.42) **	−2.06	−0.41	−1.88	(0.46) ***	−2.79	−0.97
Healthy Food Access	−2.58	(0.66) ***	−3.86	−1.29	−2.45	(0.63) ***	−3.68	−1.21
Access to Physicians	133.52	(134.45)	−130.10	397.15	114.98	(126.61)	−133.17	363.14
Education	8.05	(0.49) ***	7.08	9.01	7.87	(0.48) ***	6.94	8.81
Constant	77.47	(0.65) ***	76.19	78.74	77.85	(0.73) ***	76.42	79.28
Lambda, λ					0.48	(0.03) ***	0.42	0.54
<i>n</i>	2859				2859			
R ²	0.54							
Adjusted R ²	0.54							
pseudo R ²					0.55			

Standard errors in parentheses; state fixed effects not shown. ** $p < 0.01$, *** $p < 0.001$

As noted earlier, prior research has established that social capital is an important determinant of health [25,28,29]. The results here are consistent with that past research. Social capital is statistically significant in the models of self-reported health and life expectancy. Higher levels of social capital are systematically related to lower percentages of residents reporting fair or poor health (Table 3). A county with a 10-point higher social capital score relative to another county experiences roughly 4 percent fewer residents reporting fair or poor health. Counties with higher levels of social capital also have significantly higher levels of life expectancy (Table 4). Each 10-point increase in social capital was associated with an increased average life expectancy of 2 years.

The measure of environmental quality (the annual average level of PM_{2.5} in a county in 2014) is significant in only one of the three models, and the result is as expected. Changes in environmental quality are no more or less associated with rates of premature mortality or self-reported health across counties. Higher levels of PM_{2.5} are associated with statistically significant lower rates of life expectancy (Table 4). Each 10-point increase in PM_{2.5} across US counties is associated with a two year decrease in average life expectancy.

Overall, the remaining control variables suggest strong support for the SDoH framework. Income inequality—measured here as the ratio of household income at the 80th percentile to household income at the 20th percentile—is systematically related to poor health outcomes. This is in keeping with previous research findings; growing income inequality is significantly associated with all three measures of health [69–72]. Higher income inequality is linked to higher rates of premature mortality. Similarly, counties where the gap between the 80th and 20th percentile of household income is high also have systematically higher percentages of residents reporting fair or poor health. Finally, higher levels of income inequality within a county are linked to lower levels of life expectancy.

Inadequate housing (measured as the percentage of households that are overcrowded or lack plumbing or kitchen facilities) is significant in predicting increased premature mortality and self-reported poor health. In keeping with the large and growing literature that documents racial health disparities, the results indicate that race matters in shaping health. Counties that have a higher percentage of residents identifying as Non-Hispanic Black also have statistically higher rates of premature mortality, a higher percentage of residents reporting fair or poor health, and lower life expectancy. Similarly, access to healthy food is an important predictor of all three measures of health. Recall that this is the percentage of low-income residents who do not have access to a grocery store. As this percentage increases across counties, there are corresponding increases in rates of

premature mortality, increases in percentages of residents who report fair or poor health and declining rates of life expectancy.

The results also suggest that access to a physician matters, but not for all measures of health. In particular, this control variable is significant in only one of the models, namely premature mortality (Table 2). More per capita access to physicians is associated with lower rates of premature mortality in a county. The final control variable, education, is statistically significant across all three models and the results are consistent with prior research on the link between education and health. Counties that have more educated residents have lower rates of premature mortality, lower percentages of residents reporting fair or poor health, and higher life expectancy.

4. Discussion

Modeling three different measures of health provides an opportunity to compare more fully the relationships between health on the one hand, and energy burden, social capital, and environmental quality on the other hand. A challenge of this study was controlling for multiple determinants of health; nonetheless, strong patterns emerged across all three measures of health. Finding patterns of significance across models explaining different measures of health surely increases confidence in the results. Indeed, most of the variables had similar and expected relationships with health measures across the three models.

A limited number of studies have empirically explored the relationship between energy burden and health in the U.S while controlling for other variables known to have either positive or negative effects on public health. It was anticipated that higher energy burdens would be associated with poorer health outcomes. Across nearly all US counties, the analysis supports this expectation. Moreover, modeling results suggest this is an influential determinant of health across all three models, with only education and race having stronger influences on the health outcomes. Energy poverty is thus an important addition to the broader SDoH framework. High energy burdens for LMI households are particularly detrimental for population health. For instance, in the US, recipient families of the Low-Income Home Energy Assistance Program (LIHEAP) which provides financial assistance with energy bills, report often choosing between paying their energy bill or buying food, a situation commonly referred to as “heat or eat” which poses high health risks of malnutrition for children [73]. Recall also that the US Energy Information Administration also found that more than 25 million households reduce or forgo food or medicine in order to pay their energy bills [13]. If energy burdened households are unable to afford medical treatments, it is to be expected that the communities in which they live would experience increased levels of premature mortality, reduced life expectancy, and higher percentages of the population reporting they are in poorer health. Many state and local governments are beginning to consider the health implications of energy unaffordability and are launching programs that focus on improving energy efficiency and/or access to renewable energy in order to reduce energy consumption, improve housing quality, and reduce energy bills.

Social capital exhibits a significant positive effect on two of the three health measures, even when controlling for the effects of energy burden, environmental quality and other social determinants. Thus, to some degree it may be possible for the trust-based networks to compensate some for the negative health effects of energy burden. If greater energy burden produces an environment that either directly or indirectly is likely to lead to lower public health levels, the collective resource of social capital may produce some counterweight to energy burden’s negative health influence. The trust and reciprocity embedded in social capital’s foundation may be likely to spill over into some reservoir of support. However, it is important to note that social capital—while durable in some settings—is nonetheless dynamic and if depleted or low, is likely to take considerable time to develop. As social capital varies across counties, the resources associated with that capital also vary. A strategy to advance health by investing in social capital is a longer-term investment in community health and well-being.

Surprisingly, after accounting for spatial clustering, environmental quality was statistically associated with only one measure of public health, life expectancy. But measures of air pollution also can introduce complications. In this study, a single, annual average value of PM_{2.5} at the county level is used; as a result, variability in air quality across a county is not well accounted for. Particulates may be directly emitted from a source such as engine exhaust fumes or formed in the atmosphere as a result of chemical reactions such as industrial activity. Therefore, PM_{2.5} tends to be higher in more urban areas with a higher level of traffic. Thus, the association between air pollution and health outcomes may need to be assessed at a smaller spatial scale than the county-level, such as zip code or census tract. However, other studies have found that higher PM_{2.5} exposure was not associated with perceptions of higher concern about pollution-related health risks [74].

To be sure, this study is constrained by its character as an aggregate, observational analysis that does not directly observe the pathways through which energy burdens operate to shape health outcomes. However, other more limited previous observational studies suggest that these pathways are present and provided the foundation for the hypotheses guiding this aggregate level study. The explicit analysis of pathways across large numbers of counties is an area for future study. It is also important to note that this study is confined to a single country, the US. While the nation-wide county-level database used here provides substantial variation in the size and cultures of the energy burden context, at the same time these findings may or may not be replicated in other national contexts. Results in other countries may vary based on different conjunctions of energy burden and health, as well as energy economies that are supported by different patterns of wealth, energy governance, or by energy sources that impinge on public health to a significantly different degree.

5. Conclusions

This study supports the social determinates of health framework and suggests that energy poverty should be included as a central component. To better understand how multiple, overlapping social determinants shape health, this study examined three different health outcomes across the majority of US counties: age-adjusted premature mortality, self-reported health, and life expectancy. In particular, this research examined the impact of energy burden, social capital, and environmental quality and their influence on all three health outcomes.

The research reported here clearly leads to the conclusion that the aggregate cost and availability of energy relative to the wealth capacity of individuals to pay for it has a significant effect on the health of those individuals. Those health effects of energy burden maintain across a range of health measures, from self-assessment to life expectancy to premature mortality. Moreover, those independent effects of energy burden emerge even when controlling for the well-established effects of social capital, environmental quality, and a broader set of social determinants of health. However, it also is clear that identifying the health effects of energy burdens does not erase the health effects of social capital and the social determinants of health more broadly. Thus, this energy burden analysis enhances both the understanding of the complexity of the causes of public health when aggregated at the county level and expands knowledge in a way that should provide new and innovative pathways through which public health can be enhanced, or at least can be protected. The implications of this paper contain a dynamic that may travel beyond the boundaries of health or energy burdens themselves. Additional concerns with energy justice may reside in a location external to energy burdens when those burdens themselves are disproportionately distributed among vulnerable populations, or when the negative health effects of those burdens are likewise inequitably distributed. If so, energy burden mitigation can provide a separate pathway toward the goal of public health equity.

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Appendix A

Table A1. Descriptive Statistics.

	Mean	Std Dev	Min	Max
Premature Mortality	407.05	111.18	127.77	1216.80
Self-Reported Health	17.94	4.65	8.12	40.99
Life Expectancy	77.43	2.92	61.63	104.74
Energy Burden	0.13	0.09	0.02	0.67
Social Capital	−0.05	1.17	−3.18	21.81
Environmental Quality	9.15	1.90	3.00	19.70
Income Inequality	4.52	0.74	2.54	11.97
Inadequate Housing	0.03	0.02	0.00	0.38
Non-Hispanic Black	0.09	0.14	0.00	0.85
Healthy Food Access	0.08	0.06	0.00	0.72
Access to Physicians	0.00	0.00	0.00	0.01
Education	0.58	0.11	0.20	0.90
<i>n</i>	2853			

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Energy burden and mental health: A national study in the United States

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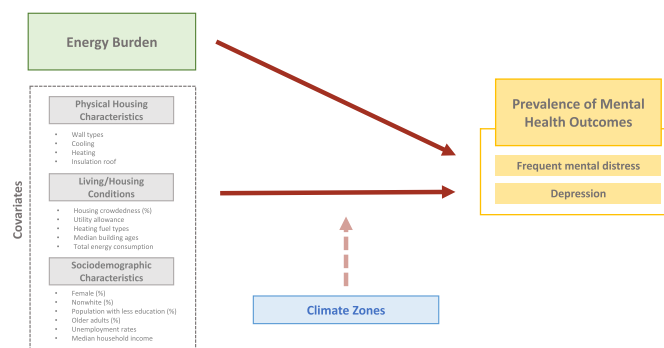
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HIGHLIGHTS

- Our study examines energy burden's impact on mental health in U.S. urban areas.
- Energy burden positively relates to mental distress and depression prevalence.
- Energy burden's link to mental health is significant across all U.S. climate regions.

GRAPHICAL ABSTRACT



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ABSTRACT

The prevalence of mental health issues in the US has significantly risen over the past decade, and it is presumably linked to an energy burden issue that has recently gained attention as a critical social determinant of mental health. Utilizing extensive nationwide datasets at the census tract, we found that the census tract level energy burden is positively associated with two key mental health indicators even after accounting for living, housing, and sociodemographic characteristics: the prevalence of frequent mental distress and physician-diagnosed depression, across all US urban areas. We also observe that these associations are consistent across various climate regions. The findings highlight that energy burden has a detrimental impact on mental health, and that it should be considered a significant social determinant of health in future studies. Lastly, our study advocates for national policies to achieve energy justice and address disparities in mental health.

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0048-9697/© 2024 Elsevier B.V. All rights reserved, including those for text and data mining, AI training, and similar technologies.

1. Introduction

Over the past ten years, there has been a significant increase in the prevalence of mental health illness in the United States, rising 18.1 % in 2010 to 22.8 % in 2019 of adults reporting that they experienced mental health issues within the past year (National Institute of Mental Health, 2023). More notably, individuals with incomes below the poverty line had a significantly higher rate of mental health problems, nearly seven times more compared to those with incomes at or above 400 % of the poverty line (Jitender Sareen et al., 2011). Among social determinants of mental health, the concept of energy burden is beginning to receive great attention as a crucial link to public health (Churchill and Smyth, 2020; Hernández, 2016; Hernández and Siegel, 2019; Lin and Okyere, 2020). Energy burden refers to the inability of a household to afford sufficient energy sources for basic needs such as heating, cooling, cooking, cleaning, lighting, and using electrical appliances, which has become a common problem in US households today (Hernández, 2016; Jessel et al., 2019). Energy Information Administration (EIA) recently reported that approximately 31 % of U.S. households experienced challenges in paying energy bills or maintaining adequate heating or cooling in homes (EIA, 2018). Given that residential energy plays a vital role in sustaining individuals' lives, the uneven distribution of energy burden across different social demographic groups can be a consequential contributor to health inequalities in the United States (Hernández, 2016).

Even though the United States presents a unique context for examining the impact of energy burden on the population's mental health, to date, there is a notable absence of studies that have investigated the relationship between these two phenomena in the United States. Unlike in developing countries, where energy issues are often driven by a lack of modern energy service markets or accessibility of modern energy sources, the energy burden in the US is largely associated with socioeconomic factors and diverse geographic conditions (Li et al., 2022; Lin and Okyere, 2020; Sy and Mokaddem, 2022; Wang et al., 2021; D. Zhang et al., 2019; J. Zhang et al., 2022). For example, while average energy expenditure for US households in 2019 was approximately 3.8 %, US households with incomes equal to or below 200 % of the federal poverty line allocate 8.1 % of their incomes on energy expenses (Drehobl et al., 2020). Similarly, low-income and racially minority households in the United States tend to consume even more energy per square foot compared to affluent and white households. Households with children or black and Hispanic households faced higher odds of receiving a notice or experiencing disconnection from the utility service and bill payment challenges in 2019 and 2020 (Memmott et al., 2021). Those findings suggest that energy burden is not merely a consequence of rising electricity prices but should be considered an underappreciated social determinant of health in the United States (Hernández, 2023). From this perspective, it is crucial to explore whether it is associated with the current significant mental health issue and to what extent it affects the prevalence of mental health outcomes in the United States.

Moreover, the US encompasses a wide range of geographical and climate conditions, from the extreme heat of the Southwest to the cold of the Northern states. This variation results in diverse residential energy needs and potentially corresponding impacts on mental health outcomes (Auffhammer and Mansur, 2014; Maxim and Grubert, 2022). Considering that the prevalence of mental health outcomes is related to climate conditions and needs for residential energy needs, research in the United States provides empirical evidence of the relationship between energy burden and mental health outcomes for policymakers.

Along with the climate regions, to explain the relationship between energy burden and mental health, the current study also considers housing characteristics and living conditions that are well known to be important to mental health outcomes. It has been found that housing characteristics, such as age and construction materials of housing unit or housing density are associated with mental health (Newman, 2001; Singh et al., 2019). However, to our knowledge, no previous empirical

research has taken those factors into account in exploring the relationship between energy burden and mental health across the United States. By considering a range of housing, living and sociodemographic factors that are known to be important to mental health, our study can contribute to the existing literature by providing a more comprehensive understanding of the topic.

To bridge the existing literature gaps, our study ventures beyond prior investigations by comprehensively analyzing all census tracts with low-income families across the United States. Notably, our study incorporates a wide range of established census- and county-level data sources to account for factors related to mental health, such as demographic characteristics as well as living and housing characteristics that have not been examined in the previous study. For this goal, we utilized the 2019 CDC PLACES data in conjunction with American Community Survey and other multiple datasets. Additionally, we stratify the models by climate zones, allowing us to investigate how the relationship between energy burden and mental health outcomes varies across different climate zones. In essence, our study makes a valuable contribution to the existing literature on energy burden by offering the initial evidence on the relationship between energy burden and population mental health nationwide in the United States.

1.1. Existing literature on energy burden and mental health

Although existing studies on energy burden and mental health focused on different geographic regions and population, many of them have found that energy burden has a negative effect on mental health. Along with the backdrop of the global energy crisis, many of existing studies have highlighted energy burden and its impact on health across European countries. A comparative study of 32 European countries found that a higher proportion of energy-poor populations is linked to poorer emotional well-being and a greater likelihood of depression, especially in more egalitarian societies like Sweden and Slovenia (Thomson et al., 2017). Another study involving 27 European countries provided further evidence that individuals unable to afford adequate heating or who had utility bill arrears were more likely to report poor health and depression (Oliveras et al., 2021). The positive relationships observed in the European studies suggest it may have a similar dynamic in the United States.

Recognizing the financial strain associated with energy burden, recent studies have explored the relationship between energy burden and mental health among vulnerable populations, such as pregnant women and older adults. For example, in Australia, the consecutive inability to afford home heating increased the odds of depressive symptoms by 1.95 times (Bentley et al., 2023). Similarly, a study in Ireland focusing on vulnerable populations revealed that energy burden is associated with a 1.64-fold increase in the odds of maternal depression (Mohan, 2021). Another recent study on China found that energy burden exerts cumulative effects on mental health outcomes and cognitive health of older adults in China, as evidenced through self-rated health (Li et al., 2022). Those findings suggest that energy burden may induce financial stress, which could contribute to the deterioration of mental health.

Economic strains, particularly among low-income households, exacerbate mental health risks due to the significant portion of income allocated to energy needs. This financial strain leaves fewer resources for other essential needs, potentially leading to adverse mental health outcomes (Bhattacharya et al., 2003; Burlinson et al., 2022). Research using in-depth interviews illustrated a detailed context for the financial hardship associated with energy costs. According to the qualitative studies from the US and Canada, the study participants reported that they dreaded utility bills coming due and there were usually the fear of utility service disconnection due to late or nonpayment. Participants emphasized that these experiences of anxiety and stress in daily life significantly worsened their mental health (De Haro and Koslowski, 2013; Harrington et al., 2005; Hernández, 2016).

The association between energy burden and mental health can be different depending on the climate conditions. However, to our knowledge, few studies take into account climate regions in studying the impact of energy burden on health. Extreme weather events can cause stress, anxiety and trauma, particularly for vulnerable populations who spend more time at home and low-income families who often face lack of adequate heating or cooling in their homes. Empirical research on indoor temperature and mental health have shown that being cold at home and damp housing increase psychological vulnerabilities and contribute to a variety of mental well-beings such as persistent worry about affordability, anxiety, cold-induced stress, feeling loss of emotional control and depressive symptoms (Liddell and Guiney, 2015; Liddell and Morris, 2010; O'neill et al., 2006; Riva et al., 2023). During the extreme weather conditions, low income families are more likely to experience fuel shortage, energy service interruptions, power outage, which can exacerbate existing health conditions, increase the risks for developing diseases, ultimately impacting their mental health in a long run (Jessel et al., 2019). Although these studies did not specifically examine how varying energy burdens are associated with mental health across different climate regions, they suggest that the impact of energy burden on mental health may vary by region.

2. Materials and methods

First, in this population-based study, we utilized census tract level information to measure the neighborhood. Before introducing the datasets used for the study, it is worth mentioning several reasons why a census tract is an appropriate unit of analysis for understanding the population mental health in relation to energy burden. First, a large body of literature on neighborhood effects on health has suggested that various census tract level characteristics are associated with population-level health outcomes (Arcaya et al., 2016). Second, census tracts are preferred “small area” geographical units for data analytics to represent local socioeconomic conditions, as well as the useful administrative unit used by federal, state, and local governments (Printing Office, U.S. Government, 2019). Thus, results from census tract level analysis can produce meaningful population health policy implications for energy burdened neighborhoods. Third, the census tract is the smallest geographic unit in which data on key measures of this study are available in the United States.

2.1. Data

In this study, for the purpose of developing comprehensive metrics pertaining to health, energy, living, housing, and socio-demographic characteristics, we incorporated data from five distinct datasets, as detailed below.

First, for the health measure this paper used 2019 PLACES: Local Data for Better Health released by Centers for Disease Control and Prevention (CDC). The data provide model-based 29 chronic disease measures at multiple local area-levels (county-, place-, census tract – and ZCTA level) across 500 largest American cities based on the Behavioral Risk Factor Surveillance System (BRFSS). The data include approximately 28,000 census tracts among 500 cities whose population is ranged from approximately 43,000 in Burlington, Vermont, to 8,300,000 in New York City, New York as of 2019 (U.S. Census Bureau, 2023).

Second, for the energy measure, this paper used 2018 Low-Income Energy Affordability (LEAD) data. LEAD, available from U.S. Department of Energy, compile information of housing units, monthly expenditures on housing energy use including electricity, gas, and other fuel and household income at Census tract levels (Ma et al., 2019). The estimates of residential energy use and energy burden are tabulated based on 2018 5-year American Community Survey.

Other energy related data and information of housing conditions were drawn from 2016 to 2020 Picture of Subsidized Housing (PSH) and

2018 End-Use Saving Shapes. PSH, provided by U.S. Department of Housing and Urban Development includes the nearly 5.1 million US households receiving housing assistant programs from the Department of Housing and Urban Development every year and collects the information of the assisted households and their residents' characteristics at the national, state, city, CBSA, and Census tract level. To make the study period consistency, we combined the census tract level data from each of the individual year years (2016, 2017, 2018, 2019 and 2020) and tabulated the 5-year estimate data for our analysis. 2018 End-Use Saving Shapes is used for the study as they profile energy efficiency and electrification of the U.S. residential building stocks. Since the unit of analysis of the data is individual buildings, not a geographic unit, they needed to be summarized at the geographic level for the analysis. By using the address information of each building, we calculated the percentage and counts of geometry wall, cooling system, heating system types, roof insulation status of the residential buildings by every county – smallest geographical unit available in the address information – across the United States.

For socio-demographic measures, this study used 5-Year estimates of 2015–2019 American Community Survey (ACS). The ACS participation is mandatory, and the survey contains broad information on social, economic, and demographic characteristics. The primary advantage of using the ACS 5-year estimates is that the data are available for all geographical units down to the block level group and provide high reliability of the data for less populated areas. For consistency of the unit of analysis, we used census tract level measures of the ACS.

Lastly, to account for climate zones since climate related stressor created by outdoor and indoor temperature is one of possible causes of poor mental health, this paper used International Energy Conservation Code (IECC) (Berry et al., 2010). While IECC originally aims at evaluating energy efficiency of residential and commercial buildings and providing specific requirements for the energy related performance tailored to different climate zones, this study utilized the measure of climate zones from the IECC.

2.2. Measures

2.2.1. Outcome variables

In this study we used two different measures of mental health. The first outcome variable of the study is census tract-level crude prevalence of having frequent mental distress obtained from CDC PLACES data. The measure is based on the percentage of respondents aged 18 years old or older who reported 14 or more days during the past 30 days during which their mental health was *not* good. Another outcome variable we explore is census tract level crude prevalence of physician-diagnosed depression obtained from CDC PLACES data as well. The measure is based on the percentage of respondents aged 18 years old or older who reported that they had been told by a doctor, nurse, or other health professionals that they had a depressive disorder.

The two outcome variables were constructed by CDC using BRFSS data and a Multilevel Regression with Poststratification (MRP) approach to estimate the small area level (here, census tracts) estimates. Both estimates were age-, sex-, race/ethnicity-, county level federal poverty adjusted (Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, n.d.; Greenlund et al., 2022; X. Zhang et al., 2014).

2.2.2. Focal explanatory variable

The focal independent variable of the study is the census-level energy burden that is measured as the averaged percentage of annual energy expenditure out of the energy of annual income.

2.2.3. Covariates

First, we included several census tract-level living and housing conditions in our analysis. We included the average utility allowance among households in dollars per month measured in dollars per month.

This estimate reflects the utilities covered by the upper limit of government subsidies provided to the low-income households to assist with their utility expenses. We also included the percentage of crowded housing and median ages of building. The crowdedness is measured through the share of houses in a census tract that have number of residents exceed the number of bedrooms in a house. For the median age of buildings in a census tract, the median age was calculated by subtracting the median year of construction from 2019. We imputed the original value of 0 for the median year of houses built with 1939, the presumably the oldest possible value that could have been reported in the Census as of the survey year. We also included the percentages of houses using gas, electricity and other fuel types respectively. In addition to the census tract level housing characteristics, due to the availability of data, county level housing characteristics are also included in the study. The housing characteristics used were physical wall type, the percentage of houses equipped cooling, heating systems and the percentage of houses with roof insulation.

Second, we adjust for the census tract level social and demographics. Detailed covariates are as follows: percentage of females in a census tract, percentage of nonwhites in a census tract, percentage of the population who are 65 or over, percentage of the population age 25 and older whose educational attainment is less than high school, the unemployment rate, and the median household income in a census tract. For the percentage of nonwhites, it included non-Hispanic blacks, non-Hispanic Asians, American Indian/Alaskan Native (AIAN), Native Hawaiian and Pacific Islanders, and Hispanics. For all covariates included, we used 0.7 as a threshold to decide the covariates for the model.

Lastly, this study considered climate zones. Climate zones were measured based on International Energy Conservation Code (IECC). The IECC is originally comprised of nine climate zones (extremely hot, very hot, hot, warm, mixed, cool, cold, very cold, and subarctic/arctic) and marine, dry, and moist status of each climate zone and identifies the entire US territory as 19 climate zones. However, due to the sample limitation, we reduce the climate zone categories into five: (very hot and hot, warm, mixed, cool, cold and very cold).

2.3. Statistical analysis

To examine the association between energy burden and the prevalence of health outcomes – having frequent mental distress and depression – we used multilevel random intercept regression models that can allow us to account for the variability at the city level. Since census tracts are nested in a city and shared similar characteristics, meaning that the data have a multilevel structure, we implement a random intercept model, treating the level-1 intercepts vary by cities (Raudenbush and Bryk, 2002). To guide the selection of the appropriate multilevel model and the covariance structure, we calculate ICC and use likelihood-ratio tests. Results suggest that incorporating a random intercept for cities explains the data better in both models for the prevalence of frequent mental distress and depression. Accordingly, our general specification is shown as follow:

$$Y_{ij} = \gamma_{00} + \beta_1 X_{1ij} + \sum_{k \geq 2} \beta_k X_{kij} + u_j + e_{ij},$$

where Y_{ij} is 1) the crude prevalence of frequent mental distress (among adults ≥ 18); 2) the crude prevalence of physician diagnosed depression (among adults ≥ 18) in the i -th census tract in j -th city,

γ_{00} is the average intercept across all census tracts, representing the average value of the outcome variable when all predictors are zero,

$\beta_1 X_{1ij}$ is the effect of high energy burden on the prevalence of chronic kidney disease,

$\sum_{k \geq 2} \beta_k X_{kij}$ is the sum of the effect of the covariates on the prevalence of chronic kidney disease,

u_j is the random intercept associated with j -th city, representing the variability in the prevalence of kidney disease that is attributable to differences between cities and capturing the influence of city-specific

characteristics on the prevalence kidney disease,

e_{ij} is the residual error term for i -th census tract within j -th city.

Furthermore, in order to explain whether the association between energy burden and the prevalence of mental health problems and depression differ by climate zones in the United States, we employ the stratified analysis by conducting the same models by five climate zones based on the IECC climate zone.

3. Results

3.1. Overview of sample characteristics of the study

The sample is restricted to 25,643 census tracts spanning in 481 cities across 46 states and the District of Columbia. It focuses on low-income households and excludes census tracts in New Jersey in terms of 2019 CDC PLACES data, as well as Alaska and Hawaii from the 2018 End-Use Savings Shapes. Descriptive characteristics of the sample, as stratified by climate zones based on the International Energy Conservation Code and the American Society of Heating, Refrigeration, and Air-Conditioning Engineers specification (very hot and hot, warm, mixed, cool, and cold and very cold climate zone), are shown in Table 1.

This study focuses on two mental health outcomes. The first outcome is the average crude prevalence of frequent mental distress which was measured through the percentage of respondents aged 18 years old or older who reported 14 or more days during the past 30 days during which their mental health was *not good* (Cree et al., 2020). The other outcome is the census tract-level crude prevalence of depression that is based on the percentage of respondents aged 18 years old or older who reported that they had been told by a doctor, nurse, or other health professionals that they had a depressive disorder.

As shown in Table 1, the prevalence of frequent mental distress among adults exceeds the national level in both very and hot and cool regions, while it remains comparatively lower in warm and cold and very cold regions. Conversely, the prevalence of depression among adults displays distinct regional patterns. It peaked in cold and very cold regions and mixed climate regions.

In terms of energy burden, U.S. households in urban areas spent approximately 3.024 % of their annual income on energy expenses. Households in census tracts located in very hot, hot, and cool climate regions spent more than the national average, with percentages of 3.142 and 3.566 % while those in warm, very cold, and cold climate regions spent less, with percentages of 2.545 % and 2.717 %, respectively. These findings indicate a regional variation in energy burden, with certain climate conditions necessitating higher energy expenditures.

3.2. Census tract level energy burden and frequent mental distress

We examined an investigation into the direct relationship between energy burden at the census tract level age-adjusted crude prevalence of having frequent mental distress and physician-diagnosed depression, among adults (aged 18 and older), respectively. This inquiry was carried out employing a multilevel random intercept regression analysis. We included energy burden, our primary independent variable, and housing and living characteristics and socio-demographic characteristics as control variables for each mental health outcome. To further elucidate variations in relationship between energy use and mental health outcomes by climate regions in urban areas across United States, we applied a stratification analysis by five climate regions based on International Energy Conservation Code and estimated climate zone specific model.

Fig. 1 illustrates the relationships between energy burden and the prevalence of frequent mental distress at the census tract level in urban areas across the United States. The key findings are that energy burden is positively related to prevalence of mental distress and that the relationships are also statistically significant in each climate region. For all census tracts, for each additional percentage point increase in the proportion of income spent on energy bills, the prevalence of mental

Table 1
Summary of Study Sample.

	All		Very Hot and Hot		Warm		Mixed		Cool		Cold and Very Cold	
	M.	SD	M.	SD	M.	SD	M.	SD	M.	SD	M.	SD
Mental Health Outcomes												
Prevalence of frequent mental distress among adults aged ≥ 18	13.951	3.587	14.210	3.388	13.500	3.471	13.884	3.454	14.630	3.887	12.897	3.418
Prevalence of physician diagnosed Depression among adults aged ≥ 18	19.553	3.442	19.273	2.288	18.468	3.311	20.017	4.148	20.490	3.072	21.819	2.837
Energy Burden												
Annual avg. energy burden	3.024	1.834	3.142	1.534	2.545	1.588	3.125	1.615	3.566	2.353	2.717	1.421
Census Tract Level Housing/Living Characteristics												
Avg. utility Allowance (in dollars)	89.114	74.122	91.690	80.614	81.474	75.144	0.075	0.263	97.658	66.651	87.061	55.745
% Crowdedness	5.284	6.660	4.771	5.079	7.615	8.726	5.024	5.896	2.911	3.466	3.181	3.675
Median age of buildings	51.579	19.937	40.485	16.515	46.353	17.385	5.024	5.896	59.008	19.718	58.651	19.935
% Heating fuel type: gas	36.467	27.149	24.154	21.602	58.053	20.736	59.667	22.838	75.442	17.353	73.891	15.112
% Heating fuel type: electricity	57.558	26.230	73.367	21.237	36.961	21.258	29.790	24.605	19.213	15.177	20.178	12.665
% Heating fuel type: others ¹⁾	4.477	8.239	1.220	1.948	2.232	3.542	9.665	12.378	4.720	8.133	5.135	8.527
County Level Housing Physical/Living Characteristics												
% Wall type = wood frame	71.315	23.653	51.614	21.833	84.089	18.793	67.755	21.609	67.729	22.172	88.869	11.724
% Cooling	99.068	1.607	96.506	1.994	75.645	22.236	85.902	12.334	79.507	8.641	67.537	4.185
% Heating	36.454	16.912	99.356	1.314	98.160	2.251	99.393	0.806	99.749	0.268	99.636	0.353
% Insulated roof	9.092	0.187	31.373	9.117	32.334	10.028	49.199	24.908	33.516	13.522	35.474	9.537
Logged Energy consumption (kwh)	9.092	0.187	9.110	0.087	8.990	0.148	9.008	0.168	9.261	0.125	9.406	0.168
Census Tract Level Demographic Characteristics												
% Population: female	51.117	4.368	50.867	4.396	50.823	4.233	51.747	4.476	51.160	4.400	50.665	4.116
% Population: nonwhites	56.139	28.749	59.462	27.592	62.589	25.646	54.890	30.071	48.673	29.468	37.879	27.922
% Population: 65+	13.745	7.086	14.466	9.304	13.280	6.648	14.165	6.467	13.639	6.528	12.757	6.170
% Population: less than high school	15.042	12.260	15.644	13.070	16.915	13.916	13.806	10.348	13.804	10.726	10.880	9.579
% Unemployed	6.607	5.051	6.154	4.121	6.271	4.238	6.380	4.741	7.827	6.649	5.203	4.090
Median HH income (logged)	10.942	0.522	10.871	0.487	11.051	0.518	10.960	0.519	10.832	0.532	10.871	0.448
Climate Zones												
IECC 1 & 2 (Very Hot and Hot)	0.163		-	-	-	-	-	-	-	-	-	-
IECC 3 (Warm)	0.334		-	-	-	-	-	-	-	-	-	-
IECC 4 (Mixed)	0.230		-	-	-	-	-	-	-	-	-	-
IECC 5 (Cool)	0.237		-	-	-	-	-	-	-	-	-	-
IECC 6 & 7 (Cold and Very Cold)	0.035		-	-	-	-	-	-	-	-	-	-
N	25,643		4191		8570		5909		6068		905	

Note: 1) Others include 2) The sample of the study is restricted to 25,643 census tracts spanning in 481 cities across 46 states and the District of Columbia. New Jersey and Alaska and Hawaii were excluded.

distress increases by 0.473 percentage points at the census tract level, after adjusting for other covariates.

Regarding the relationship between census tract level housing and living characteristics and the prevalence of mental distress, average utility allowance given by the government, percent of crowded housing have a positive relationship with the prevalence of frequent distress. When census tracts have 10 % point high in the share of crowded housing and 10 dollar higher in the average utility allowance that houses received from the government compared to other census tracts, the prevalence of frequent mental distress increased by 0.18 and 0.01 by respectively. However, census tracts with old building tended to have lower prevalence of frequent mental distress (see Supplementary Table 1).

In terms of census tract level demographic characteristics in relation to the frequent mental distress, a higher percentage of female population, a greater proportion of individuals with less than a high school education, and higher unemployment rates within a census tract are positively correlated with increased prevalence of frequent mental distress. Conversely, a higher percentage of nonwhite population and higher median household income are negatively associated with the prevalence of frequent mental distress.

The findings of the multilevel regression analyses, as presented in

Fig. 1 and Supplementary Tables 2 through 6, reveal a significant positive association between higher energy burden within a census tract and the prevalence of frequent mental distress across five climate regions: very hot, hot and warm, mixed, cool and cold, and very cold regions. Specifically, for each additional percent of household income spent on energy bills, the prevalence of frequent mental distress increases by 0.535, 0.534, 0.481, 0.386, and 0.538 respectively across these regions.

These findings suggest that an increased energy burden within a census tract is consistently associated with a higher prevalence of frequent mental health across all US urban areas and across various climate regions. It implies that as household allocate a larger portion of their income to energy expenses, the mental health of individuals in those census tracts tends to deteriorate that may cause to more frequent experiences of mental distress.

3.3. Census tract level energy burden and diagnosed depression

Shifting focus to the prevalence of depression, as shown in Fig. 2, we found that census tract level energy burden is positively associated with the prevalence of physician diagnosed depression in urban areas across the United States and that this relationship are also statistically

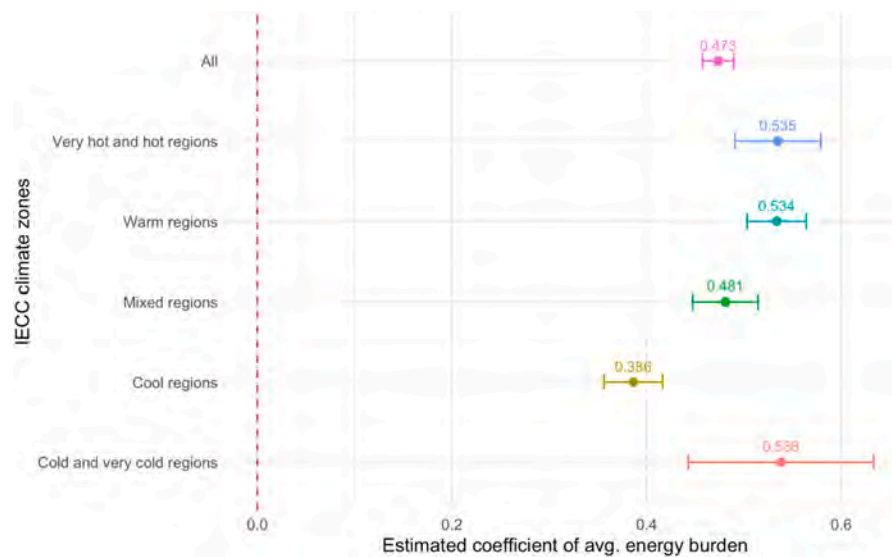


Fig. 1. Estimated coefficient of energy burden on prevalence of frequent mental distress by IECC climate regions.

Note: Points indicates the estimated coefficients and bars represent the 95 % C.I.s, estimated from random intercept regression models for the total sample and stratified by simplified climate zones. The full model estimations are provided in Supplementary Table 1 to 6.

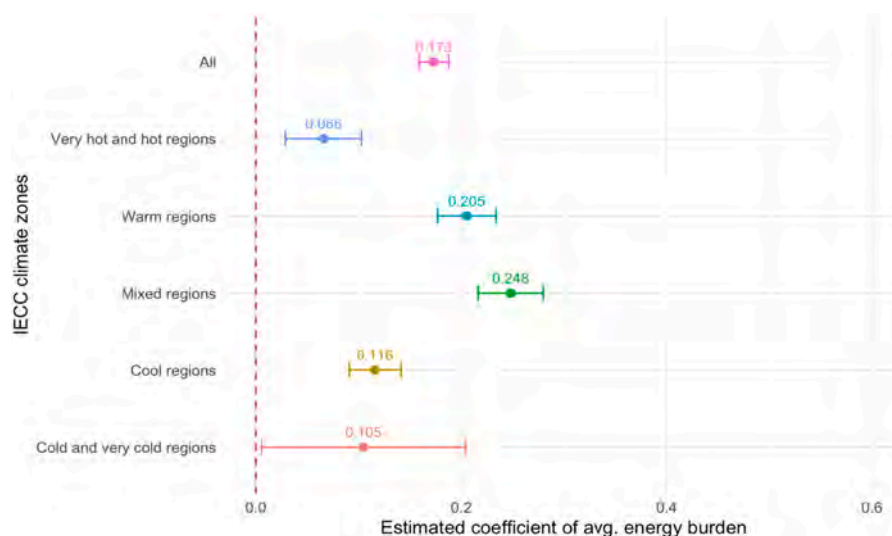


Fig. 2. Estimated coefficient of energy burden on prevalence of depression by IECC climate regions.

Note: Points indicates the estimated coefficients and bars represent the 95 % C.I.s, estimated from random intercept regression models for the total sample and stratified by simplified climate zones. The full model estimations are provided in Supplementary Table 7 to 12.

significant in each climate region. In U.S. urban areas, when households allocate an additional 1 % of their income to energy expenses, the prevalence of depression at the census tract level increases by 0.173 percentage points, after accounting for other variables.

Supplementary Table 7 provides the multilevel regression result underpinning this relationship. When it comes to census tract level housing and living characteristics,

a \$10 increase in the average utility allowance provided by the government is associated with a 0.01 percentage point increase in the prevalence of depression. However, the median age of buildings and the percentage of crowded houses within a census tract are negatively associated with depression prevalence. Unlike the positive relationship between building age and frequent mental distress, depression prevalence tends to decrease with older buildings. A 1 % increase in crowded housing is associated with a 0.012 percentage point decrease in depression prevalence among adults, consistent with the findings for mental distress.

The relationships between sociodemographic characteristics and the prevalence of adult depression are consistent with those observed for frequent mental distress. A higher percentage of females, a greater proportion of the population with less than a high school education, and higher unemployment rates are positively associated with adult depression. In contrast, a lower share of nonwhite individuals and a higher percentage of older adults are negatively associated with the prevalence of depression among adults. Additionally, median household income is negatively associated with the prevalence of adult depression.

Supplementary Tables through 7 to 12 provides the random intercept regression results stratified by each climate region. Controlling for the socio demographic covariates, on average, each additional percentage point of annual energy burden at the census tract is associated with approximately a 0.29 % increase in the prevalence of depression. In the subgroup analysis stratified by IECC regions, a statistically significant positive association between energy burden and the prevalence of depression is observed in all climate zones with the highest association

found in mixed climate zone.

4. Discussion

As the prevalent mental health issues and energy burden phenomena in the United States have recently garnered public concerns in the United States, many previous studies have examined each phenomenon separately. The dearth of such studies leads to questions about the relationship between energy burden and mental health outcomes at a census tract level.

Our study addresses a significant gap in the existing literature by utilizing nationally representative data to examine the relationship between energy burden and mental health outcomes in U.S. urban areas across different climate zones. Using multilevel random intercept models, we found that annual energy burden is a key factor in the prevalence of frequent mental distress and physician-diagnosed depression. Additionally, our study identified that factors such as utility allowance, crowded housing, female population percentage, low education levels, and unemployment have a detrimental impact on the two mental health outcomes, while the percentage of nonwhites, older adults, and median income are negatively associated with these outcomes.

The evidence of the relationship between energy burden and mental health outcomes identified in our study aligns with findings in the existing literature from various regions, including European countries, Canada, Australia, and developing countries such as Ghana and rural China (Bentley et al., 2023; Lin and Okyere, 2020; Oliveras et al., 2021; Riva et al., 2023; Thomson et al., 2017; J. Zhang et al., 2022). Furthermore, our findings emphasize the importance of considering living conditions and physical housing characteristics when examining mental health outcomes. Studies found that building construction materials, living conditions and overall housing quality are critical to indoor thermal comfort, which can significantly influence mental health (Ige et al., 2019; Ormandy and Ezratty, 2012). Living in a cold and damp house and crowded house increase the mental health stressors (Liddell and Guiney, 2015; Mangrio and Zdravkovic, 2018). Old housing is often associated with housing dilapidation, mold and dampness, which can exacerbate residents' well-being and mental health over time.

Our empirical evidence supports that energy justice is interrelated with health justice and that achieving energy justice can be a crucial strategy for addressing health inequalities. As part of the efforts to achieve energy justice in the United States, the US government announced the Federal program titled Justice40 Initiative, directing a significant portion of federal investment to disadvantaged communities that have been disproportionately affected by climate change (Schlosberg and Collins, 2014), energy efficiency (Ghorbany et al., 2024), and infrastructure inequalities (Environmental Justice, n.d.). Given the complex interplay between energy burden, housing conditions, income levels, and mental health, it is essential to adopt a multifaceted policy approach (Bednar and Reames, 2020; Cong et al., 2023; Graff et al., 2022; Wang et al., 2021) This approach should include a combination of various strategies, such as enhancements to housing conditions (e.g., through weatherization programs (Tonn et al., 2018; Zivin and Novan, 2016)), income-based assistance (e.g., rebates (Datta and Gulati, 2014; Sun and Sankar, 2022)), and measures to alleviate energy burden (e.g., bill assistance (Helmke-Long et al., 2022)). The potential enhancement of mental health resulting from these energy programs emphasizes the need to bolster investments in these initiatives. Additionally, tailoring policy strategies to the specific climate zones and conditions of the affected populations is vital to their effectiveness.

This study has three limitations. First, as the data were aggregated by the census tract, translating the findings from an aggregate level data into the individual or household level would introduce potential for an ecological fallacy. This limitation cannot be easily overcome, as there is no nationally representative data available that include mental health, energy burden and housing characteristics together at an

individual or household level, primary due to concerns about individual privacy. Second, due to limited data availability, some physical housing conditions were solely measured at the county level. Interpreting housing conditions measured at the county level should be approached with caution, as inferring census tract-level outcomes from county-level variables could potentially introduce inaccuracies. In future research, it will be important not only to merge data across the same analytic levels but also to consider housing problems such as leaks, mold, plumbing issues, and lead-based issues that may be associated with health outcomes. These factors should be considered to gain a comprehensive understanding of the relationship between housing conditions and health. Lastly, the causality between energy burden and mental health outcomes cannot be inferred from the data used in our study since they are cross-sectional. However, given that there is a dearth of empirical studies on the topic, our findings provided empirical evidence that energy burden and mental health are strongly associated. In future research, it will be important to answer research questions, such as mechanisms through which energy hardship interplaying with housing conditions and residential energy use affects public health in the US.

CRediT authorship contribution statement

Soojin Han: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis. **Ming Hu:** Writing – review & editing, Methodology, Conceptualization, Supervision. **Xue Gao:** Methodology, Writing – review & editing. **Youqin Huang:** Writing – review & editing. **Fei Guo:** Writing – review & editing. **Gordon C. Shen:** Writing – review & editing. **Donggen Wang:** Writing – review & editing. **Shao Lin:** Writing – review & editing. **Kai Zhang:** Supervision, Project administration, Methodology, Conceptualization, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.scitotenv.2024.176796>.

Data availability

The authors will share the link to the data upon request.

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Understanding ‘energy insecurity’ and why it matters to health



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ABSTRACT

Energy insecurity is a multi-dimensional construct that describes the interplay between physical conditions of housing, household energy expenditures and energy-related coping strategies. The present study uses an adapted grounded theory approach based on in-depth interviews with 72 low-income families to advance the concept of energy insecurity. Study results illustrate the layered components of energy insecurity by providing rich and nuanced narratives of the lived experiences of affected households. Defined as an inability to adequately meet basic household energy needs, this paper outlines the key dimensions of energy insecurity-economic, physical and behavioral- and related adverse environmental, health and social consequences. By thoroughly examining this understudied phenomenon, this article serves to raise awareness of an increasingly relevant issue that merits more attention in research and policy.

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“I mean, no bill drives me crazy like my gas bill.” – Erica, mother of two and market rate renter

“My apartment was huge but it was awful too because of the heating system. It was never constant, consistent heat. So that basically was the start of my high gas bill ‘cause I had to keep running that ‘senseless’ heat.”–Nicole, mother of three and housing subsidy recipient

1. Introduction

1.1. Energy as a critical social and public health matter

Erica and Nicole’s experiences are emblematic of a source of hardship that affects an estimated 16 million low-income households in the United States (Power, 2006). For this segment of the population, the struggle to meet basic household energy needs is a common strain that remains hidden in plain sight (Hernández, 2013). The World Health Organization (2006) affirms that “energy is essential to meeting our basic needs: cooking, boiling water, lighting and heating. It is also a prerequisite for good health-a

reality that has been largely ignored by the world community.” The lack of attention to energy-related hardship, particularly in the U.S. context impels a need to further explore this issue in order to better understand its implications at the nexus of place, health and socioeconomic factors.

Energy is an increasingly important social and public health concern. As costs for residential heating, cooling and other household energy needs steadily increase, they account for a higher percentage of household budgets and represent emerging disparities between richer and poorer households (American Coalition for Clean Coal Electricity, 2012). An economic ratio, represented as “low household income/high energy expenditures,” is used to estimate energy burden in the US and fuel poverty in Europe (Residential Energy Consumption Survey, 2012; Power, 2008; Moore, 2012). Both energy burden and fuel poverty ensue when energy expenditures exceed ten percent of a household’s income. Recent data shows that most U.S. households at or near the federal poverty line are significantly burdened by energy costs (Hernández et al., 2014, 2016). However, this economic ratio captures only one dimension of energy-related hardship and otherwise fails to account for additional factors that contribute to energy burden such as housing conditions and energy behavior.

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1.2. Energy insecurity as a needed conceptual framework

One factor that contributes to energy as an ignored hardship is the lack of an appropriate label and related conceptual framing. While the term “energy insecurity” exists in the literature, the phenomenon is not well understood. Existing studies have utilized the term to understand its connection to low socioeconomic status and other social disadvantages, negative health outcomes, and in conjunction with other economic and environmental insecurities. First, socioeconomic status and race/ethnicity are closely linked to the experience of economic energy insecurity. Hernández et al. (2016; 2014) demonstrated that households near or below the federal poverty line were more likely to surpass the ten percent threshold on energy expenditures. The authors also found that African Americans across the economic spectrum experienced economic energy insecurity at the highest rates while Asian and Latino immigrants were the least burdened (Hernández et al., 2014, 2016). Second, energy insecurity has been linked to health and other hardships (Cook et al., 2008; Smith et al., 2007 Frank et al., 2006; Nord and Kantor, 2006). Cook et al. (2008) found that children in moderately and severely energy insecure homes are more prone to food insecurity, hospitalizations, poorer health ratings, and developmental concerns than children in ‘energy secure’ homes. The “heat or eat” dilemma demonstrates the trade-offs that low-income householders make in order to meet the basic necessities of life whereby at-risk groups are forced to decide between food and energy, often sacrificing one for the other (Frank et al., 2006; Nord and Kantor, 2006; Food Research and Action Center, 2005; Bhattacharya et al., 2002). Third, energy insecurity has also been linked to other insecurities such that rising energy costs have also impacted access to clean and safe water (Eichelberger, 2010). Beyond these limited examples, attention to energy insecurity remains scant and research in this area is severely underdeveloped (Hernández, 2013).

This article fills a critical gap in the literature by more comprehensively operationalizing the concept of “energy insecurity.” Energy insecurity is defined here as “an inability to adequately meet basic household energy needs.” Besides offering this definition, the present study advances this concept by highlighting its primary dimensions-economic, physical and behavioral- and exploring the mutually reinforcing nature of this phenomenon. Based on an adapted grounded theory analytical framework, this paper gives meaning to the term *energy insecurity*-by providing real world examples of how energy insecurity is experienced and the different forms it takes in the lives of vulnerable groups.

2. Methods

2.1. Research questions

The key dimensions of energy insecurity emerged using an adapted grounded theory approach in a qualitative study originally conducted to explore broad housing problems among low-income families (Hernández, 2016a; 2016b). The present analysis focused on energy as a unique housing problem and addressed the following research questions: (a) What are the primary dimensions of energy insecurity? (b) How is the experience of energy insecurity related to the larger landscape of material hardship for low-income households? and (c) What are the health and social implications of energy insecurity?

2.2. Sample

A convenience sample of 72 participants was recruited from community health centers in the Boston area. The author

approached families in the waiting areas of pediatric departments and asked willing parties to answer a 10-question screen to determine their eligibility for the study. Eligible participants included those with: a) at least one self-reported housing hardship, ranging from housing affordability, to frequent moves, to hazardous housing conditions, b) an income at or below \$32,000, which equals 150 percent of the 2008 federal poverty level and c) residence in Dorchester, Massachusetts.

A sample consisting of 70 female and 2 male heads of household ranging in age from 18 to 59 were enrolled in the study. Most participants were single mothers (97%), racial/ethnic minorities (47% African American; 29% Latino), native-born (62%), English (72%) or Spanish (25%) speakers, and had a high school education or higher (85%). The median annual income was \$30,000 and the majority received housing subsidies (65%).

2.3. Data collection

Participants underwent a home-based, semi-structured interview to understand their housing and neighborhood environments, the coping strategies that participants used to deal with housing problems, the use of safety net resources, and parental and child health. The housing, energy and health questions included: “Please describe any problems you’ve had with respect to your housing” “What have you done to deal with/fix this problem?” “Now, I’m going to ask you about your housing expenses including the rent and utilities.” “How, if at all, has your housing affected you and/or your children in terms of health?” In addition, respondents were asked to give the interviewer a tour of their home in order to document the housing conditions described in the interview such as drafty windows, faulty thermostats, poor lighting, electrical hazards, outdated appliances and pest infestations. Observations from the walkthroughs were captured in field notes. Interviews were conducted in English and Spanish by the author and in Vietnamese with the assistance of a translator. Interviews were digitally recorded and transcribed; the average duration was 90 min. Respondents were compensated \$25 in cash.

This study was approved by Institutional Review Boards at Cornell University, Boston University Medical Center, and Beth Israel Deaconess Medical Center, and by participating community health centers not affiliated with academic institutions. All study participants provided informed consent. Identifying information has been removed to protect the confidentiality of study participants.

2.4. Data analysis

Interview transcripts and field notes were systematically coded for emergent themes using an adapted grounded theory analytical approach involving a two-phase coding process (Charmaz, 2006). Two coders (the principal investigator and a graduate-level research assistant) reviewed the transcripts and field notes several times in order to become deeply familiar with the data. This process was aided by qualitative data analysis software (Atlas.TI version 6.0), which facilitates the systematic analysis of qualitative data and assists in the process of categorization and coding, developing themes and organizing data segments (Creswell, 2012). Following an inductive analytic approach characteristic of grounded theory, we employed open and axial coding techniques. In the open coding phase small segments of the data were summarized to offer basic descriptions of the text and enable the grouping and categorization of thematically similar codes. These codes included descriptive terms such as “light,” “gas,” “heat,” “bills,” “boiler,” “utilities,” and “shut-offs” and *in vivo* terms (in participant’s own language) such as “NSTAR” and “ABCD,” which respectively

referenced the local utility company and a popular fuel assistance organization. During the axial coding phase, several codes were selected for in-depth analysis on the evolving topic of energy-related hardship. The analysis yielded emergent themes that demonstrate repeated categories of information and the nature of

their associations. The process of analysis linked codes and traced processes that ultimately led to the observed outcomes related to the three dimensions of energy insecurity and related consequences (see Tables 1–4). Collectively the data conveyed a tale of material hardship, inefficient building infrastructure, complex

Table 1

Economic Energy Insecurity- Definition, related codes and exemplary quotes.

Dimension	Related codes	Exemplary quotes
Economic energy insecurity	Poverty, material hardship and tenuous employment	<i>We're definitely not making ends meet between the price of food, the gas is killing us, just the normal day [things] ... It's hard to keep up.</i>
<u>Definition:</u>		<i>At the time I was working part-time and I just couldn't give them anything. I know sooner or later they'd probably be taking me to court for non-payment but it's sad because even then I could never get no help also for my high gas bills.</i>
<i>Financial hardship associated with the cost of energy relative to income and other expenses.</i>		<i>If I had access to a job or a little bit more money it would be so much easier to pay these bills and stuff, you know, 'cause I don't like owing anybody anything.</i>
		<i>I'm playing catch-up with my light bill because like I said, for two years, I wasn't really working. When I moved here my light bill was I think 800, almost 1000 dollars. So shortly after I moved here, I went back to my real job. Then I got laid-off in January but I went back to work in February. It's just playing catch-up</i>
		<i>If I go back to work he says that I will lose the food stamps. We'll lose the fuel assistance, and he feels like we really won't be any better off. So I feel like it's a catch-22.</i>
	Energy-specific financial hardship	<i>I'm having a hard time keeping up with the utilities. It's just really throwing me over the edge financially.</i>
		<i>The only difficulty we have is the lights. Other than that, we make it.</i>
		<i>It's just been high, high, high! And it's like when you pay all the bills, they let you know you're gonna get another light bill ... It's like it's not going anywhere.</i>
		<i>My electric bill has gone way out of whack. I mean, I have a 700 dollar electric bill.</i>
		<i>The bill is at \$7000.00. I told the representative to do a payment plan that is no more than \$60.00, because I honestly can't pay any more than \$60.00 plus the regular bill. It's too much for me.</i>
	Priorities and trade-offs	<i>If I had to choose between paying my rent, paying my utilities, and feeding my children, I'd feed my children and I'd worry about that later. But I do. My rent's always paid. He'll tell you. My rent's right there. Because I figure, at least I've got a roof over their head, you know.</i>
		<i>I have difficulty paying the utilities. Sometimes I have to pay one and then pay the other. I'ma always pay my rent 'cause I'm not trying to be out there on the [street] you know what I'm sayin'.</i>
		<i>It's either pay the electricity bill or do what I gotta do for my kids and to be honest with you I'd rather just turn all this stuff off.</i>
	Seasonal variations	<i>The bills vary by season. For example, summertime gas is slightly lower than electricity and then you know, wintertime gas is much, much higher – extremely higher than electricity. As for summertime, electricity is obviously higher because of air-conditioning. It's so hot and we live on the third floor. It is burning hot. It is extremely hot.</i>
	Billing issues	<i>Sometimes your gas bill you get charged twice on your gas bill. You get charged a gas supply charge and a delivery charge. So that's what gets you.</i>
		<i>They had to give my niece \$2000 back 'cause they overcharged her. She was paying for [her neighbors too].</i>
	Landlord improprieties	<i>I never took any landlords to court though I should've one time because this landlord was using my electricity to clean out his units and ran me a bill for almost \$9000. When I wasn't home, I was at school, he's using my socket from outside.</i>
	Discontinued service due to non-payment	<i>Well the light just came as a new bill for \$120.00. Earlier it was disconnected because the account went up to \$3000.</i>
		<i>I have difficulty paying the utilities, sometimes I have to pay one and then pay the other. They threatened to shut off my gas and I was like, 'Listen, I can't do it. I only get one check.' I can't afford it, you know what I'm sayin'. I got the rent, lights, gas and everything but it's just me ...</i>

Table 2
Physical Energy Insecurity- Definition, related codes and exemplary quotes.

Dimension	Related codes	Exemplary quotes
Physical energy insecurity <u>Definition:</u> Deficiencies in the physical infrastructure of the home environment that impact thermal comfort, induce harmful indoor exposures and increase energy costs.	Poor overall housing quality	<p><i>The disadvantage of having a Section-8 voucher is that these landlords tend to take advantage. In a lot of Section-8 apartments, none of them provide you with heat and hot water. It's always no utilities. It's not the best apartments. I'm quite sure it's not the best heating systems 'cause like I said, I've lived there. I'm a prime example. That's why people have to know their rights as a tenant.</i></p> <p><i>There's no insulation in the house. That's why it's cold, and the heating's always gone so ... The electrical is outdated, and the plumbing.</i></p>
	Faulty building infrastructure	<p><i>If I open this door you feel like you're standing outside. There's no heat in here and there's no heat in the kitchen but it's big, huge, empty house.</i></p> <p><i>Our heater goes down to 60, 61, 62 [degrees] tops all year-round but the walls were never insulated, so the heat goes right out the window.</i></p> <p><i>The thermostat, if you turn it off, the heat will still be on, and that runs up the bill.</i></p> <p><i>I want Boston Gas to come out here so they can look at the boiler for themselves 'cause the first [inspector], when I first got my energy report he told me it looked like I was heating the whole of Boston. Then I get the next [inspector's] report and his report is just as bad as the first man's report. What don't they understand? Don't go after me. Go after the landlord 'cause I can only afford to give you \$200 a month and that's all I can give you</i></p>
	Changes in building energy systems	<p><i>We didn't have to pay for the heat, it was oil based and the landlords paid for it themselves. Then about a year later they changed it, without notice and they didn't even tell us. The bill just came. It was very warm before, now you put that thing on and you'll still feel cold ...</i></p>

coping strategies, and limited options for assistance as illustrated below.

3. Results

3.1. The three dimensions of energy insecurity: economic, physical and behavioral

An understanding of the challenges associated with energy insecurity was shaped by the rich and detailed narratives of participants who described energy as a main source of hardship. Three primary dimensions of energy insecurity emerged: economic, physical and behavioral. The presentation of findings is organized to explain each dimension followed by a discussion of the environmental, health and social consequences of this phenomenon.

3.2. Economic energy insecurity

Economic energy insecurity represents the disproportionate financial burden that high energy costs impose on low-income households. Participants reported a wide range of household energy expenditures, from as low as \$30 a month to, in some cases, as high as \$650 a month at the height of the heating season. On average, participants reported monthly bills between \$100 and \$300 dollars, with considerable variations by season and housing type. To put this economic burden in perspective, according to Massachusetts State guidelines in 2012 a household of four receiving public assistance would net \$691 in cash assistance, a portion of which would need to be allocated to utility expenses ([Community Resources Information](#)). Utilities bills at \$200 per month would represent nearly thirty percent of household income and therefore a significant, and likely unaffordable, expense. This would also render those at the federal poverty line (\$23,050 for a family of four in 2012) as energy insecure using the 10 percent threshold.

The experience of economic energy insecurity is linked to financial hardship and the prioritization of basic needs. Many participants attributed low household incomes to unstable employment, low wages and the “cliff effect” ([Prenovost and Youngblood, 2010; Romich et al., 2007](#)). “Cliff effects” occur when households become ineligible for safety net benefits despite not experiencing full economic self-sufficiency through employment, a circumstance described by one participant as a “catch-22.” Further, in comparison to other household expenses such as housing and food, utilities were often considered less of a priority and were handled with more flexibility because service interruptions take time to ensue and can be avoided. Nevertheless, participants expressed an ethos of responsibly “paying the bills,” except many simply could not afford the monthly utility payments and were often “playing catch up.” This vicious economic cycle borne from a process of prioritization and trade-offs complicates the already fragile financial profiles of low-income ratepayers.

The economic hardships associated with unaffordable utility bills resulted in arrearages often marked by thousands of dollars of debt to utility companies and brought consequences which included limits to energy access as well as restrictions on the ability to change residences. Utility arrearages reflected financial hardship but were also linked to billing issues, landlord improprieties and seasonal variations as well as building-level inefficiencies that increased costs. Shut-off threats and the disruption of utility service were a persistent cause for concern among those behind on their bills, though some families were able to seek shut-off protection by leveraging medical vulnerabilities.

Moving represented a challenge for families with accumulated utilities debt seeking to transfer service accounts to a new residential address. Under these circumstances, some participants elected to put services in the name of other household members including underage householders. As a vivid illustration of this point, Nicole accumulated \$5000 in utilities debt after a year and a half of paying for the “senseless heat” (meaning: inadequate) she

Table 3
Behavioral Energy Insecurity- Definition, related codes and exemplary quotes.

Dimension	Related codes	Exemplary quotes
Behavioral energy insecurity <u>Definition:</u> Behavioral strategies used to cope, improvise and counteract the impacts of economic and structural energy insecurity.	Energy conservation	<p><i>I use my gas wisely, you know. Only time it's on is to cook real quick or hot water for showers ... Right before its time for them to take showers I turn the heat on, and then when they get ready for bed, sometimes I'll turn it down or turn it off 'cause they're underneath the blankets. You just gotta manage how you do it ... If you don't need it you shut it off."</i></p> <p><i>I don't use heat all that much and we manage because the gas is budgeted ... We have been watching what we keep the thermostat at.</i></p> <p><i>During the day we keep off lights. The only thing that's running is the TV ... We also don't burn that much gas. We don't use that much electricity 'cause I know the electricity be sky-high if you leave the lights on and stuff.</i></p>
	Seeking thermal comfort	<p><i>In the wintertime if something happens to the heat by chance, I turn the oven on, which is my electricity. The heat goes through the place like that and then I cut it off. That's what I do.</i></p> <p><i>Some people also came in here and showed me how to save electric ... I pretty much did it myself—the insulation. I put the stuff under the doors and plastic over the windows [to keep the cold out].</i></p>
	Lump sum and partial bill payments	<p><i>I'm praying that I get enough money back from my tax return to pay everyone off so they can leave me alone, don't bother me no more.</i></p> <p><i>So the whole week [during a shut off], all we did was took a bucket like we were having a cookout. You know those buckets that you use to put sodas and stuff. Put some ice in it, it lasted for a week. Eating sandwiches, takeout. My kids said, 'Mommy, when they gonna put the gas back so we cook the fish?' I finally got two checks and turned the lights back on. You gotta sacrifice.</i></p> <p><i>My mother's pays like 50 dollars here, 100 dollars there, whatever she can.</i></p> <p><i>But even if I give them \$100 right now, I can't pay because even if I give them \$80 the bill is \$100, \$120 every month. That's why I give them \$80 'cause I can't pay the whole bill.</i></p>
	Fuel assistance	<p><i>I can go to certain places if I need help to get fuel assistance</i></p> <p><i>After running around trying to get help there but they helped me out finally. I did that ... fuel assistance helped me.</i></p> <p><i>I just started with them last year ... they gave me \$350 for the bill. Then I got a letter from them a couple of weeks ago to fill out and send back [to renew].</i></p> <p><i>I could never get no help for my high gas bills. I would call the local foundations, the Salvation Army, churches and they would always say that they had no money.</i></p>
	Leveraging medical vulnerability	<p><i>They can't turn it off, basically, because my baby has asthma, for one thing. My mother has a bad heart, for another thing. I don't care how high it gets. They can keep on sending us [bills]; we'll pay what we can ...</i></p> <p><i>I had my son's doctor fax a letter to [the utility company] saying they can't turn off my lights because he's on an asthma machine and he needs it. So that's the only reason my lights stayed on.</i></p> <p><i>I have called the electric company. We're protected from our lights getting shut off for now from financial difficulties and because of [my son's] asthma.</i></p>
	Faith, hope and despair	<p><i>That's [a shut off] what was worrying me before, but I'm trusting in God.</i></p> <p><i>My outlook on it is that, I want better for my children. To have better for my children I need better housing.</i></p> <p><i>Inside these neighborhoods ain't no way for us to save no money on no electricity 'cause they come out when they want to come out and it's hard to find people to talk to [for good information]. There's nothing you can do ...</i></p>

referenced in the opening quote. She considered moving, but essentially was stuck until she could pay off the debt as the utility company barred arrearage transfers. Nicole attributed this conundrum to living in subsidized housing. She noted that while mobile voucher program recipients have more housing choices they are

often limited to subpar units where they cannot control the efficiency of the dwelling's appliances and heating/cooling systems and seldom have utilities included in the rent.

Economic energy insecurity thus reflects the financial hardship associated with making ends meet on limited budgets and the

Table 4
Environmental, health and social consequences of energy insecurity.

Consequence	Related codes	Exemplary quotes
Environmental	Hazardous exposures	<i>For three months there was a gas leak and I ended up going to the hospital. ... The smell kept on coming up [but] the [stove] pilot wasn't lit. I had to call the gas company. I said, "Look, you have to come down here. This gas is killing me." ...</i>
	Heat stress	<i>As for summertime, electricity is obviously higher because of air-conditioning. It's so hot and we live on the third floor. It is burning hot. It is extremely hot.</i>
	Cold stress	<i>If I open this door you feel like you're standing outside. There's no heat in here and there's no heat in the kitchen. He [the landlord] says it's a four bedroom but really it's a big, huge, empty house.</i>
Health	Asthma	<i>In the wintertime its more [of a problem] 'cause he [child] gets sick more with asthma.</i>
	Chronic stress	<i>"Stress. It adds stress. It's silly sometimes, but I think like, "Geez. My lights are gonna shut off." Even though I know they won't but even if I'm behind a few days a week I worry. I worry about a lot of things. I do. I mean, I know it won't happen but I worry about it. I do. I worry a lot."</i>
	Mental health trigger	<i>Every time I call I get nowhere, that's why I told my psychiatrist. Then I went into a depression, you know, 'cause I'm trying to show them my bill and everything and don't nobody ever have funds for me. So I told her I feel like I'm being targeted, which I know better, but I was just feeling low, you know ...</i>
Social	Parental fear and stigma	<i>One day I didn't have no money to pay my bill and they was gonna turn off my lights. When they turn off your lights people look at that and I didn't want nobody coming in here and take my children from me because I don't have my lights on.</i>
	Family disruption	<i>My bills started raising up and raising up and I went to the doctor's because they turned off my gas. So, I sent my kids to their aunt's house 'cause I didn't want them in the house since you can't cook or give them a bath or nothing. I didn't want them here. And then I went through my depression thing- it just went down for me.</i>
	Residential instability	<i>From all my apartments I've always had faulty heating systems and I always had to pay my own utilities. That's one of the reasons why we moved so much.</i>

consequences of exorbitant utility bills. The economic challenges are further exacerbated by surplus costs stemming from inefficiencies in the physical environment, reflecting the second dimension of energy insecurity.

3.3. Physical energy insecurity

Physical energy insecurity is defined as deficiencies in the physical infrastructure of the home environment that impact thermal comfort, induce harmful exposures and increase energy costs. Examples of such deficiencies include but are not limited to malfunctioning heating and cooling systems, outdated plumbing and electrical systems, poor lighting, and inefficient appliances. In some instances physical energy insecurity stemmed from the overall poor quality of the housing unit marked by a lack of upgrading in older housing, the use of subpar building materials and inadequate maintenance practices. Facing limited housing options due to lack of affordability, many poor renters and homeowners alike are at increased risk of living in lower-quality housing. Renters are at a significant disadvantage when landlords have little incentive to improve older, less efficient building systems and appliances particularly when the onus of payment falls on the tenants (Bird and Hernández, 2012). In this sample, energy-specific inefficiencies deriving from drafty doors and windows, faulty thermostats and lack of insulation resulted in significant heat loss and thermal discomfort. Further, participants noted that the transition from oil to gas, often a more efficient option, resulted in less comfort and unexpected bills. These conditions not only caused further economic hardship, but contributed to unsafe living conditions. In response to these challenges, study participants often devised a variety of behavioral strategies to manage the physical and economic facets of energy insecurity.

3.4. Behavioral energy insecurity

Behavioral energy insecurity is defined by strategies used to cope, improvise and counteract the impacts of economic and physical energy insecurity. This dimension is marked by both positive and negative behavioral approaches. Positive strategies had environmental and economic benefits and demonstrated resourcefulness; negative strategies presented risks to health, safety and residential stability. Strategies revolved around three inter-related categories: energy conservation and/or thermal

comfort compensation, bill-paying, and shut-off avoidance and compensation.

Participants described a range of energy conservation strategies, some more elaborate than others. Many practiced vigilance in energy consumption using lights, heating equipment and other appliances sparingly so as to minimize costs. Some participants sought thermal comfort by insulating their homes to reduce drafts and addressing other sources of heat loss. However, the inability to regulate temperatures and the consideration of costs led some to sacrifice comfort and jeopardize health and safety. For example, under desperate circumstances, some described using space heaters to compensate for inadequate thermal comfort, and others used the stove or oven as improvisational heating methods.

Bill-paying behaviors described by participants included juggling expenses by paying down utilities debt using funds from annual tax returns when available or making partial payments to keep the services on while simultaneously accruing debt for the unpaid portion. Some enrolled in "balanced billing" to better predict expenses based on a monthly average of the annual energy costs for the home, that is then billed evenly across the year by the utility company. Other participants drew on external resources such as fuel assistance administered through local organizations to help pay bills. Fuel assistance is typically applied directly to the utility bill and renewed annually for those fortunate to qualify and enlist when resources are available. However, several participants described being turned away as federal and state-sponsored fuel assistance resources are often quickly exhausted in high demand areas such as Boston, leaving needy households with few options for relief.

In the event of a shut-off, households sacrificed by drawing on basic survival skills using non-energy sources to store and prepare food until they obtained the needed funds to reinstate the services. Many utility companies offer shutoff protection for eligible households, including those with very young children and elderly inhabitants or those with medical conditions that require household energy, though this stipulation varies by utility company and state-level policy (U.S. Department of Health and Human Services). At the time of data collection, shut-off protection in Massachusetts required a letter from a qualified medical provider and was subject to renewal every 90 days. Many study participants with young children or medical conditions such as asthma, diabetes or mental health disabilities qualified for this renewable protection. However, leveraging medical vulnerabilities proved an insufficient and

unsustainable method of shielding a household from energy insecurity since arrearages mounted and participants were, in essence, trapped when unable to transfer accounts with balances to a new residence.

Participants noted key challenges in receiving helpful information on energy savings and available resources in marginalized communities, feeling that nothing could be done to improve the circumstances. Still others simply hoped for more and had faith that they would overcome the energy hardships they encountered. Ultimately, the persistence of such economic and physical deficiencies posed significant environmental, health and social risks.

3.5. Adverse consequences of energy insecurity

Study participants identified a number of adverse environmental, health and social consequences related to the energy insecurity problem. Whether renters or owners, the economic and physical housing hardships and negative behavioral strategies significantly compromised resident health and environmental quality as well as exacerbated conditions of social disadvantage. Poor housing quality and lack of proper maintenance (i.e. poor insulation, limited ventilation, and malfunctioning heating and cooling systems) often caused harmful environmental exposures including extreme home temperatures, gas leaks and dampness, mold and humidity. Further, the use of stoves for heat was a common strategy for seeking thermal comfort yet doing so induces harmful exposures shown to jeopardize health and safety (Lanphear et al., 2001; Garrett et al., 1998). The lack of comfortable home temperatures also exacerbated asthma symptoms, particularly during winter months.

Economic hardships and poor physical conditions also contributed to chronic stress (Evans and Kantrowitz, 2002; McEwen, 1998). Participants described feeling worried about fuel bills and the deteriorated conditions of their home environments. The experience of energy insecurity also triggered mental health disorders such as anxiety and depression. Several participants mentioned involvement with medical providers for adversity-related mental health treatment or to leverage a medical vulnerability for shut-off protection purposes. The constant threat of service interruptions due to non-payment fueled parental fear and stigma. Parents felt judged by persistent surveillance on the part of child protective services and feared losing parenting privileges to the State with the concern that being unable to “keep the lights on” could be considered a marker of inadequate parenting. Some participants expressed feelings of shame and a disruption of family life when living through a utility service disconnection. Moving represented a way out of the discomfort with some participants moving frequently to escape both faulty heating systems and high bills. However, this coping strategy brings with it negative consequences, as residential instability spurs the loss of social network and institutional ties, which comes at a significant cost in terms of social capital.

4. Strengths, limitations and future directions

This article presents a comprehensive view of a hidden source of hardship–energy insecurity. Although the original purpose of this study was to examine housing problems experienced by low-income householders, the phenomenon of energy insecurity emerged from a rigorous examination of the data using an adapted grounded theory approach. This process uncovered the dimensions of energy insecurity along with its adverse environmental, health and social consequences. Notwithstanding these strengths, the exploratory nature of the research may omit other critical aspects of this phenomenon that did not surface in the analysis. Also, this

study was conducted in the Northeast where cold weather and home heating issues factored prominently into participants' narratives. Warm weather burdens and cooling hardships borne by those in hotter climates should be explored in future research. These results should be used to inform larger epidemiological studies to validate the links between energy insecurity and various health outcomes pertaining to overall health and in particular respiratory and mental health. These findings should also motivate refinement of existing measures of energy insecurity, which to date focus heavily on shut-offs, inability to pay and using alternative heating sources rather than the more comprehensive dimensions of energy insecurity exposed in the present article (U.S. Department of Health and Human Services, Office of the Administration for Children and Families).

5. Discussion

5.1. The energy insecurity pathway to disease and disadvantage

The present analysis focused on the lived experiences of energy insecurity among low-income householders. The evocative narratives presented above highlight the salience of material hardship in determining an outcome of vulnerability that renders keeping the lights on and staying warm an everyday challenge for poor households throughout the United States. As demonstrated by the results, energy insecurity is an important social, economic and environmental determinant of health. It is a manifestation of poverty comprised not only of an imbalanced ratio of household income to energy expenditures but also one that includes physical and behavioral realms of hardship. In this way, energy insecurity is akin to food insecurity. In fact, an almost equal number of U.S. households encounter food insecurity as do experience energy insecurity (16 million versus 17 million, respectively) (Power, 2006; Coleman-Jensen et al., 2015). Many are burdened by both. Similar to food insecurity, where affordability and access to quality food matters, energy insecurity is determined by access to decent, efficient and affordable housing. Both are embedded within larger contexts of material deprivation and neighborhood disadvantage. Still, food is generally considered indispensable whereas energy is often perceived as an amenity. As most of people would cringe at the thought of hunger-prone families, few shudder at the notion of poor households living in the cold and in the dark, accruing debt to fulfill a basic need (Fig. 1).

The energy insecurity phenomenon is predicated on markers of social disadvantage such as low socioeconomic status, race, ethnicity, family composition and housing tenure; all considered key social determinants of health. In addition, energy insecurity acts as a mediator in the poor housing to poor health continuum. Set within the larger context of neighborhood disadvantage, factors such as racial residential segregation, concentrated poverty, limited social cohesion and deficient institutions produce a backdrop of structural challenges with direct implications for the availability of a decent housing stock. Unsafe neighborhood conditions also amplify the salience of the home environment as people stay home more often to avoid violence and danger (Hernández, 2016a,b). As an additional layer of disadvantage, housing marked by deficiencies in quality and lacking modern efficiencies affect the conditions of the home environment and the costs associated with its operation (i.e. utility expenses). Individuals living under these circumstances proceed to interact with the physical and economic aspects of housing and energy according to available material, informational and institutional resources. If limited by poverty and low social capital, householders may cope in ways that are detrimental to health and well-being (i.e. experiencing a shut-off, thermal discomfort). The environmental, health and social consequences of

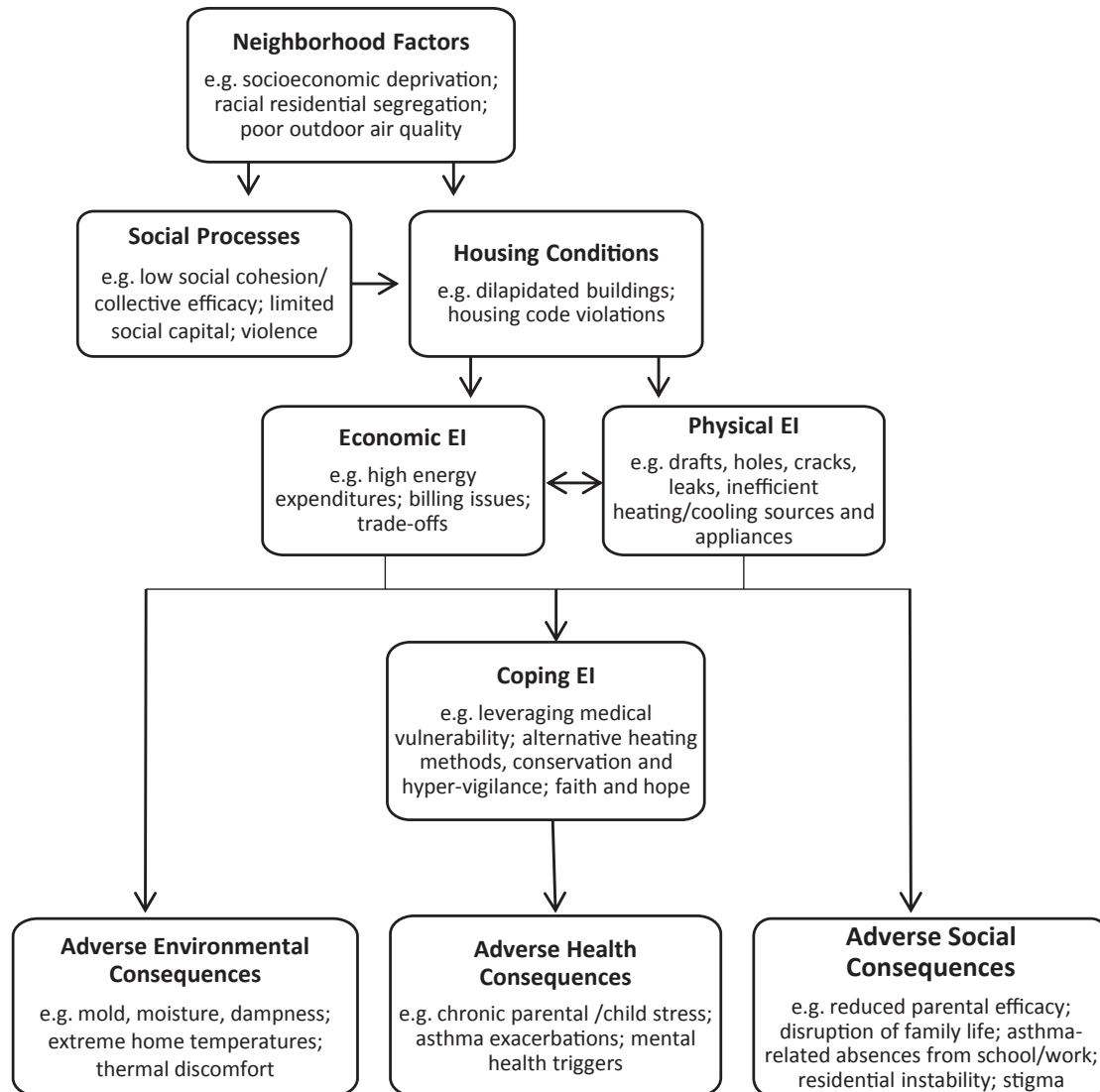


Fig. 1. Energy insecurity: a pathway to disease and disadvantage.

this phenomenon are thus the result of a “pathway of disadvantage” in which energy insecurity plays a unique mediating role. Its position reflects and exacerbates layers of ecological disadvantage from household income at the micro-level to housing cost and quality at the meso-level to low resource neighborhood settings and lack of adequate policies at the macro-level.

Literature suggests that housing interventions that promote warmth and energy efficiency are among the most effective options to improve health outcomes by way of housing conditions and the socio-economic determinants of health (Thomson and Thomas, 2015). While evidence in this area is still emerging in the U.S. context, researchers in Europe and New Zealand have established that investments in warmth and energy efficiency improve housing conditions, reduce fuel costs, and increase comfort and a sense of pride in one's home, which then lead to direct and indirect improvements in general health, respiratory health and mental health. Further, cycles of disadvantage are thwarted by reduced time off from school and work thereby increasing parental and child productivity (Thomson and Thomas, 2015). The intergenerational promise of such interventions is critical given the deleterious impact of adverse childhood experiences and chaotic environments on child development (Shonkoff et al., 2012; Evans et al., 2005). Therefore, addressing energy insecurity through energy efficiency

interventions has the potential to break chronic cycles of hardship along this path of disadvantage.

5.2. Energy insecurity and housing-related factors

Energy insecurity is impacted by housing type, tenure and quality whereby one's status as an owner or renter determines if and how one experiences this phenomenon. The majority of study participants that experienced economic energy insecurity were either a) housing choice voucher recipients, which provides the option to rent market rate apartments using a subsidy that covers two-thirds of the rental amount; b) renters in market rate apartments or c) low-income homeowners; all in a low resource neighborhood context. For renters, subsidized and market rate alike, decisions regarding the quality of the building and energy infrastructure remain outside of their control and mostly favored the interests of landlords and property managers. At times, energy-related infractions qualified as housing violations and in most instances exhibited egregious abuses of power and privilege on the part of landlords. As shown above, landlord improprieties, maintenance practices and choices to improve property (or not) had a direct impact on the quality of household energy, with implications for cost and comfort on the part of tenants. The “split-incentive

problem,” whereby landlords lack clear incentives to invest in the most efficient options when they are not responsible for utility costs, further exacerbates the dilemma of energy insecurity for renters (Bird and Hernández, 2012). Renters would have further recourse with revised and better enforced housing codes related to energy as well as further financial incentives for landlords to upgrade properties in order to decrease costs, mitigate risks and increase comfort.

Among renters, energy expenditures were often cited as a significant consideration in choosing to move to or from apartments that required tenants to pay utilities. Many ultimately chose poorer quality apartments in lieu of utilities payments. Public housing residents and a handful of participants for whom utilities were included in the rent were spared from the financial hardships associated with economic energy insecurity. Nonetheless, these economic protections did not always shield against the physical and behavioral aspects of energy insecurity, for instance, over- and under-heating, poor insulation, drafts and malfunctioning appliances. In fact, the experience of those who did not pay for utilities but still encountered energy challenges formed the basis for further exploration of the various dimensions of energy insecurity beyond the economic component. In order to address both the cost and conditions issues presented by energy insecurity, the U.S. should consider adopting an energy rating system for all buildings, already implemented throughout Europe, to increase transparency in energy performance in all housing types but especially in rental properties (Bio Intelligence Service et al., 2013).

Unlike renters, low-income homeowners shouldered the entire burden of economic responsibilities related to housing and energy expenditures, and as such the onus and associated trade-offs were more severe for this group. Further, the costs to properly maintain and upgrade older homes were often prohibitively expensive given the upfront costs of upgrades and the broader housing and economic crises occurring at the time of data collection. So, while homeowners enjoyed some measure of control over the structural conditions of their home, their low-income status constrained opportunities to increase the energy efficiency of their property. Safety net benefits should look to especially target low-income homeowners with subsidies to improve housing conditions, increase efficiency, and decrease costs so as to promote economic and residential stability in this vulnerable group.

5.3. Addressing energy insecurity through policy and advocacy

Energy insecurity is impacted by gaps in energy-related safety net policies and by the lack of sufficient protection for low-income energy consumers. As a critical component in alleviating poverty, addressing energy insecurity at the policy level necessitates a closer look at the current options to support affected populations. The Low-Income Home Energy Assistance Program and the Weatherization Assistance Program are the most relevant federal-level initiatives seeking to provide fuel assistance and weatherization services to eligible households. However, both programs have historically been underfunded and subject to budget cuts particularly in recent years, thus preventing low-income households from accessing needed resources to address energy-related hardships (Hernández and Bird, 2010). Greater awareness of the dimensions of energy insecurity and accompanying advocacy may lead to more comprehensive policy measures to expand existing programs in order to ensure that the needs of low-income householders are better met (Bird and Hernández, 2012; Hernández and Bird, 2010).

State-level policy and utility companies play critical roles in the problem of energy insecurity. State disconnection policies vary substantially but most cover medically vulnerable households and often contain seasonal policies barring shut-offs during extreme

weather (U.S. Department of Health and Human Services). Nevertheless, many of these policies are time limited taking effect for a year or less on average and thereby dismissing the chronic nature of energy-related hardship (U.S. Department of Health and Human Services). Comprehensive measures are needed to a) better protect households from the experience and threat of utility disconnection; b) mandate more favorable rates for indigent households; and c) defend against the accumulation of debt and related account transfer restrictions. Utility companies may be compelled to realize such priorities as non-payment marks a financial liability and shut-offs are an encumbrance for all. Pressure by lawmakers and advocates may help propel these changes as utility companies (like landlords) may otherwise lack incentives to act in the best interest of low and moderate-income ratepayers.

The present research has implications for revising standards for healthy and sustainable housing to ensure that low-income households across the U.S. can access higher quality, health-conducive and energy secure housing environments. The Centers for Disease Control and the U.S. Department of Housing and Urban Development (HUD) have issued healthy housing guidelines in order to reduce exposure to environmental hazards in the home and promote healthful indoor living environments (Centers for Disease Control and Prevention and U.S. Department of Housing and Urban Development, 2006). However, thermal comfort and energy efficiency are not comprehensively included in the various health and safety measures covered by current national-level initiatives. For example, HUD-subsidized housing, including the housing choice voucher program and public housing, does not enforce an energy efficiency standard leaving tenants more susceptible to energy insecurity. Nevertheless, energy and health are becoming more integrated in affordable housing development via mechanisms such as the Enterprise Green Communities Criteria and Certification, which provides a framework to ensure that low-income housing is healthier, more efficient and incorporated into the fabric of communities thereby promoting resident well-being and sustainability. Improved standards and integrative housing development are a critical application of “health in all policies” that should apply to both new construction and existing buildings.

Finally, the concept of energy insecurity provides a useful framework to fuel advocacy. “Energy justice”, which seeks equity for vulnerable populations along the energy production and consumption continuum, recognizes sacrifice and insecurity as central tenets of the present energy landscape in the U.S. (Hernández, 2015). While the call for energy justice is broad and includes imperatives to move toward healthy, sustainable energy production and access to the best available energy infrastructure, the movement relates directly to energy insecurity with demands for affordable energy and uninterrupted energy service. Housing, poverty and public health advocates should consider promoting energy justice in order to address the complex social, environmental and public health problem that is energy insecurity.

6. Conclusion

This article describes three key dimensions of energy insecurity: economic, physical, and behavioral that are premised on poverty and carry adverse environmental, health and social consequences. Study results help to uncover the layered components of energy insecurity by providing rich and nuanced narratives of the lived experiences of those affected by this form of hardship. As a construct, energy insecurity reveals and amplifies other chronic and interactive vulnerabilities that low-income householders encounter. The economic hardship associated with energy insecurity is indicative of low incomes relative to high energy expenditures. In addition to the constraints caused by poverty, the problem

of economic energy insecurity might be viewed from a structural perspective, as exemplified by the participant who aptly attributed energy insecurity to the poorer quality of housing available to low-income renters. In its physical form, energy insecurity encompasses inadequate housing conditions such as drafts from windows/doors and holes/cracks in the walls, floors or ceilings that induce energy inefficiencies and reduce “tightness” in the home. These conditions, in turn, create difficulties in regulating home temperatures and produce vulnerabilities in a home’s physical infrastructure that provoke mental health risks and unhealthy exposures. Combined, the physical and economic challenges associated with energy insecurity prompt coping strategies in the form of behavioral responses to energy inefficiencies that sacrifice comfort and potentially safety in response to energy costs (e.g. using space heaters or ovens for heating, carrying utility arrearages due to making partial bill payments). Paradoxically, these practices may lead to higher utility bills compared to more efficient alternatives. Some energy conservation methods used by study participants did result in economic and environmental benefits and the ingenuity employed under these circumstances demonstrated resourcefulness. However, there were several adverse health and social consequences to the energy insecurity problem including environmental hazards, parental fear and stigma as well as residential instability. Critical issues pertaining to energy insecurity such as the role this phenomenon plays along the pathway of disadvantage and the salience of housing type, tenure and quality were discussed alongside the need for policy-level changes to better address energy insecurity and advance energy justice.

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Energy bills strain many household budgets, and some far more than others. ACEEE's research has found that low-income, Black, Hispanic, and disadvantaged households all face dramatically higher energy burdens—spending a greater portion of their income on energy bills—than the average household. High energy burdens are correlated with greater risk for respiratory diseases, increased stress and economic hardship, and difficulty in moving out of poverty.



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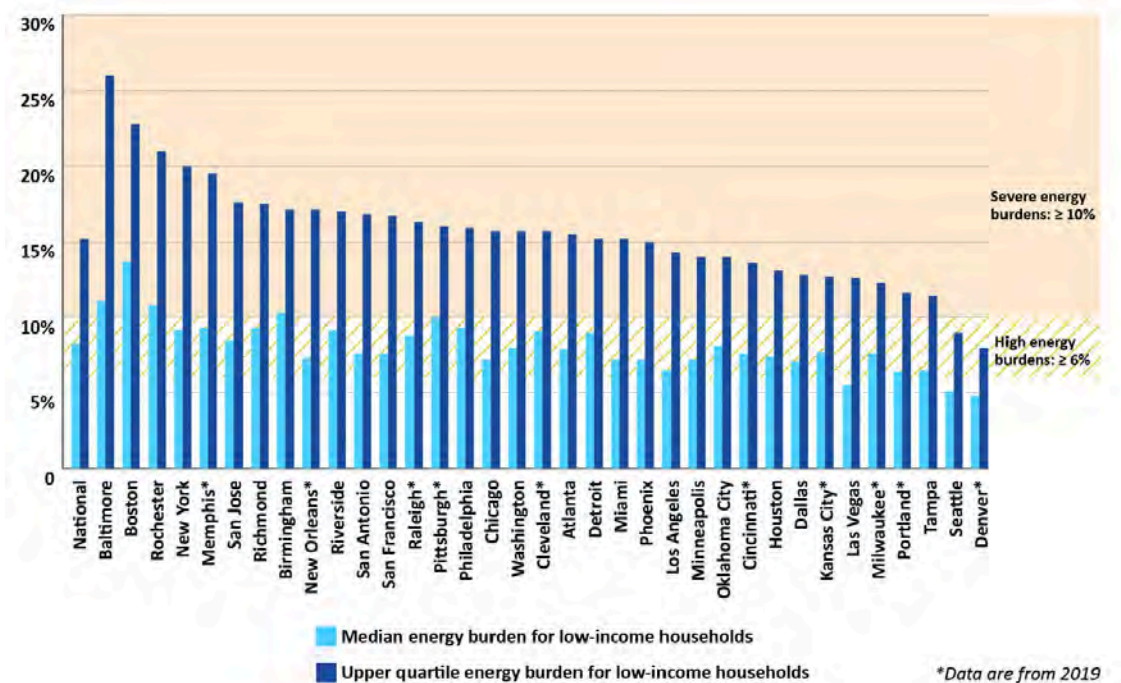
2024 Energy Burden Report Update: One in Four Low-Income Households Spend Over 15% of Income on Energy Bills

Our latest energy burden research highlights burdens among the upper quartile of low-income households, or the fourth of low-income households with the highest energy burdens. It found that among those households, energy burdens on average are over 15%. The policy brief also contains energy burden data among Black households, Hispanic households, homeowners, and renters at both the national level and in 35 metropolitan regions. This brief updates our more comprehensive 2020 energy burdens report with more recent data.

[Read the Policy Brief \(https://www.aceee.org/policy-brief/2024/09/data-update-city-energy-burdens\)](https://www.aceee.org/policy-brief/2024/09/data-update-city-energy-burdens)

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Median and Upper Quartile Low-Income Household Energy Burdens by Metropolitan Region



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This 2024 topic brief analyzes combined energy burdens, which include expenditures on both home and transportation energy as a share of income. On average, low-income households spend 17.8% of their income on energy bills and transportation fuel, more than three times the national average.

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2018 Energy Burden Report: The High Cost of Energy in Rural America: Household Energy Burdens and Opportunities for Energy Efficiency

This report examines residential energy affordability in rural and small-town America and identifies energy efficiency as an underutilized strategy that can help reduce energy burdens by as much as 25%. The report looks at how rural energy burdens vary across regions and among specific groups, finding that low-income, non-white, elderly, and renter households, as well as residents of multifamily and manufactured housing, spend a greater proportion of their income on utilities than the average family.

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This report measures household energy burdens in 48 of the largest American cities, finding that low-income, African American, Latino, and renter households all spend a greater proportion of their income on utilities than the average family.

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Extreme Weather and Climate Change

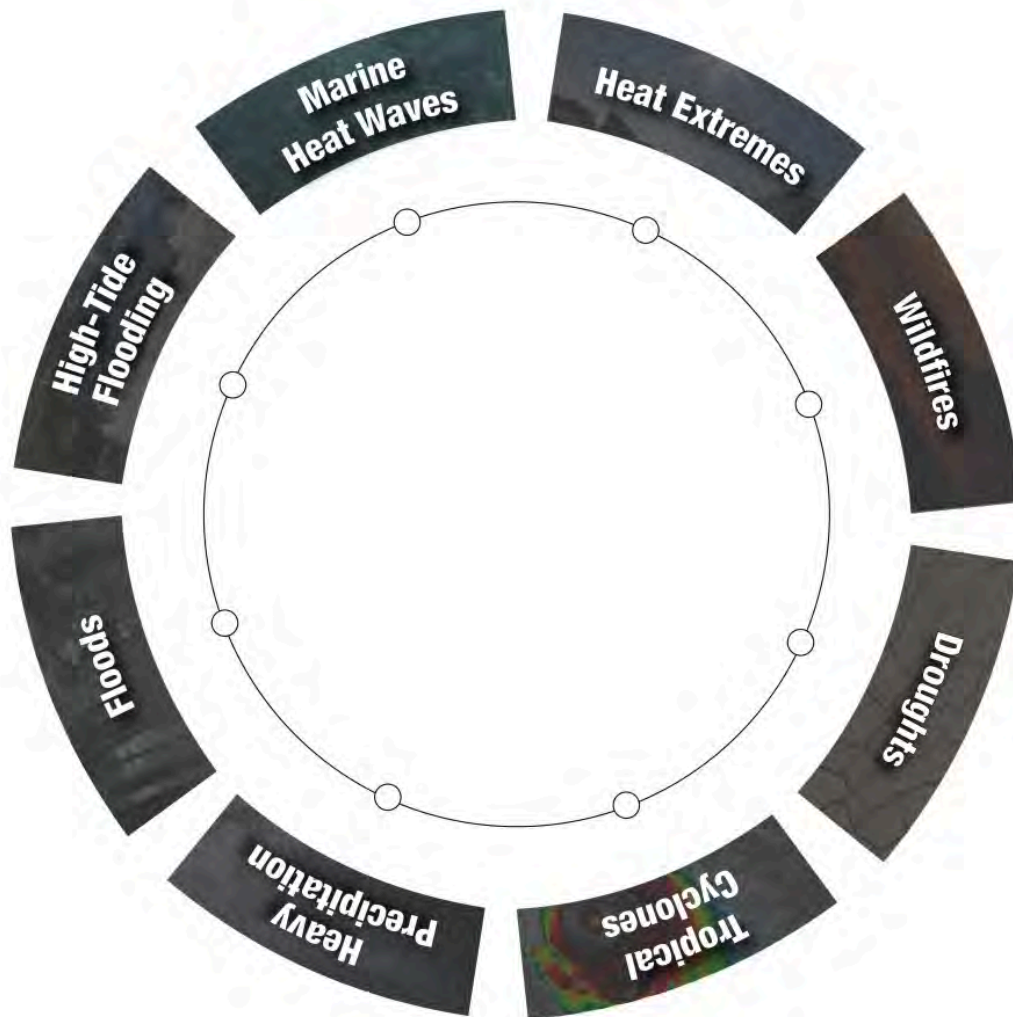
As the climate changes, the frequency and intensity of extreme weather events are increasing.

As Earth's climate changes, it is impacting extreme weather across the planet. Record-breaking heat waves on land and in the ocean, drenching rains, severe floods, years-long droughts, extreme wildfires, and widespread flooding during hurricanes are all becoming more frequent and more intense.

Human actions since the Industrial Revolution, primarily the burning of fossil fuels, have caused greenhouse gases to rapidly rise in the atmosphere. As carbon dioxide, methane, and other gases increase, they act as a blanket, trapping heat and warming the planet. In response, Earth's air and ocean temperatures warm. This warming affects the water cycle, shifts weather patterns, and melts land ice — all impacts that can make extreme weather worse.

According to the Intergovernmental Panel on Climate Change (IPCC)'s Sixth Assessment Report released in 2021, the human-caused rise in greenhouse gases has increased the frequency and intensity of extreme weather events. NASA's satellite missions, including the upcoming Earth System Observatory, provide vital data for monitoring and responding to extreme weather events.

What are the effects of climate change on extreme weather?



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Research says all the risks from these extreme weather events will escalate the more the planet warms. However, IPCC's Sixth Assessment Report also describes some climate change mitigation strategies,

technological developments, and methods for reducing greenhouse gas emissions.

How do scientists determine if changes in extreme weather events are linked to climate change?

Scientists use a combination of [climate models \(simulations\)](#) and land, air, sea, and space-based observations to research how extreme weather events change over time. First, scientists examine historical records to determine the frequency and intensity of past events. Many of these long-term records date back to the 1950s, though some start in the 1800s. Then scientists use climate models to see if the number or strength of these events is changing, or will change, due to increasing greenhouse gases when compared to what has happened historically.

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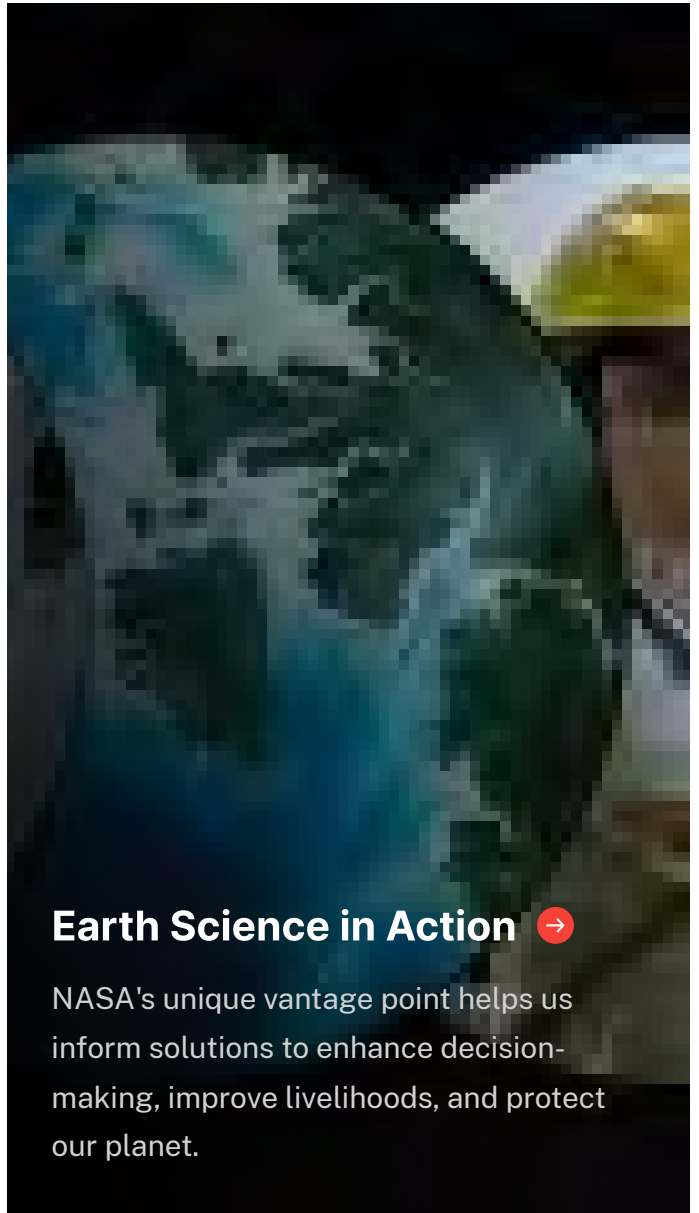
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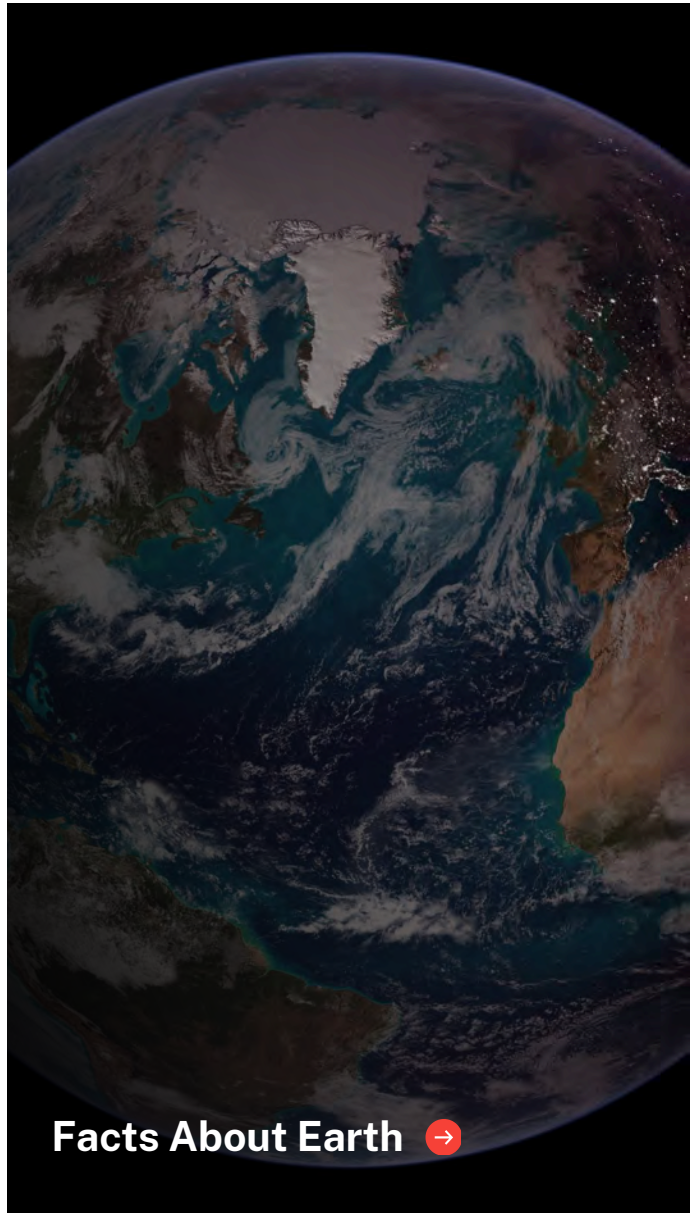



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Sweating the energy bill: Extreme weather, poor households, and the energy spending gap

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A B S T R A C T

We estimate the relationship between temperature and energy spending for both low and higher-income U.S. households. We find both groups respond similarly (in percentage terms) to moderate temperatures, but low-income households' energy spending is half as responsive to extreme temperatures. Consistent with low-income households cutting back on necessities to afford their energy bills, we find similar disparities in the food spending response to extreme temperature. These results suggest adaptation to extreme weather, such as air conditioning use, is prohibitively costly for households experiencing poverty.

1. Introduction

Many U.S. households report struggling to pay their energy bills. Eleven percent of households kept their home at an unhealthy or unsafe temperature for at least one month in 2015, and over 20 percent reduced or went without basic necessities to pay a home energy bill (Energy Information Administration, 2018). These households are disproportionately low income (Energy Information Administration, 2018), as are households that are *energy burdened*, spending more than 10 percent of household income on energy services (Jessel et al., 2019). These hardships exist despite energy assistance and other social programs.

Climate change makes understanding energy costs for households experiencing poverty urgent. Air conditioning dramatically reduces the effects of heat exposure on mortality (Barreca et al., 2016), but this form of adaptation to a warmer climate is only available if households can afford to run their air conditioners. Households that cannot afford cooling may be more susceptible to the effects of extreme heat, such as increased emergency room visits (White, 2017), poor mental health (Mullins and White, 2019b), diminished learning (Park et al., 2020), and death (Deschenes and Moretti, 2009). Climate policies also have distributional consequences, and may make energy less affordable. For example, both of Washington state's failed 2016 and 2018 carbon tax initiatives would have increased energy prices, but only one made redistributing revenues to low-income households a priority (Anderson et al., 2019).

We estimate the relationship between temperature and energy spending for both low and higher-income households. Our analysis relies on household-level data from the Consumer Expenditure Survey (CEX) for 2004–2018. We pair these data with mean daily temperatures aggregated to counts of days in temperature bins at the state-month level. U.S. households receive monthly bills that vary with energy use. We estimate the causal effect of additional hot or cold days on energy spending, allowing for heterogeneity by

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household poverty status. Because we include state-by-month fixed effects, temperature shocks (unseasonably hot or cold weather) provide identifying variation for our estimates.

We find low-income households' energy spending is much less responsive to extreme weather than that of other households. Events like the 2017 polar vortex or the 2011 heat wave can sharply increase exposure to extreme weather: for example, in August 2011, Oklahoma experienced 14 more days with a daily average temperature above 30 C (86 F) than is typical. We estimate replacing a temperate day (15–20 C/59–68 F) with a very cold day (< -5 C/ < 23 F) increases monthly energy spending by 1.2 percent for higher-income households but only 0.5 percent for low-income households. This difference of 0.7 percentage points is statistically significant. We refer to the muted spending response to extreme weather among low-income households relative to higher-income households as a “poverty gap”. This aggregate pattern of energy spending is driven by the fuels associated with heating and cooling: electricity spending exhibits a poverty gap at both extremes, while natural gas spending exhibits a poverty gap only for cold weather. Replacing a temperate day with a very hot day (> 30 C/ > 86 F) increases electricity spending for higher-income households by 0.5 percent but does not increase electricity spending for low-income households. The implied magnitude of the difference in electricity use would power a typical air conditioner for four hours.

These differences are best explained by low-income households foregoing heating and cooling during extreme weather. We first show spending disparities reflect underlying differences in energy consumption, rather than differences in prices. We then find differences in consumption are not driven by lower energy needs for the dwellings of low-income households: our preferred specification yields estimates of proportional, not level, changes in energy spending, and estimates are robust within housing sizes and types. Nor are they driven by differences in AC availability: we find similar estimates for a sample where all households have AC. Instead, we propose differences in use during unseasonable weather reveal a pattern of low-income households opting for more extreme indoor temperatures. Surveys documenting systematic differences in energy efficiency – households experiencing poverty tend to live in homes that are leakier and more poorly insulated – suggest differences in energy consumption could even understate resulting differences in dwelling temperatures.

We find similar poverty gaps for food spending, consistent with low-income households cutting back on necessities to afford their energy bills. While food spending by higher-income households is unaffected by extreme weather, food spending by low-income households falls in response to additional days of extreme heat or cold. The resulting food spending poverty gaps are statistically significant and about twice as large as the energy poverty gaps. We focus on food because it is consistently Americans' third greatest expense category, after housing and transportation, and it is likely more flexible in the short run than the other two (Bureau of Labor Statistics, 2019). Liquidity constraints may explain why low-income households are unable to smooth these shocks.

Taken together, these results indicate energy assistance programs fail to adequately insulate low-income households from energy bill shocks. Our estimates corroborate surveys and qualitative studies that find energy insecurity is widespread among low-income households, and imply policies that raise energy prices will disproportionately impact low-income households. The symmetry of our findings – poverty gaps in energy spending that are of similar magnitudes for both hot and cold weather – suggests energy assistance programs focused primarily on winter heating costs may miss a substantial part of the burden of energy bills. While nearly all U.S. households use air conditioning in their home, the largest energy assistance program in the United States allocated over five times as much funding to heating assistance as it did to cooling assistance in 2014 (Perl, 2018). As the climate warms, social programs will also need to adapt.

We contribute to the literature by documenting a novel poverty gap in the energy spending response to hot weather. Previous work has found differential responses to extreme cold, but not extreme heat; we also provide contemporary estimates of the cold weather gap. Using data from 1980–1998, Bhattacharya et al. (2003) finds low-income households spend less on energy and food in response to extreme cold, compared to other households.² More recently, Beatty et al. (2014) finds similar poverty gaps in response to unseasonably cold in the United Kingdom.³ Previous work also suggests the spending disparities we document lead to health disparities. (Frank et al., 2006) links participation in energy assistance to improved nutrition among low-income children; (Nord and Kantor, 2006) finds an association between increased energy costs and food insecurity; and Chirakijja et al. (2019) finds higher home heating costs increase mortality, especially in low-income counties.

We also contribute to the literature describing how climate damages vary across populations and highlighting how socioeconomic inequality leaves low-income households distinctly vulnerable to extreme temperature. (Mullins and White, 2019a) finds access to health care mitigates the effect of heat on mortality, and Garg et al. (2020) shows income lessens the effect of heat on test scores. Globally, increases in both temperatures and incomes will drive air conditioner adoption (Davis and Gertler, 2015). Finally, Barreca et al. (2016) attribute dramatic reductions in heat-related mortality to air conditioner access. Our results contextualize this finding. In countries like the United States, where income inequality is high and adoption is approaching saturation, air conditioner operating costs may be just as important as access for the distribution of climate damages.

² The working paper version, Bhattacharya et al. (2004), tests for hot weather energy and food spending gaps by estimating the main specification on a subsample of Southern households in July and August. It finds that neither rich nor poor households spend more on energy in response to unseasonably hot summers (p.14).

³ Beatty et al. (2014) does not find a hot weather spending gap, possibly because weather in the U.K. is more temperate, and few households have air conditioning.

2. Energy insecurity and energy assistance

Household energy consumption is an adaptive response to extreme outdoor temperatures: adequate indoor heating in cold weather and cooling in hot weather can prevent not just discomfort but severe health consequences, including mortality.⁴ On average, people increase energy use in response to extreme temperatures (Deschenes and Greenstone, 2011; Davis and Gertler, 2015; Hsiang et al., 2017).

However, this heating and cooling response to extreme temperature is costly, and these costs are not trivial for low-income households. The related concepts of *energy insecure* and *energy burdened* describe, respectively, households “unable to adequately meet household energy needs” and that spend a large percentage (typically greater than 10 percent) of their income on energy services (Jessel et al., 2019). In a detailed qualitative study, Hernández (2016) documents substantial hardship among energy-burdened households struggling to pay high utility bills. These hardships include the accumulation of debt, service interruptions, physical discomfort, and the mental load of managing consumption and costs.⁵

Households that lack emergency savings and access to credit may be more sensitive to atypically high energy bills. These bills strain household finances in a way similar to other unanticipated expenses, such as car repairs or medical bills (Gjertson, 2016). Cullen et al. (2005) studies how households without substantial assets smooth consumption shocks caused by higher energy bills, finding households had sufficient liquidity to accommodate anticipated changes in disposable income, but were unable to buffer even modest unanticipated shocks.

We engage with these themes more formally by developing a theoretical model of household energy consumption (see Appendix A). The model incorporates household preferences over reducing health risks from exposure to extreme weather, emphasizing the distinction between willingness- and ability-to-pay for energy spending. Extensions include weather-dependent household income, energy prices that increase with income, and income-associated differences in energy needs.

Recognizing the risks of energy insecurity, social programs exist to help households with their energy bills. The largest such assistance program is LIHEAP, a federal block grant program that provides over \$3 billion annually to states for heating assistance, cooling assistance, crisis assistance, and weatherization (Perl, 2018). Murray and Mills (2014) finds LIHEAP reduces energy insecurity, and Frank et al. (2006) finds a positive association between LIHEAP participation and children’s health. States and utilities may also supplement LIHEAP funding with additional energy assistance. Despite these programs’ size and apparent benefits, take-up and overall participation are low: only 22 percent of eligible households, and less than 5 percent of all households, received energy assistance nationwide in recent years (Falk et al., 2015; U.S. Census, 2018).

3. Data

Our analysis focuses on the period from 2004–2018, and our unit of observation is a household in a state, month, and year. We link consumer expenditures on utilities (energy) and groceries (food), to state-level data on temperature and precipitation.

3.1. BLS consumer expenditure survey

Household data come from the Bureau of Labor Statistics’ Consumer Expenditure Survey Public-use Microdata (CEX). The CEX is comprised of two separate, nationally-representative surveys: the Interview Survey and the Diary Survey. The Interview Survey collects information about monthly household spending on major and less-frequent purchases (such as cars, rent, and utilities). It interviews households every three months for four quarters. The Diary Survey better captures frequent or minor purchases, such as food. Households in the diary survey record almost all expenses for two consecutive weeks. Both surveys collect data on utilities and food purchases, and both collect households’ income and demographic data. Bee et al. (2015) finds the diary survey has more under reporting of expenditures, especially for categories comprised of small, infrequent expenditures. Given the strengths and weaknesses of each survey, we follow the BLS in their choice of survey for summary analysis: we use the Interview Survey to study utility expenditures, and the Diary Survey to study food expenditures. For both surveys, observations are individual consumer units, defined as financially independent households or individuals, and referred to here as households for convenience. Each sample consists of different households and is independently nationally representative with provided sample weights.⁶

We use observations of a household in a particular state, month, and year and limit our sample to the 15 most recent years of CEX data available. Household energy expenditures are the sum of reported bills across all fuel types (such as electricity, fuel oil, and natural gas). We restrict our energy spending analysis to households with positive fuel purchases. For food expenditures, we focus on food spending for consumption in the home (“food in”), but also consider all food spending, which includes fast food and restaurants, including take-out and delivery. We extrapolate from the weekly expenses recorded in the Diary Survey to monthly expenses by multiplying by the number of weeks in each month.

⁴ Extreme temperatures, and especially extreme heat, increase mortality (Deschenes and Moretti, 2009; Deschenes and Greenstone, 2011; Burgess et al., 2017), and Barreca et al. (2016) finds that air conditioner adoption reduces heat-related mortality.

⁵ This mental burden of energy insecurity is consistent with the bandwidth costs described in Schilbach et al. (2016).

⁶ Due to data limitations, we use a subset of these nationally-representative data in estimation. The BLS public use data suppress state of residence for observations from Missouri, Montana, New Mexico, North Dakota, South Dakota, and Wyoming for both CEX surveys, so we omit these states from our analysis. We also exclude Alaska and Hawaii for lack of weather data. According to the 2010 U.S. Census, the states included in our sample account for 96 percent of the U.S. population.

Table 1
Summary statistics.

A: Interview Survey (IS)				
Statistic	Mean	Median	St. Dev.	N
Days under -5 C	1.08	0.00	3.41	925,021
Days over 30 C	0.54	0	2.64	925,021
Energy expenditures	199.81	165.75	157.99	925,021
... Over 1.5 FPL	207.69	172.67	162.13	628,087
... Under 1.5 FPL	183.12	151.63	147.45	296,934
Natural gas expenditures	49.28	21.22	78.54	925,021
... Over 1.5 FPL	52.64	25.71	80.22	628,087
... Under 1.5 FPL	42.15	3.44	74.37	296,934
Electricity expenditures	138.23	115.1	101.62	925,021
... Over 1.5 FPL	141.19	117.47	102.17	628,087
... Under 1.5 FPL	131.99	109.88	100.15	296,934
Any air conditioning (0/1)	0.74	1	0.44	925,021
... Over 1.5 FPL	0.77	1.00	0.42	628,087
... Under 1.5 FPL	0.67	1.00	0.47	296,934
Rooms in home	6.02	6.00	2.22	917,888
... Over 1.5 FPL	6.27	6.00	2.23	625,186
... Under 1.5 FPL	5.48	5.00	2.11	292,702
B: Diary Survey (DS)				
Statistic	Mean	Median	St. Dev.	N
Days under -5 C	1.07	0.00	3.37	171,336
Days over 30 C	0.51	0	2.56	171,336
Any food expenditures (0/1)	0.90	1	0.30	171,336
... Over 1.5 FPL	0.95	1.00	0.21	109,105
... Under 1.5 FPL	0.80	1.00	0.40	62,231
In home food expenditures	363.92	261.45	396.34	171,336
... Over 1.5 FPL	408.28	311.49	403.91	109,105
... Under 1.5 FPL	286.13	172.63	370.09	62,231
All food expenditures	599.45	456.66	655.71	171,336
... Over 1.5 FPL	701.91	564.27	706.24	109,105
... Under 1.5 FPL	419.81	275.11	508.56	62,231

Note: Statistics constructed from the CEX for 2004–2018. N is the no. of household-months. Days under -5 C are counts of days each month with an average daily temperature under -5 C; Days over 30 C is the same for >30 C. Energy expenditures (total, natural gas, and electricity) are monthly spending in Jan. 2018 dollars. Over 1.5 FPL is the subset of households with income over 1.5 times the Federal Poverty Line, given their family size. Any air conditioning is an indicator for whether a household reported having A.C. that year; it is 0 for both households without A.C. and those that did not respond. Rooms in home is the number of rooms in the households' dwelling. In home food spending is monthly expenditures on food for consumption at home. Table B.1 presents additional statistics.

We use annual income and the number of individuals in the household to categorize a household's status with respect to the federal poverty line (FPL). Our income measure is gross income, exclusive of transfers, which is collected quarterly in the CEX. This is a simple, meaningful indicator of relative household poverty, because multiples of this threshold are used to determine eligibility for assistance programs, including LIHEAP, SNAP, and Medicaid. For our primary specification, we allow the effect of weather on spending to differ for households above and below 150 percent of the FPL. We choose this cutoff because it is commonly used for LIHEAP, the federal energy assistance program. Throughout, we refer to households under 150 percent of the FPL as "low income", and households above 150 percent of the FPL as "higher income".

Summary statistics for these data over our study period (2004–2018) are shown in Table 1. The median household spends about 166 dollars per month on fuel for the home and 457 dollars per month on food for consumption in the home. About one quarter of households have incomes and family sizes that put them under the FPL, and about one third are classified as under 150 percent of the FPL. These households are spread throughout the U.S., with higher proportions in the South and West; these are also the regions with the most frequent extremely hot days.

Fig. 1 shows how mean energy spending differs over the year for households above and below 150 percent of the FPL. Households above 1.5 FPL spend more on energy, and the difference in spending between the two groups is noticeably larger in the winter and summer months. These fluctuations in the aggregate are driven by the dominant billing paradigm in the U.S., where households receive monthly bills for the quantity of energy they consumed last month. In the CEX, where households are observed for up to five quarters, the average within-household standard deviation of monthly fuel spending is \$56, which is substantial relative to the average household spending of \$193 per month. We note that not all countries use this billing system; for example, some countries bill bi-monthly and others using an account system where households are billed the same amount each month.

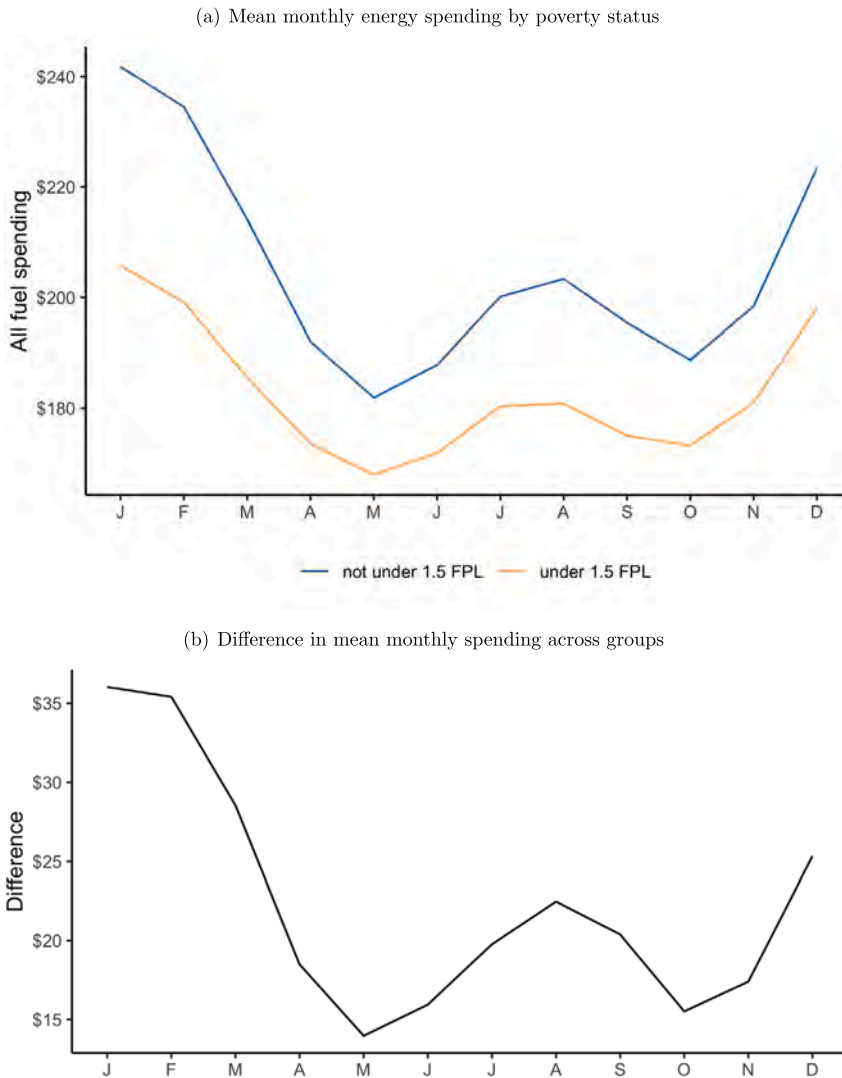


Fig. 1. Seasonal energy spending by poverty status.

Note: Average monthly fuel spending (using sample weights) is plotted separately for households above and below 1.5 times the FPL in Panel (a). Panel (b) plots the difference between the two group means in Panel (a).

3.2. Weather and other controls

We use daily, gridded weather data from (Schlenker, 2020), which are based on the PRISM weather data for the contiguous United States, and derived from a fixed set of weather stations. Because our household data is only geographically precise to the state level, we create a state-level variable that is a weighted average of grid cell observations. Specifically, we first aggregate to the county level, weighting each cell by inverse distance to the county population centroid. We then aggregate up to the state level, weighting by county population.⁷ Daily mean temperatures are the average of the reported minimum and maximum at the grid cell-level before aggregation.

We characterize exposure to weather using counts of the number of days in each state, month, and year during which the mean temperature fell in a particular five-degree Celsius window (bin). This approach follows a large literature and allows for non-linear relationships between temperature and our outcome variables. Our preferred specification uses eight of these bins: under -5 degrees, $-5-0$ degrees, and so on, up to over 30 degrees. We also estimate and include results for alternate bin choices.

⁷ County populations are from the Census and vary annually; county population center coordinates are from the Census and 2010 values are used.

We also report in [Table 1](#) the average number of days in the extreme temperature bins from 2004–2018. We define extremes as average temperatures below -5 C and above 30 C, and show the full distribution of mean daily temperatures over our study period in [Figure B.1](#). Additional summary statistics are provided in [Table B.1](#).

4. Empirical framework

We first estimate the relationship between weather and monthly energy spending. We then test whether responses are the same for low-income and higher-income households, and conduct a similar analysis for food spending.

We use temperature bins to flexibly estimate the response to extreme weather, as is common in the climate change literature ([Deschenes and Greenstone, 2011](#); [Barreca et al., 2016](#); [Hsiang, 2016](#); [Mullins and White, 2019b](#)). While our spending data is at the household level, we only observe the state where households live, not their exact location. A temperature bin $Temp_{j,sm}$ is the number of days in month m where the average temperature in state s fell within the j th 5 C-degree bin. Because we include state-by-month fixed effects in all specifications, results capture responses to deviations from average weather. Because variation in weather is plausibly exogenous, we can causally identify the spending response to weather ([Dell et al., 2014](#)). Our main specification is

$$\log(Spend_{imy}) = \sum_{j=1}^J \beta_j Temp_{j,sm} + X_{ismy}\gamma + \delta_{sm} + \mu_{my} + \epsilon_{imy} \quad (1)$$

where $Spend_{imy}$ is spending by household i in month m in year y . We include state-by-month fixed effects, δ_{sm} , and month-by-year fixed effects, μ_{my} . The set of temperature bins J omits one reference bin, the 15–20 C degree bin. We cluster standard errors at the state level and weight by the CEX sampling weights.

We also control for other determinants of household spending, X_{ismy} . We control for the age, sex, race, and education of the reference individual. We also control flexibly for total household size, the number of children, and the number of elderly. While month–year fixed effects capture the aggregate business cycle, we include the monthly state-level unemployment rate from the BLS to capture local economic conditions. Finally, we control for precipitation and its square.

We next estimate a model that allows for differential effects of weather on spending by income. Specifically, we interact the temperature bins with whether a household falls below 1.5 times the federal poverty line (FPL), a cutoff often used to determine eligibility for energy assistance:

$$\log(Spend_{imy}) = \sum_{j=1}^J \beta_j Temp_{j,sm} + \sum_{j=1}^J \alpha_j Temp_{j,sm} \times 1[1.5 FPL_{isy}] + 1[1.5 FPL_{isy}] + X_{ismy}\gamma + \delta_{sm} + \mu_{my} + \epsilon_{imy} \quad (2)$$

where $1[1.5 FPL_{isy}]$ is an indicator for whether household i is under 150 percent of the federal poverty line (FPL). This cutoff is often used to determine eligibility for energy assistance. Throughout, we refer to households under 150 percent of the FPL as “low income”.

This specification is sufficient for describing differential spending responses for low- and higher-income households. However, this specification is insufficient for identifying whether or not income is the cause of a subpopulation’s vulnerability to extreme weather ([Hsiang et al., 2019](#)). Causal identification of low-income as the source of a weaker spending response would require exogenous changes in both temperature and poverty status ([Hsiang et al., 2013](#)). We note that while we do not claim income differences drive our effect, it is highly likely to be the underlying cause, and the relevant policy takeaways – income-targeted heating and cooling assistance – are unchanged.

Using logged spending as the dependent variable drops households with zero spending in a month. For energy spending we observe very few zeros. These zeros may be due to either a disconnection or errors in the data. We also estimate this model separately for spending on natural gas, and the logged specification drops many households that never use natural gas. Finally, to avoid dropping meaningful zeros for food spending, we use the inverse hyperbolic sine (IHS) transformation rather than the log for the dependent variable in food spending regressions.

5. Results

We present results for energy and then food spending. We assess the two using separate survey data, but hypothesize that energy spending due to weather shocks may constrain food spending for low-income households.

5.1. Energy spending

[Fig. 2a](#) documents the expected U-shaped pattern in the energy spending response to temperature: households spend more when weather is extreme. When a day in the 15–20 C bin is replaced with a day in the under -5 C bin, monthly energy spending increases by 1 percent. Similarly, when a day in the 15–20 C bin is replaced with a day in the over 30 C bin, energy spending increases by 0.4 percent.

We find meaningful differences in the response to extreme weather by household poverty status. Lower-income households’ fuel spending matches all other households’ spending except at the extremes of the temperature distribution, where it is substantially lower. [Table 2](#) reports regression results using our baseline specification with interactions ([Eq. \(2\)](#)), and this relationship is visualized in [Fig. 2b](#). For cold weather, when a day in the 15–20 C bin is replaced with a day under -5 C, low-income households increase

Table 2
Poverty gap in energy spending response.

	Dependent variable:					
	log(All energy) (1)	log(Natural gas) (2)	log(Electricity) (3)	All energy (4)	Natural gas (5)	Electricity (6)
Under -5	0.012*** (0.002)	0.018*** (0.002)	0.005** (0.002)	2.365*** (0.372)	1.555*** (0.332)	0.668** (0.272)
... xunder 1.5 FPL	-0.007*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-1.216*** (0.181)	-0.517*** (0.134)	-0.245** (0.114)
Over 30	0.005*** (0.001)	-0.002* (0.001)	0.005*** (0.002)	1.214*** (0.266)	0.084 (0.167)	1.078*** (0.261)
... xunder 1.5 FPL	-0.003* (0.002)	0.003** (0.001)	-0.004** (0.002)	-0.886** (0.379)	0.110 (0.100)	-1.065*** (0.347)
FE	SxM+YxM	SxM+YxM	SxM+YxM	SxM+YxM	SxM+YxM	SxM+YxM
Subset	IS	IS	IS	IS	IS	IS
Observations	925,021	516,874	912,438	925,021	516,874	912,438
R ²	0.269	0.352	0.269	0.181	0.271	0.194

Note: Dependent variables are at the household-month level. Data from the CEX Interview Survey (IS). All energy is total HH energy expenditures; Natural gas and Electricity are expenditures for each fuel type. Under -5 is the no. of days in that month with an average temp. <-5 C for the state the HH resides in; Over 30 is the same for days >30 C. Under 1.5 FPL is an indicator for HHs with income under 1.5 times the federal poverty line, given their family size. All specifications include temperature bins for <-5 C, -5-0 C, ..., 25-30 C, >30 C and their interaction with Under 1.5 FPL; the omitted bin is 15-20 C. All specifications include state-by-month FE and month-year FE; the age, sex, race, and education of the reference individual; HH size, no. of children, and no. of elderly; the state-level unemployment rate for that month; and state-level precipitation and its square. SE clustered by state. Observations weighted by CEX sampling weights.

*p<0.1.

**p<0.05.

***p<0.01.

Table 3
Poverty gap in food spending response.

	Dependent variable:				
	Any food (0/1) (1)	ihs(Food in) (2)	ihs(All food) (3)	Food in (4)	All food (5)
Under -5	-0.001* (0.001)	0.002 (0.006)	-0.007 (0.005)	1.331 (1.127)	1.472 (1.772)
... xunder 1.5 FPL	-0.003** (0.001)	-0.012* (0.006)	-0.017** (0.008)	-1.632* (0.825)	-1.977 (1.830)
Over 30	0.001 (0.001)	0.011 (0.009)	0.008 (0.010)	1.558 (1.486)	2.578 (3.532)
... xunder 1.5 FPL	-0.002*** (0.001)	-0.018*** (0.004)	-0.016*** (0.005)	-2.876*** (0.817)	-2.478 (1.684)
Subset	DS	DS	DS	DS	DS
Observations	171,336	171,336	171,336	171,336	171,336
R ²	0.082	0.126	0.152	0.158	0.162

Note: Dependent variables are at the household-month level. Data from the CEX Diary Survey (DS). Any food is an indicator for non-zero HH food expenditures during the two week DS. Food in is expenditures on food for consumption at home. Expenditures during the two week DS are scaled up to construct the monthly measure. All Food is the same for total food expenditures. Under -5 is the no. of days in that month with an average temp. <-5 C for the state the HH resides in; Over 30 is the same for days >30 C. Under 1.5 FPL is an indicator for HHs under 1.5 times the federal poverty line. All specifications include temperature bins for <-5 C, -5-0 C, ..., 25-30 C, >30 C and their interaction with Under 1.5 FPL; the omitted bin is 15-20 C. All specifications include state-by-month FE and month-year FE; the age, sex, race, and education of the reference individual; HH size, no. of children, and no. of elderly; the state-level unemployment rate for that month; and state-level precipitation and its square. SE clustered by state. Observations weighted by CEX sampling weights.

*p<0.1.

**p<0.05.

***p<0.01.

spending by 0.7 percent, or \$1.22, less than higher income households. When a day in the 15-20 C bin is replaced with a very hot day (over 30 C), low-income households increase spending by 0.3 percent, or \$0.89, less than higher income households. Appendix Table B.2 shows estimates vary as expected when we change the cutoffs for the most extreme bins.

These differences in energy spending are driven by differences in electricity spending for hot days, and both natural gas and electricity spending for cold days. This is intuitive: electricity alone is used for cooling, while both electricity and natural gas are used for home heating. Table 2 also reports results for spending broken down by fuel type. The hot day spending effect is larger and

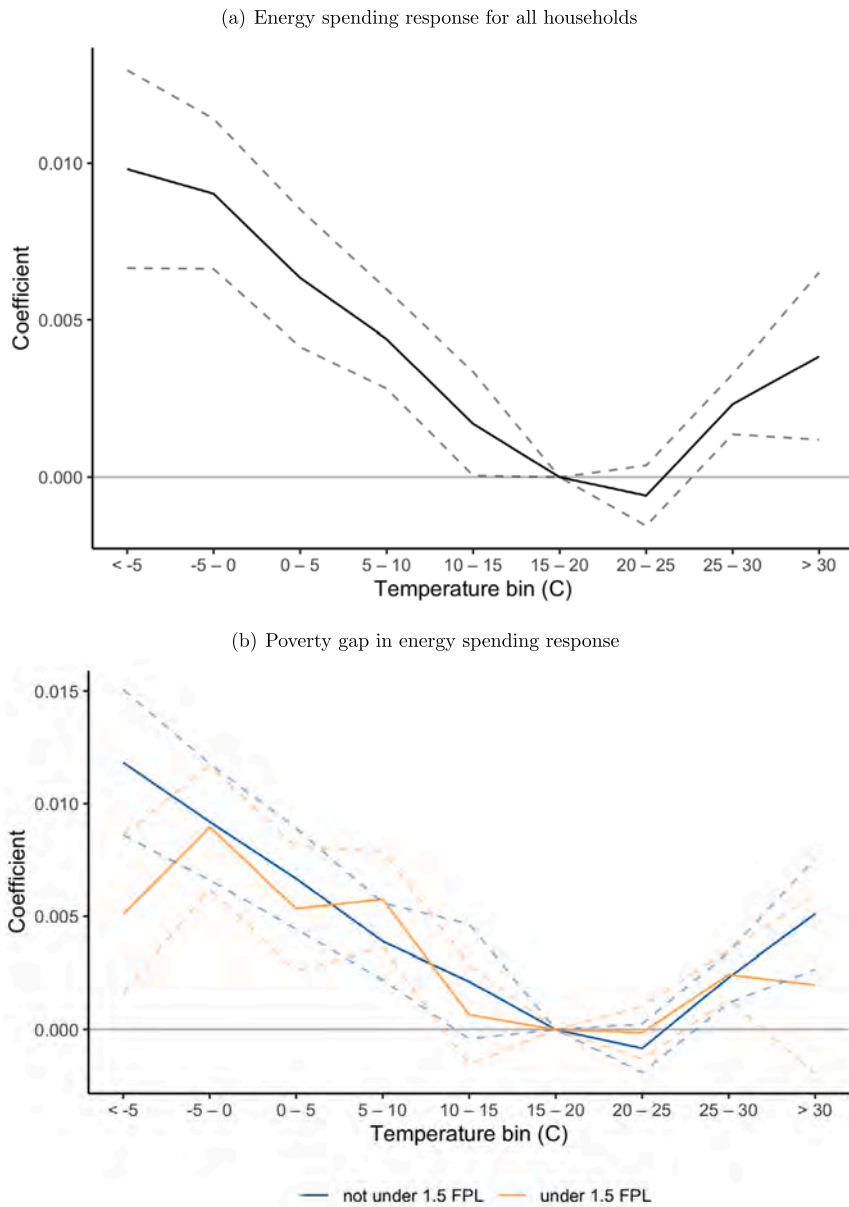


Fig. 2. Energy spending response to temperature.

Note: Coefficients show the effect of one additional day per month in each 5 C-temperature bin on log-transformed monthly home energy spending. Panel (a) corresponds to Eq. (1) in the text, and Panel (b) to Eq. (2), which allows for heterogeneity in household spending by poverty status. Confidence intervals are 95%.

more precisely estimated for electricity. Surprisingly, we find also find a statistically significant positive spending gap for natural gas spending on hot days, though overall spending on natural gas on hot days is low. For the response to cold weather, we find poverty gaps for both natural gas and electricity spending contribute to our overall energy spending result.

5.2. Food spending

Food spending is not very responsive to extreme weather for the average household: the effects on food spending of replacing a 15–20 C day with a day below -5 C or a day above 30 C are not statistically different from zero.

As with energy, however, we find food spending poverty gaps for both extreme cold and extreme heat. Table 3 presents estimates for three measures of spending: an indicator for any food spending, total grocery spending, and total food spending. When a day in the 15–20 C bin is replaced with a day in the < -5 C bin, low-income households are 0.3 percent less likely to buy any food in the

Table 4
Poverty gap in spending response with previous month's weather.

	Dependent variable:			
	ihS(All energy) (1)	ihS(Food in) (2)	All energy (3)	Food in (4)
Under -5	0.010*** (0.001)	0.002 (0.007)	1.881*** (0.323)	1.423 (1.165)
... xunder 1.5 FPL	-0.005*** (0.001)	-0.010 (0.006)	-0.866*** (0.196)	-1.950** (0.880)
Under -5 (t-1)	0.010*** (0.001)	0.002 (0.005)	1.965*** (0.294)	0.518 (0.994)
... xunder 1.5 FPL	-0.004*** (0.001)	-0.009 (0.008)	-0.688*** (0.174)	0.616 (0.808)
Over 30	0.004*** (0.001)	0.015 (0.011)	0.855*** (0.231)	1.482 (1.593)
... xunder 1.5 FPL	-0.002 (0.001)	-0.016** (0.007)	-0.591* (0.315)	-1.948* (0.993)
Over 30 (t-1)	0.005*** (0.001)	-0.014 (0.015)	1.029*** (0.225)	-0.774 (1.479)
... xunder 1.5 FPL	-0.003** (0.001)	-0.006 (0.007)	-0.621*** (0.217)	-0.982 (0.808)
Subset	IS	DS	IS	DS
Observations	925,021	171,336	925,021	171,336
R ²	0.269	0.126	0.179	0.158

Note: Dependent variables are at the household-month level. Data from the CEX Interview Survey (IS) and Diary Survey (DS). All energy is total energy expenditures in month t ; Food in is expenditures on food for consumption at home in month t . Under -5 is the no. of days in month t with an average temp. <-5 C for the state the HH resides in; Over 30 is the same for days >30 C. Under 1.5 FPL is an indicator for HHs with income under 1.5 times the federal poverty line, given their family size. Under -5 (t-1) is the no. of days last month ($t-1$) with an average temp. <-5 C for the state the HH resides in; Over 30 (t-1) is the same for days >30 C. All specifications include temperature bins for <-5 C, $-5-0$ C, ..., $25-30$ C, >30 C in t and $t-1$ and their interaction with Under 1.5 FPL; the omitted bin is $15-20$ C. All specifications include state-by-month FE and month-year FE; the age, sex, race, and education of the reference individual; HH size, no. of children, and no. of elderly; the state-level unemployment rate for that month; and state-level precipitation and its square. SE clustered by state. Observations weighted by CEX sampling weights.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

survey week than higher income households. Low-income households also respond by spending 1.2 percent less on groceries and 1.7 percent less on all food than higher income households. In levels, this gap is \$1.63 for groceries and \$1.98 (estimated imprecisely) for all food. At the other extreme, when a day in the $15-20$ C bin is replaced with a day in the >30 C bin, low-income households are 0.2 percent less likely to buy any food than higher income households. The corresponding gaps in spending are 1.8 percent for groceries and 1.6 percent for all food spending, or \$2.88 and \$2.48 in levels.

5.3. Lagged effects

We next turn to models with lagged weather variables. If these poverty gaps are due to liquidity constraints, they may appear in the month following unseasonable weather when the household pays its energy bill. Lingering spending gaps are also more consistent with budget constraints than other behavioral changes in spending related to weather. For diary survey weeks that occur early in a given month, the previous month's weather may also better reflect recent conditions.

We find the effects of last month's weather on spending are similar in magnitude to contemporaneous effects (Table 4). For energy spending, the coefficients on last month's <-5 C bin and its interaction with poverty status are nearly identical to this month's coefficients. For hot days, lagged and contemporaneous effects are similar, but only the lagged poverty interaction is statistically significant. In both cases, point estimates for contemporaneous effects are slightly smaller when lags are included. Estimates for the effects of weather on food spending are less precisely estimated when we include lags, but generally consistent with persistent decreases in spending.

6. Discussion

We find a novel poverty gap for energy spending in response to very hot days. This effect is driven by electricity spending, and its magnitude is consistent with disparate air conditioner use: the additional increase in electricity use among non-low income households for an unseasonably hot day would power a typical window air conditioning unit for four hours (see Appendix C).

To return to the example of the August 2011 heat wave, our estimates (combined with the shift in each temperature bin relative to the study average) imply a typical higher income household in Oklahoma increased monthly energy spending by about 7 percent, relative to a typical August, while for a low-income household this increase was only 1 percent. Like (Bhattacharya et al., 2003), we find that low-income households increase their spending by less in response to extreme cold. During the January 2018 cold wave, our estimates imply energy spending in North Carolina rose by about 4 percent for higher-income households, but less than 1 percent for low-income households.

We rule out that the differences we document are driven by measurement error in temperature exposure. Weather is assigned at the state level, which implies mismatch between assigned and experienced weather at the household level. This concern is mitigated by population-weighting the underlying weather data when we aggregate it to the state level. The most likely effect of measurement error on our estimates is attenuation towards zero. Measurement error correlated with household income would also be cause for concern. As a robustness check, we estimate specification (2) omitting the five states with the greatest within-month variability in temperature across counties, i.e., the states where measurement error is likely the largest.⁸ Our main results are robust to this sample restriction (see Appendix Table B.3).

We next provide evidence these differences in spending are indicative of differences in consumption and differences in dwelling temperatures. We then discuss the implications of inadequate indoor heating and cooling for health and policy.

6.1. Differences in consumption

It is possible differences in energy prices are driving our findings, rather than underlying differences in consumption. We rule this out by comparing energy usage and spending in the Residential Energy Consumption Survey (RECS).

In particular, if low-income households face lower marginal energy prices than higher-income households, then the same increase in energy use would result in a smaller increase in energy spending for low-income households. Marginal energy prices can vary with location or with use, especially for electricity. Borenstein and Bushnell (2019) find almost 60 percent of households face marginal electricity prices that vary with consumption.⁹ Of these households, about two-thirds face marginal prices that increase with use, while one-third face marginal prices that decrease with use.

We use the RECS, which collects annual data on energy billing and use directly from respondents' utilities, to find that low and higher-income households face similar prices.¹⁰ For electricity, we find a one kWh increase in use is associated with a \$0.105 increase in spending for low-income households, compared to a \$0.111 increase for higher-income households. For natural gas, the increase in spending for a one therm increase in use is \$1.11 for both groups. Appendix C provides a more thorough discussion of these results. It also shows that our CEX electricity spending results are robust to dropping households with the highest electricity spending, and also the state of California (that is, households most likely to pay high marginal prices under increasing block pricing).

The design of the CEX also makes it unlikely our results reflect bill non-payment or under-payment by low-income households. The CEX questions solicit the amount billed, not the amount paid, for utilities. We cannot rule out the possibility that households misinterpret the question and report the amount actually spent (low-income households may spend less on energy because they are receiving energy assistance), so we test whether results extend to households unlikely to receive energy assistance. Energy subsidies from LIHEAP, the federal assistance program, are limited to households below either 150 percent of the FPL or 60 percent of state median income (Perl, 2018). If energy assistance were driving our findings, we might expect the energy poverty gaps to disappear as we raise the poverty threshold. This is not the case: the spending disparities remain with a higher threshold of 200 percent of the FPL (Table B.4).

The differences in energy spending we document do not appear to be a product of differences in prices or billing associated with poverty status, but instead evidence of differences in household energy consumption during extreme weather.

6.2. Differences in indoor temperature

It is possible our estimates reflect differences in housing characteristics but not disparities in indoor temperatures. We rule this out by showing spending gaps exist conditional on housing types and sizes.

Smaller homes and apartments require less energy to maintain ambient temperature. In the CEX, low-income households' homes have on average fewer rooms (5.4 versus 6) and are more likely to be apartments (23 versus 15 percent), and these differences could result in energy consumption gaps without indoor temperature differences.

We find little evidence home sizes or types explain these energy spending gaps. First, our preferred specification uses the log of energy spending, which avoids scale effects. Thus, to explain the gap, smaller dwellings would need to require less of an increase in energy spending in *percentage* terms to maintain ambient temperature. Second, our estimates are robust to comparisons within size and type of home. While we do not observe square footage in the CEX, we do observe the number of rooms. For the log specifications, we estimate similar poverty gaps if we subset the data by the number of rooms and estimate the model separately for each subset (Table B.5). The point estimates on the extreme bins for higher-income households are also alike across these subsets, suggesting

⁸ These are Arizona, California, Colorado, Nevada, and New Mexico.

⁹ Using data from 2014–2016 they find 58 percent of households are served by utilities whose primary residential tariff has marginal prices that vary with consumption (p.6).

¹⁰ We cannot use these data to estimate our main specification for three reasons: we only observe household location at the Census division level, the RECS data is annual rather than monthly, and the RECS sample is much smaller than the CEX sample.

the percentage increase in spending in response to extreme weather is similar across homes of different sizes. Estimating poverty gaps within housing types in the CEX (such as apartments, or single family homes) also yields results consistent with our main estimates (though with less precision, see Table B.5), suggesting our findings are not driven by systematic differences in housing type by poverty status.

Conversely, differences in dwelling characteristics may cause consumption differences to understate differences in indoor temperature. This could be the case if lower-income households' homes are systematically less well insulated or served by less efficient heating and cooling systems. There is survey evidence for just these efficiency disparities: in the 2015 RECS, 25 percent of households below 1.5 times the FPL live in homes with poor or no insulation, compared with only 15 percent of households above that threshold. Frequent draftiness is reported in 19 percent of low-income households, versus 8 percent of other households. In the 2011 American Housing Survey, about twice as many households below the 1.5 FPL threshold as above it report inadequate heating capacity or inadequate insulation in their unit. Low-income households are also 50 percent more likely to report their dwelling has holes in the roof or walls. Thus, lower quality housing could lead to disparities in indoor temperatures even absent observed differences in consumption: the same amount of energy towards cooling will leave a less efficient home warmer on a hot day than a more efficient home.

Finally, while indoor temperature differences may reflect hardship, they are also consistent with low-income households consuming "just enough" heating or cooling. To test for this, we re-estimate Eq. (2) omitting the most affluent households, that is, those least likely to be concerned about utility bills and monitoring or rationing energy use. Table B.7 shows results are robust to dropping households above five and ten times the FPL, so the gap is not due to excess energy spending by affluent households. Corroborating this interpretation, both qualitative and survey evidence find that low-income households are more likely to keep their homes uncomfortably hot or cold (Hernández, 2016; Energy Information Administration, 2018).

6.3. Implications for health and policy

We conclude these energy spending gaps reflect differences in energy use that result in disparities in indoor temperature. Experiencing too-hot or too-cold temperatures may have serious health consequences. Extreme cold and heat cause a wide range of health ailments, including respiratory illness, heart attacks, and death. Compounding this, lower-income individuals are more likely to have underlying health conditions that increase the danger of exposure to extreme weather.

The energy spending gap during hot weather is likely not due to lack of access to air conditioning. Air conditioning is prevalent in the U.S.—nearly 90 percent of households had it in their home in 2015 (Energy Information Administration, 2018)—and when we re-estimate our main specification using only households with air conditioning, we find similar poverty gaps (Table B.8).¹¹ This suggests affordability, not availability, limits U.S. households' consumption of air conditioning over the period we study. Barreca et al. (2016) use data from 1960–2004 to find the relationship between heat and mortality was lower in areas where more households owned air conditioning—but to receive the health benefits of air conditioning, households must be able to afford to run their units.

The food spending results further support the explanation that low-income households keep their homes at less comfortable temperatures during extreme weather. If households cannot smooth budget shocks caused by high energy bills, we would expect them to decrease other variable expenses. We find statistically significant food spending poverty gaps, consistent with low-income households cutting back on necessities, such as maintaining a comfortable indoor temperature, in order to afford energy bills.¹² We cannot test for these monthly budget constraints directly because the CEX only reports income and total expenditures at the quarterly level. Using these quarterly data, we do find that low-income households are much more likely to be spending exactly what they take in each quarter (see Appendix Figure B.2). Overall, these results raise the possibility of a pattern of cutting back spending on healthful categories, such as medicine, in order to afford energy.

Our findings point to a failure of current U.S. assistance programs to adequately buffer households from energy bill shocks. This may be because take-up of these programs is limited: many households eligible for benefits are not enrolled (incomplete take-up of both SNAP and LIHEAP are documented in Currie (2006) and Graff and Pirog (2019), respectively). Benefits may also be inadequate. Twenty-six states did not offer any LIHEAP cooling assistance in 2015.¹³ In our sample, low-income households in these states reported average fuel expenditures of \$157 for June, July, and August; similar to the \$168 low-income households spent in states that did offer cooling assistance. Average summer fuel expenditures for low-income households in states without cooling assistance (\$157) are also comparable to their average winter (December, January, February) fuel expenditures of \$194. Eligibility thresholds may also be too low. While the LIHEAP eligibility cutoff is 150 percent of the FPL, poverty gap estimates for specifications with a cutoff of 200 percent of the FPL are very similar to those for 150 percent of the FPL (see Appendix Table B.4).

Climate change could exacerbate these weather-driven spending disparities. By 2065, the frequency of days with mean temperatures over 30 C is expected to rise by about 24 days per year under a business as usual scenario, while the frequency of days below –5 C is expected to fall by only 7 days.¹⁴ More frequent heat shocks may exacerbate the unaffordability of air conditioner

¹¹ The CEX does not differentiate between households that do not have air conditioning and those that do not respond to the question. Thus, the households we exclude from this analysis may or may not have air conditioning.

¹² It is possible low-income households have different food shopping responses to extreme temperature. Yet, if low-income households are more likely to delay shopping trips, we should find a corresponding rebound in food spending the next month. Instead, we find persistent poverty gaps (Table 4).

¹³ Full table of benefits from HHS available at <https://liheapch.acf.hhs.gov/tables/FY2015/heatbenefit.htm>.

¹⁴ This projection is for the typical household in the U.S. It comes from average changes in each bin of our temperature distribution from 2004–2018 to 2050–2065 under the RCP 8.5 scenario, across the CMIP5 ensemble models from Hsiang et al. (2017) and Rasmussen and Kopp (2017), combined with a middle-of-the-road county population forecast from Hauer (2019).

use for lower-income households. And while less frequent extreme cold may generate savings in winter energy spending (implying reduced energy insecurity during those months), the gains and losses at each end of the temperature distribution may not cancel out, but represent a further source of inequality. For example, low-income households in the Southern U.S. may be especially harmed by an increase in very hot days while households in the Northeast benefit the most from a reduction in extremely cold weather.

7. Conclusion

This paper estimates how energy and food spending responds to unexpectedly hot or cold weather, with a focus on estimating the difference in the response for low and higher-income households. Our data come from the U.S. Consumer Expenditure Survey for 2004–2018. We pair these household-level data with distributions of daily temperatures at the state-month level. We exploit variation in the frequency of unseasonably hot or cold weather to identify how spending on energy and food changes for low- and higher-income households.

We find a novel poverty gap in the energy spending response to very hot weather, and a corresponding disparity for very cold weather. Higher-income households increase monthly spending by 0.5 percent when faced with an additional very hot day (>30 C/>86 F) relative to a temperate day (15–20 C/59–68 F), whereas low-income households increase their energy spending by only 0.2 percent. The implied difference in electricity use could power a window air conditioner for about four hours. We also find poverty gaps in the food spending response to temperature: food spending by low-income households falls in response to unexpected days with extreme temperature, hot or cold, whereas higher-income food spending is unaffected. This corroborates the concern that lower-income households cut back on necessities to afford energy bills.

This research has implications for existing social programs. It suggests low-income households are especially vulnerable to exposure to weather shocks. Currently, many U.S. states provide heating assistance but not cooling assistance. The hotter, Southern U.S. already has the highest rates of energy insecurity and the lowest fraction of households receiving energy assistance ([Energy Information Administration, 2018](#)). Many households that do not receive cooling assistance might benefit from it, particularly as the frequency and intensity of heatwaves rises.

We note several open questions that merit greater study. Differences in spending are particularly concerning if they result in health disparities. Our findings highlight the unaffordability of energy as a potential mechanism behind income-associated effects of extreme weather on health. We cannot assess these health effects directly, but future work could pair a study of energy affordability with direct measures of health outcomes. Next, research could explore how extreme weather affects spending composition. Our findings suggest extreme weather crowds out other spending, but the types of spending crowded out (e.g., soda versus fruits and vegetables or medicine) matters for the health consequences of these shocks. Finally, research to better understand the effects of energy assistance programs on health and financial well-being could help policymakers serve vulnerable households. Cooling technologies like air conditioning have a key role to play in adaptation to climate change, but so does energy assistance: the affordability of adaptation is likely to affect the distribution of climate damages.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.jeem.2022.102609>.

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Crisis in Energy Affordability
Summer Shutoff Protections and Bill Support Fail to Adapt to a Warming World
July 2024

Key Findings

State shut-off rules to help families stay connected to cooling during periods of extreme temperatures have not kept pace with the realities of climate change. Many were written decades ago when in many parts of the country dangerous temperatures were limited to short-term heat waves and the demand for electricity to run cooling systems was much lower because fewer families had access to air-conditioning. This issue brief provides background on why energy is becoming less affordable to low income families, and the limitations of current federal funding programs and state shut-off rules to protect families during periods of high summer temperatures.

- **Low income families struggle to pay their home energy bills. The rapid increase in the cost of basic goods – food, shelter and energy – have placed millions of low income families in the precarious position of having to choose between paying their home energy bill and food, rent and medicine.** While the overall rate of inflation is finally starting to come down, the impact of rapidly rising prices in the last year have taken their toll.
- **Summer shut-off protections are only required by 19 states and DC. About 49% of the US population (164.2 million) of the US population (334.9 million) live in the 31 states with no summer shut-off protections.** Of the 92.3 million people with incomes of less than 200 percent of the federal poverty level, 45.2 million (49.0 percent) live in the states with no shut-off protections. (See page 8)
- **The lack of shut-off protections will put millions of low income families at risk of shut-off this summer** as the cost of home cooling continues to rise as families crank-up their air conditioning as temperatures continue to reach record levels. NEADA and CEPC recently [estimated](#) that the financial burden to families of keeping cool this summer will increase by 8.7 percent across the United States to an average of \$719 from June through September, up from \$661 during the same period last year.
- **Federal Funding for the Low Income Home Energy Assistance Program Reduced by \$2 billion:** The dangers of extreme heat leave low-income families at heightened risk, due to lack of access to affordable summer cooling, increasing electric costs and cutbacks in funding for the federal Low Income Home Energy Assistance Program (LIHEAP) from \$6.1 billion in FY 23 to \$4.1 billion for FY 24.

States have reported that due to the reduction in federal funds, they will have no choice this year but to reduce the number of households served by about one million, and reduce average heating and cooling benefits. It is estimated that only around 12% of LIHEAP funds will be used on summer cooling despite predictions of another summer of unprecedented high temperatures. NEADA has called on Congress to restore the additional [\\$2 billion plus \\$1 billion in emergency funds](#) to help families pay the additional costs associated with cooling this summer.



Crisis in Energy Affordability Summer Shutoff Protections and Bill Support Fail to Adapt to a Warming World July 2024

Rising temperatures are putting millions of low-income families at risk of losing access to home energy during the summer months as they struggle to pay higher cooling costs. The National Energy Assistance Directors Association (NEADA) and the Center for Energy Poverty and Climate (CEPC) [project](#) that the financial burden of residential cooling will increase this summer by 8.7% across the United States to an average of \$719 from June through September, up from \$661 during the same period last year. Increased cooling costs means that low-income families will be at risk for incurring debt to pay for cooling; face utility shut offs due to unpaid electricity bills; and suffer dangerous health effects of extreme heat exposure.

Almost 20% of very Low-Income Families have no Air Conditioning: For households who will be shut off from electricity this summer because they cannot afford their bills, **even being inside their homes is dangerous.** In less extreme situations, a family can ride out a hot day by opening their windows, taking a cool shower, and hoping it cools down at night. But when the heat persists for weeks, or the outside air is dangerous, opening a window will only make things worse.

Energy price increases fall hardest on low-income households. The average energy burden for low-income households is about [8.6% of income](#), almost three times the rate for non-low-income households (3.0%). Of even more concern, the most recent [Census Households Pulse Survey \(7/11/2024\)](#), which was designed to estimate the economic impact of the pandemic on families, found that:

- The percentage of households that could not pay their energy bill for at least one month in the last year increased, from 21.6% to 23.7%. The largest increase was in households with children, which increased from 29.3% to 32.4%.

Percent of Households Unable to Pay Energy Bill

Household was unable to pay an energy bill or unable to pay the full bill amount, at least one month in the last year

Time Period	National Average	Low- and Moderate-Income (<\$50k)	Households with Children	Households of Color
5/28/2024 - 6/24/2024	23.7%	37.4%	32.4%	32.3%
6/7/2023 - 6/19/2023	21.6%	36.3%	29.3%	31.1%

Table: NEADA • Source: Census Pulse Survey July 2024 • Created with Datawrapper

- The percentage of households reporting that they kept their home at unsafe temperatures also increased during the 12-month period, from 20.3% to 22.0%. The largest increase with this metric was in households with children, increasing from 19.8% to 22.4%.

Percent of Households Keeping Home at Unsafe Temperature to Save Money on Energy Bill, by Survey Period

Household kept home at a temperature that felt unsafe or unhealthy, at least one month in the last year

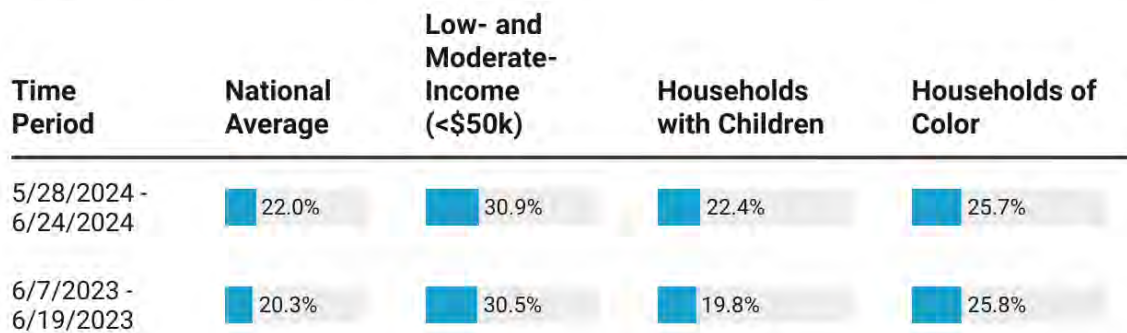


Table: NEADA • Source: Census Pulse Survey July 2024 • Created with Datawrapper

- More than one out of three households (34.2%) reduced or forewent basic household expenses at least once during the previous 12 months in order to pay their home energy bills. Of all households surveyed during the reporting period, the largest increase was in households with children, from 38.7% to 40.9%.

Percent of Households Foregoing Basic Necessities to Pay Energy Bills, by Survey Period

Household reduced or forewent expenses for basic household necessities, such as medicine or food, in order to pay an energy bill, at least one month in the last year

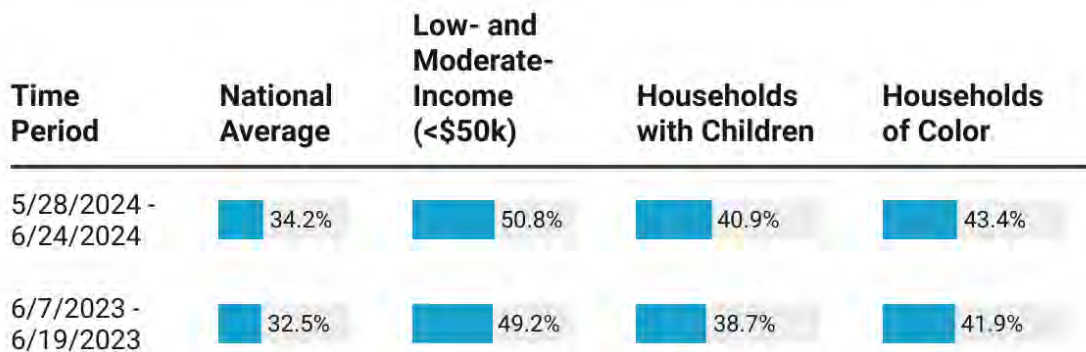
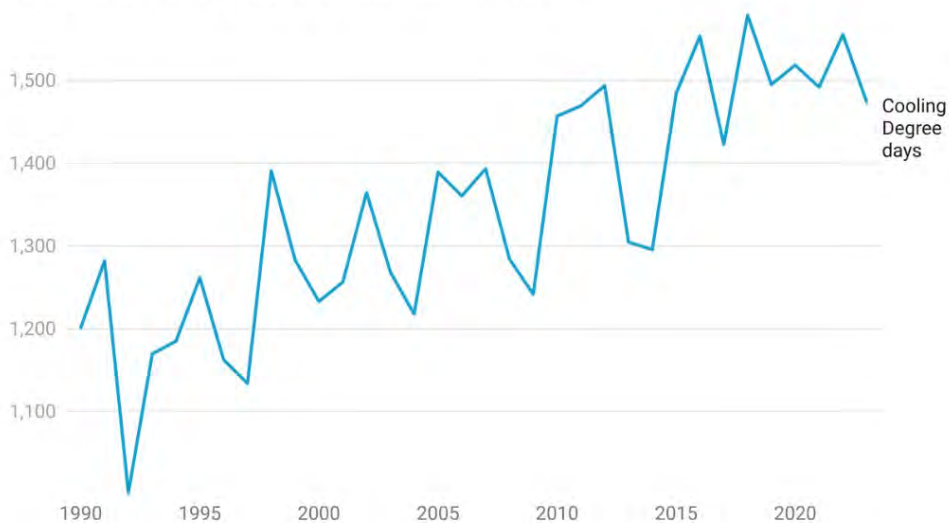


Table: NEADA • Source: Census Pulse Survey July 2024 • Created with Datawrapper

Increased Need for Cooling: The fact that temperatures are rising due to climate change is not news. The Energy Information Administration, which has been tracking a metric for calculating the number of days in a year that require cooling since 1990, has found a steady increase in cooling degree days over time. Families that may have not had cooling, or only needed to turn on their air conditioners during brief heat waves in prior decades are now using cooling more frequently, for longer periods of time, and are paying the additional cost.

Cooling Degree Days 1990 to 2023

Yearly cooling degree days for the entire United States



Source: EIA • Created with Datawrapper

Furthermore, the United States is woefully unprepared for the health and financial impacts of a hotter world. Rising temperatures are not just uncomfortable, they are also a major cause of heat stroke and death. A recent report from the Department of Health and Human Services tracking extreme heat and extreme heat risk factors reported that there were an estimated [2,302](#) heat related deaths in 2023 over triple the average from 2004 to 2018 as reported by the Center for Disease Control and prevention of [702](#). In part, these figures are increasing due to on average longer heat waves than in decade past, as an Environmental Protection Agency report [released last week](#) made clear.

Federal Funding for the Low-Income Home Energy Assistance Program Reduced by \$2 billion:

The dangers of extreme heat leave low-income families at heightened risk, due to lack of access to affordable summer cooling, increasing electric costs and cutbacks in funding for the federal Low Income Home Energy Assistance Program (LIHEAP) from \$6.1 billion in FY 23 to \$4.1 billion for FY 24. States have reported that due to the reduction in federal funds, they will have no choice this year but to reduce the number of households served by about one million, and reduce average heating and cooling benefits. Its estimated that only around 12% of LIHEAP funds will be used on summer cooling despite predictions of another summer of unprecedented high temperatures.

Summer Cooling/Bill Payment/Shut-Off Protections: Shut-off protections are put in place by the state governing body that oversees regulated utilities to protect families from losing access to heating or cooling during extreme temperatures. When shutoff protections are not in place, utilities generally follow a structured process when a family falls behind on the bill. This includes issuing late fees, a disconnections notices and then issue a disconnect order. State Public Utility Commissions do not have jurisdiction over cooperative or municipal utilities, or delivered fuel providers, so they are not subject to shutoff protection requirements.

In general, winter shutoff protections are more robust than in the summer. The best winter protections provide blanket shut-off protections for low-income families for the months of December to March. The argument being that winter temperatures are unpredictable and families need to be protected against shut-offs even in periods of warmer temperatures during the winter months. Other states use temperature-based rules that only protect families during periods of very low-temperatures, overall 46 states and DC have some winter shut-off protections.

On the other hand, summer shut-off protections have changed little since they were first established in the early 1970s. At that time, summer heat waves were limited in scope and air conditioning was needed was needed in only part of the summer cooling season. Of the states that have summer protections they are primarily temperature-based – they only go into effect if the outside temperature reaches a certain level – do not take humidity into consideration and only apply during the core summer months, usually May to August.

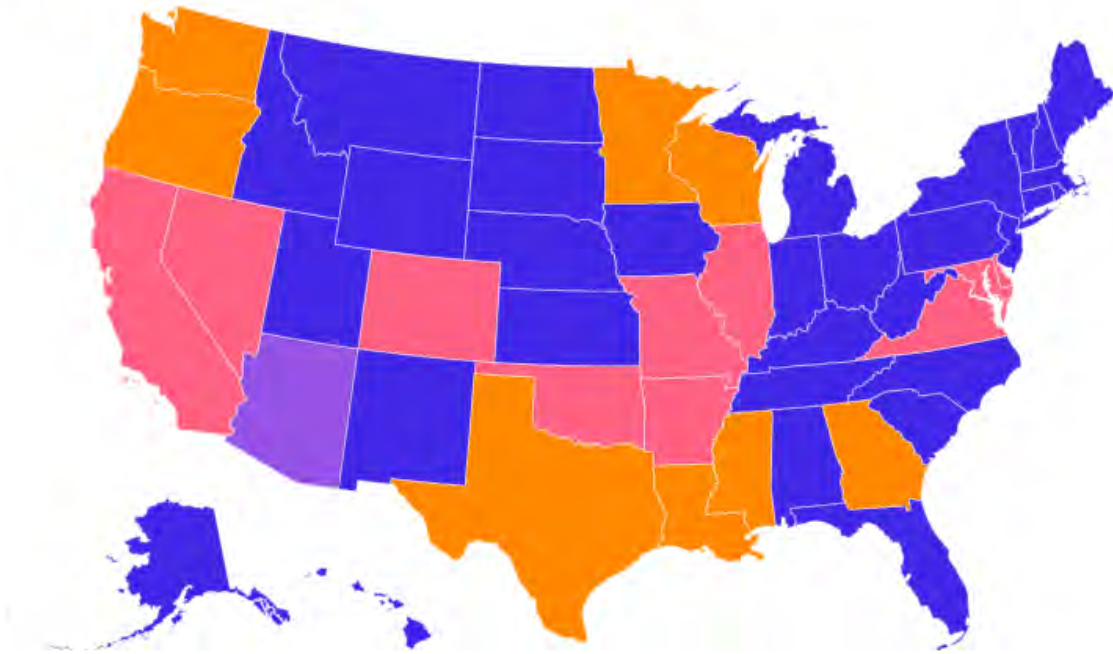
The following provides a summary of state-by-state summer protections. A detailed table follows at the end of this paper. Three types protections are offered by 19 states and DC:

1. Temperature-based shutoff protection. The temperature that triggers this protection varies widely between states from 90 degrees to 105 degrees.
2. Temperature and date based. Similar to temperature-based, except protection from shutoff is only available during a specific time period.
3. National Weather Service warning. Shutoff protections go into effect when the National Weather Service issues a heat advisory for that area.
4. Date based, where the state offers blanket shut-off protections during certain months.

The remaining 31 states offer no protection from shutoff during the summer.

Summer Shut-off Protections by State

■ None
 ■ Date Based Protections
 ■ Temperature Based Protections
 ■ National Weather Service Heat Warning



Next Steps: The data presented in this memorandum demonstrate that the current system to protect low-income families from high summer cooling bills and the threat of disconnection if they cannot pay those bills needs to be updated to reflect longer summer cooling periods. The data presented in this report will be used to develop model summer cooling protections that reflect the longer waves and the risk that they place on low-income families, especially those with vulnerable health conditions.

Source: Center for Energy Poverty and Climate

US Population Living in States With and Without Summer Protections

US population who live in states with summer shut off protection

	US Total	People Of Color	200% of Poverty	125% of Poverty	Children	Elderly
Population with Protections	170,683,612	75,144,216	47,115,526	27,054,136	37,404,279	26,867,744
Population without Protections	164,231,283	51,991,419	45,204,418	26,087,488	33,837,244	29,553,339
% with Protections	51.0%	59.1%	51.0%	50.9%	52.5%	47.6%
% without Protections	49.0%	40.9%	49.0%	49.1%	47.5%	52.4%

Created with Datawrapper

The [Center for Energy Poverty and Climate](#) (CEPC) is a nonprofit organization that is creating a platform for policymakers to engage directly with one another to share best practices and lessons learned, brainstorm solutions to difficult problems, and find innovative ways to braid funds and leverage programs to achieve net zero.

The [National Energy Assistance Directors Association](#) (NEADA) is the primary educational and policy organization for state directors of the Low Income Home Energy Assistance Program (LIHEAP), a federal program that helps low-income families pay their heating and cooling bills.

Appendices

Protections Listed by State			
Summer Protections	No Summer Protections	Winter Protections	No Winter Protections
Arizona	Alabama	Alabama	Alaska
Arkansas	Alaska	Arizona	Florida
California	Connecticut	Arkansas	Hawaii
Colorado	Florida	California	Kentucky
Delaware	Hawaii	Colorado	North Dakota
DC	Idaho	Connecticut	
Georgia	Indiana	Delaware	
Illinois	Iowa	DC	
Louisiana	Kansas	Georgia	
Maryland	Kentucky	Idaho	
Minnesota	Maine	Illinois	
Mississippi	Massachusetts	Indiana	
Missouri	Michigan	Iowa	
Nevada	Montana	Kansas	
Oklahoma	Nebraska	Louisiana	
Oregon	New Hampshire	Maine	
Texas	New Jersey	Maryland	
Virginia	New Mexico	Massachusetts	
Washington	New York	Michigan	
Wisconsin	North Carolina	Minnesota	
	North Dakota	Mississippi	
	Ohio	Missouri	
	Pennsylvania	Montana	
	Rhode Island	Nebraska	
	South Carolina	Nevada	
	South Dakota	New Hampshire	
	Tennessee	New Jersey	
	Utah	New Mexico	
	Vermont	New York	
	West Virginia	North Carolina	
	Wyoming	Ohio	
		Oklahoma	
		Oregon	
		Pennsylvania	
		Rhode Island	
		South Carolina	
		South Dakota	
		Tennessee	
		Texas	
		Utah	
		Vermont	
		Virginia	
		Washington	
		West Virginia	
		Wisconsin	
		Wyoming	

200% of Poverty with and Without Summer Protections			
Population with Summer Protections		Population without Summer Protections	
State	Population	State	Population
Arizona	2,117,299	Alabama	1,713,641
Arkansas	1,114,447	Alaska	174,988
California	10,572,958	Connecticut	768,507
Colorado	1,273,479	Florida	6,584,110
Delaware	222,908	Hawaii	324,113
DC	147,627	Idaho	549,313
Georgia	3,194,151	Indiana	1,947,879
Illinois	3,227,523	Iowa	814,867
Louisiana	1,710,593	Kansas	807,390
Maryland	1,321,686	Kentucky	1,545,838
Minnesota	1,238,999	Maine	350,396
Mississippi	1,136,002	Massachusetts	1,465,517
Missouri	1,798,198	Michigan	2,879,030
Nevada	947,160	Montana	323,063
Oklahoma	1,401,258	Nebraska	507,649
Oregon	1,147,379	New Hampshire	247,325
Texas	9,373,489	New Jersey	1,950,386
Virginia	2,003,411	New Mexico	769,227
Washington	1,709,507	New York	5,506,926
Wisconsin	1,457,452	North Carolina	3,132,734
Total	47,115,526	North Dakota	181,844
% of Total	51.0%	Ohio	3,355,981
		Pennsylvania	3,322,587
		Rhode Island	248,579
		South Carolina	1,627,959
		South Dakota	240,358
		Tennessee	2,161,809
		Utah	753,049
		Vermont	152,953
		West Virginia	641,593
		Wyoming	154,807
		Total	45,204,418
		% of Total	49.0%

Total US Population With and Without Summer Potections			
Population with Summer Protections		Population without Summer Protections	
State	Population	State	Population
Arizona	7,431,344	Alabama	5,108,468
Arkansas	3,067,732	Alaska	733,406
California	38,965,193	Connecticut	3,617,176
Colorado	5,877,610	Florida	22,610,726
Delaware	1,031,890	Hawaii	1,435,138
DC	678,972	Idaho	1,964,726
Georgia	11,029,227	Indiana	6,862,199
Illinois	12,549,689	Iowa	3,207,004
Louisiana	4,573,749	Kansas	2,940,546
Maryland	6,180,253	Kentucky	4,526,154
Minnesota	5,737,915	Maine	1,395,722
Mississippi	2,939,690	Massachusetts	7,001,399
Missouri	6,196,156	Michigan	10,037,261
Nevada	3,194,176	Montana	1,132,812
Oklahoma	4,053,824	Nebraska	1,978,379
Oregon	4,233,358	New Hampshire	1,402,054
Texas	30,503,301	New Jersey	9,290,841
Virginia	8,715,698	New Mexico	2,114,371
Washington	7,812,880	New York	19,571,216
Wisconsin	5,910,955	North Carolina	10,835,491
Total	170,683,612	North Dakota	783,926
% of Total	51.0%	Ohio	11,785,935
		Pennsylvania	12,961,683
		Rhode Island	1,095,962
		South Carolina	5,373,555
		South Dakota	919,318
		Tennessee	7,126,489
		Utah	3,417,734
		Vermont	647,464
		West Virginia	1,770,071
		Wyoming	584,057
		Total	164,231,283
		% of Total	49.0%

State Utility Shutoff Moratorium Overview			
State	Protection Dates	Temperature	Seasonal Policy
Alabama		<32° F	
Alaska			No disconnect for seriously ill, disabled.
Arizona	6/1 - 10/15	32° F and below or 95° F and above	Utilities advised not to terminate residential service when the customer has an inability to pay and where weather will be especially dangerous to health (usually 32° F or below for winter and above 95° F for summer) as determined by the Commission.
Arkansas		<32° F or >95° F (elderly and disabled)	No disconnect for elderly or disabled or medical emergency.
California		<32° F or >95° F	
Colorado		>95° F	
Connecticut	11/1 - 5/1		No disconnect for hardship customers.
Delaware	11/15 - 4/15	20° F or below, 105° F or above	
District of Columbia		<32° F or 95° F and above	
Florida			
Georgia	11/15 - 3/15	<32° F or National Weather Service Heat Advisory or Excessive Heat Warning in effect	No disconnect if illness would be aggravated.
Hawaii	None	None	
Idaho	12/1 - 3/1		Disconnect ban for households with children under 18, elderly age 62 or older, or infirm.
Illinois	12/1 - 3/31	<32° F; >=95° F: NWS Heat Warning	
Indiana	12/1 - 3/15		Prohibits disconnect if customer qualifies and applies for state energy assistance.
Iowa	11/1 - 4/1	<20° F	
Kansas	11/1 - 3/31	<35° F	
Kentucky			
Louisiana		Winter termination procedures: The previous day's highest temperature did not exceed 32° F, and the temperature is predicted to remain at or below that level for the next 24 hours. Summer termination procedures: When NWS issues a heat warning for any parish in the utility's service territory, or when such a	

State Utility Shutoff Moratorium Overview			Seasonal Policy
State	Protection Dates	Temperature	
		warning has been issued on any one of the preceding two calendar days.	
Maine	11/15 - 4/15		Must agree to special payment arrangement
Maryland	11/1 - 3/31	During the next 72 hours, if 32° F or below during winter dates or if temperature exceeds 95° F at any time of year	
Massachusetts	11/15 - 3/15		Disconnect not permitted if household includes child <12 months, seriously ill member or all residents are 65 or older.
Michigan	11/1 - 3/31		Winter Protection Plan for elderly 65 years or older, recipients of Medicaid, SNAP or state emergency relief, full-time active military personnel or persons needing critical care or having a certified medical emergency. Households with income less than 150% of federal poverty level must be in a payment plan.
Minnesota	10/1 - 4/30	Disconnect ban for residential electricity service when an excessive heat watch, heat advisory, or excessive heat warning has been issued by the National Weather Service	
Mississippi	12/1 - 3/31	Summer Rule: Residential customers shall have the right to avoid discontinuation of electric service for nonpayment of bills if, as of 8:00 am on the scheduled disconnection day, and Excessive Heat Warning has been issued by the National Weather Service for the county of the scheduled disconnection.	
Missouri	11/1-3/31, 6/1-9/30	<32° F and 95° or above	
Montana	11/1 - 4/1	No disconnect when the temperature at 8 a.m. is below 32° F or if freezing temperatures are forecast for the next 24 hours for customers receiving public assistance or if household member is age 62 or older or disabled.	
Nebraska			No disconnect for low-income natural gas customers with proof of eligibility for energy assistance.
Nevada		15° F or below and 105° F or above	
New Hampshire	11/15 - 3/31		



State Utility Shutoff Moratorium Overview			
State	Protection Dates	Temperature	Seasonal Policy
New Jersey	11/15 - 3/15		Disconnect ban for customers receiving Lifeline, LIHEAP, TANF, SSI, or households unable to pay overdue amounts due to unemployment, medical expenses, or recent death of spouse
New Mexico	11/15 - 3/15		Must be current with payments or have entered into a payment agreement and are current with that agreement by Nov. 15
New York	Two week period between 12/25 and 12/31		
North Carolina	11/1 - 3/31		No disconnect for elderly, disabled, and customers who are eligible for the Energy Crisis Assistance Program.
North Dakota			
Ohio	10/20 - 4/15		Medical certification program.
Oklahoma		32° F or below (daytime), 20° F or below (night), or heat index 101° F or higher	
Oregon		Any day a forecasted high temperature of 32° F or below or on any day a local Heat Advisory is issued by the applicable weather reporting service.	
Pennsylvania	12/1 - 3/31		
Rhode Island	11/1 - 4/30		Disconnect ban for elderly, disabled, seriously ill, households with child under 2 years old, or recipients of unemployment compensation, federal heating assistance or have income 75% or less of state median income.
South Carolina		Disconnection is suspended when the average forecasted temperature is 32°F or below for a 45-hour period.	
South Dakota	11/1 - 3/31		
Tennessee		<32° F	
Texas		<32° F or during heat advisory	No disconnect for elderly 65 years + and critical care customers until Oct. 1
Utah	11/15 - 3/15		
Vermont	11/1 - 3/31	<10° F or <32° F for households with elderly age 62 or older.	
Virginia		<32°F or >92°F	Disconnect delay for persons with a 'Serious Medical Condition Certification Form.' This is a year-round policy.

State Utility Shutoff Moratorium Overview			
State	Protection Dates	Temperature	Seasonal Policy
Washington	11/1 - 3/31	NWS heat advisory	
West Virginia	11/1 - 3/31	Service may not be disconnected on a day the National Weather Service predicts temperature to be 32 degrees Fahrenheit or colder near the customer's home.	Disconnection may be delayed when termination of service would be especially dangerous to the health or safety of a member of the customer's household.
Wisconsin	11/1 - 4/15	Prohibited when heat advisory from the National Weather Service is in effect.	Prohibited when heat advisory from the National Weather Service is in effect.
Wyoming	11/1 - 4/30	Disconnection only if above 32° F	



Article

Heat-Related Illness Is Associated with Lack of Air Conditioning and Pre-Existing Health Problems in Detroit, Michigan, USA: A Community-Based Participatory Co-Analysis of Survey Data

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Abstract: The objective of the study was to investigate, using academic-community epidemiologic co-analysis, the odds of reported heat-related illness for people with (1) central air conditioning (AC) or window unit AC versus no AC, and (2) fair/poor vs. good/excellent reported health. From 2016 to 2017, 101 Detroit residents were surveyed once regarding extreme heat, housing and neighborhood features, and heat-related illness in the prior 5 years. Academic partners selected initial confounders and, after instruction on directed acyclic graphs, community partners proposed alternate directed acyclic graphs with additional confounders. Heat-related illness was regressed on AC type or health and co-selected confounders. The study found that heat-related illness was associated with no-AC ($n = 96$, odds ratio (OR) = 4.66, 95% confidence interval (CI) = 1.22, 17.72); living ≤ 5 years in present home ($n = 57$, OR = 10.39, 95% CI = 1.13, 95.88); and fair/poor vs. good/excellent health ($n = 97$, OR = 3.15, 95% CI = 1.33, 7.48). Co-analysis suggested multiple built-environment confounders. We conclude that Detroit residents with poorer health and no AC are at greater risk during extreme heat. Academic-community co-analysis using directed acyclic graphs enhances research on community-specific social and health vulnerabilities by identifying key confounders and future research directions for rigorous and impactful research.

Keywords: climate change; heat wave; heat exhaustion; community-based participatory research

1. Introduction

Global climate change is occurring, attributable in large part to the increased burning of fossil fuels by humans [1]. Extreme heat events are expected to increase in frequency, severity, and duration as a result of climate change [1]. Warm temperature extremes have direct impact on health by compromising the body's ability to regulate its internal temperature [2]. Loss of internal temperature control can result in a cascade of health effects including heat cramps, heat exhaustion, heatstroke, hyperthermia, respiratory problems, or mortality [2]. The impacts of extreme heat events disproportionately affect the health of certain subpopulations. Vulnerable populations such as the elderly, young children,

low-income communities, communities of color, and individuals with existing health problems have a higher health burden of heat exposure [3,4].

The location of populations can also further heighten the burden of heat-related illness and mortality. Populations who live in urban areas are at a disadvantage given the urban infrastructure. Three urban features can contribute to what is known as the urban heat island effect, in which urban and suburban areas have elevated air temperatures relative to surrounding rural areas or wildlands. These include use of dark, dense paving and building materials; the three-dimensional form of buildings, which absorb solar radiation and restrict air circulation; and a reduced abundance of vegetation, which decreases shade and restricts evaporation and transpiration, which can cool the environment [5]. On hot days, which tend to occur with high-pressure weather systems, air quality in urban areas may also worsen [2]. In areas where air pollution exposures tend to be higher, adverse health effects on extreme heat days could potentially be worse than they are in areas with lower levels of air pollution [3]. People living in urban areas may find refuge from extreme heat through the use of cooling mechanisms such as air conditioning (AC). However, AC units can increase the outdoor air temperature. For example, in Tokyo the “waste” heat from AC units has caused a temperature rise of 1–2 °C or more on weekdays [6]. The increase of outdoor heat can promote further increased use of AC for some. However, lower-income residents typically lack the monetary resources to obtain AC or may limit using AC to minimize utility costs [5].

This study uses data from Detroit, Michigan, a U.S. city that has a 35.7% poverty rate [7] and a median household income of \$28,099 [7], where health disparities related to heat exposure are well documented. The data were collected in Detroit as part of a National Science Foundation (NSF)-funded three-site project “Enhancing Emergency Preparedness for Critical Infrastructure Failure during Extreme Heat Events.” Previous studies [8,9] showed that Detroiters experience high indoor temperatures, use relatively less AC compared to other U.S. cities, lack access to cooling centers and cool spaces, and experience pronounced urban heat island effects. In interviews, Detroit residents described their concern about heat and other climate-related exposures [10,11].

When researching environmental and social determinants of marginalized communities’ health status, researchers and practitioners have called for increased attention to greater community involvement and sensitivity about working in diverse communities [12]. Recently, community-based approaches to public health are becoming a more commonly employed approach to develop knowledge and action in the field [13]. Community-based participatory research (CBPR) focuses on conducting research with a community as a social and cultural entity that is actively engaged in the research process. Partnerships form to strengthen and enhance the understanding of the research interests through utilizing the unique skills, resources, and knowledge of everyone involved. This collaborative approach treats all partners as equals and integrates knowledge and action for the mutual benefit of all partners.

With the rise of CBPR within the public health field, researchers are now challenged to incorporate community members as equal partners in all phases of research. However, community partners often do not participate in the analysis phase of the research [14] despite the potential for alternate perspectives on data interpretation to enhance research insights [15,16]. An analysis of 25 National Institutes of Health (NIH)- and Centers for Disease Control and Prevention (CDC)-funded CBPR projects in the Southeast U.S. found a wide range of community participation rates among the components of research, with data analysis, data ownership, and interpretation of findings ranked among the lowest in terms of community participation [17]. Additionally, sharing research results with community partners through internal dissemination requires that complex data be discussed in an understandable format with opportunities to answer questions, exchange knowledge, jointly interpret results, and discuss how the results will be used [18].

For this study, we employed a CBPR approach to co-analyze and co-interpret the data from a larger project on self-reported experiences with housing and community resources and health impacts of extreme heat among 101 residents of Detroit, Michigan. The research objectives were to (1) understand

the association between heat-related health effects and AC ownership, (2) understand the association between heat-related health effects and health status, and (3) gain new insights on the inclusion of community partners in the data analysis and interpretation phase of research.

2. Methods

2.1. Survey Data Collection

We obtained consent from and surveyed 101 adult Detroit residents in 2016–2017 regarding weather and air pollution. Fifty-one of these residents were selected from lists of individuals who had received services from or volunteered with three neighborhood organizations—Jefferson East Inc. (multi-service neighborhood organization that serves low-income populations on Detroit’s east side), the Friends of Parkside (resident advocate based at the Villages of Parkside public housing complex on Detroit’s east side), and Southwest Detroit Environmental Vision (neighborhood organization focused on improving the environment and strengthening the economy of Southwest Detroit). List members were categorized by housing type (masonry vs. non-masonry, single vs. multi-family, two or fewer stories vs. 2–5 stories, presumed AC status) and contacted randomly within type. An additional 50 Detroit residents were recruited without consideration of neighborhood or housing type at community events. The selected residents were asked 125 questions about their demographics, housing address and characteristics, weather and air pollution risk perception, electrical cooling behaviors, short-term cooling strategies in and outside the home, long-term cooling strategies including home improvements, black-out experiences, social networks, general health status, and heat impacts on health. The survey was administered, after the resident’s informed consent, by study staff on a tablet with programmed skip patterns. All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the University of Michigan Institutional Review Board (HUM00102979).

2.2. Health Outcome

The health outcome of interest, heat-related illness, or “heat exhaustion”, was measured through the survey question, “During the past 5 years or so, have you had medical symptoms related to heat exhaustion from high temperatures such as muscle cramps, dizziness, tiredness, weakness, throbbing headache, nausea or vomiting, fainting, or paleness?” using a definition adopted from the CDC [19].

2.3. Main Exposures

AC use was measured through the survey question, “Do you use the air conditioner to cool your home during the summer?”. We subcategorized responses as: those who did not use or do not have central air or a window AC unit (none), those who program their thermostats for their central air (reference), and those who have a window AC unit (low).

Health status was measured through the survey question, “In general, compared to other people your age, would you say your health is . . . ” where the designated options were Excellent, Good, Fair, or Poor.

2.4. Co-Analysis

A directed acyclic graph (DAG) was used to illustrate the relationships between the variables and to identify potential confounders and covariates. DAGs are a graphical tool used in epidemiology to identify, a priori, sources of bias and hence variables that should and should not be included in a model of the association between a particular health outcome and a particular exposure. Arrows represent direct effects, and the graph is “acyclic” because there are no feedback loops in the graph. In the final model, controlling for or conditioning on a variable closes paths that pass through that variable and, in theory, eliminates bias from that variable, with the goal of having only causal paths (which may still include mediators) from the exposure to the outcome. (For further discussion including instances

when bias can actually be introduced by conditioning on a variable, such as a collider, see Greenland and Pearl's 2014 overview of DAGs [20].) Four academic partners first constructed a DAG and then provided instruction to the community partners on the concept and function of DAGs. Next, the DAG was brought to a meeting of the "Heatwaves, Housing, and Health" community-academic research partnership. This partnership's steering committee included University of Michigan faculty and representatives from five not-for-profit organizations in Detroit, described in further detail [21]. Three of these organizations, Jefferson East, Inc., Friends of Parkside, and Southwest Detroit Environmental Vision, assisted with recruitment and retention (see above). The other two organizations, Detroiters Working for Environmental Justice and EcoWorks, advocate for and assist with environmental and housing concerns on behalf of Detroit residents citywide. Through discussion, the community partners and academic partners co-selected potential confounders, expanding the original DAG the academic partners created to include housing and neighborhood characteristics, utility cost concerns, and age (Figure 1). The community partners emphasized the potential for negative confounding from the fact that older homes with more stories and large homes that have been converted to multifamily housing may not have central AC (correlation with the exposure) but may have less need for it given the cooling impacts of the design features of these older homes and resulting potential association with indoor temperature and, therefore, the health outcome.

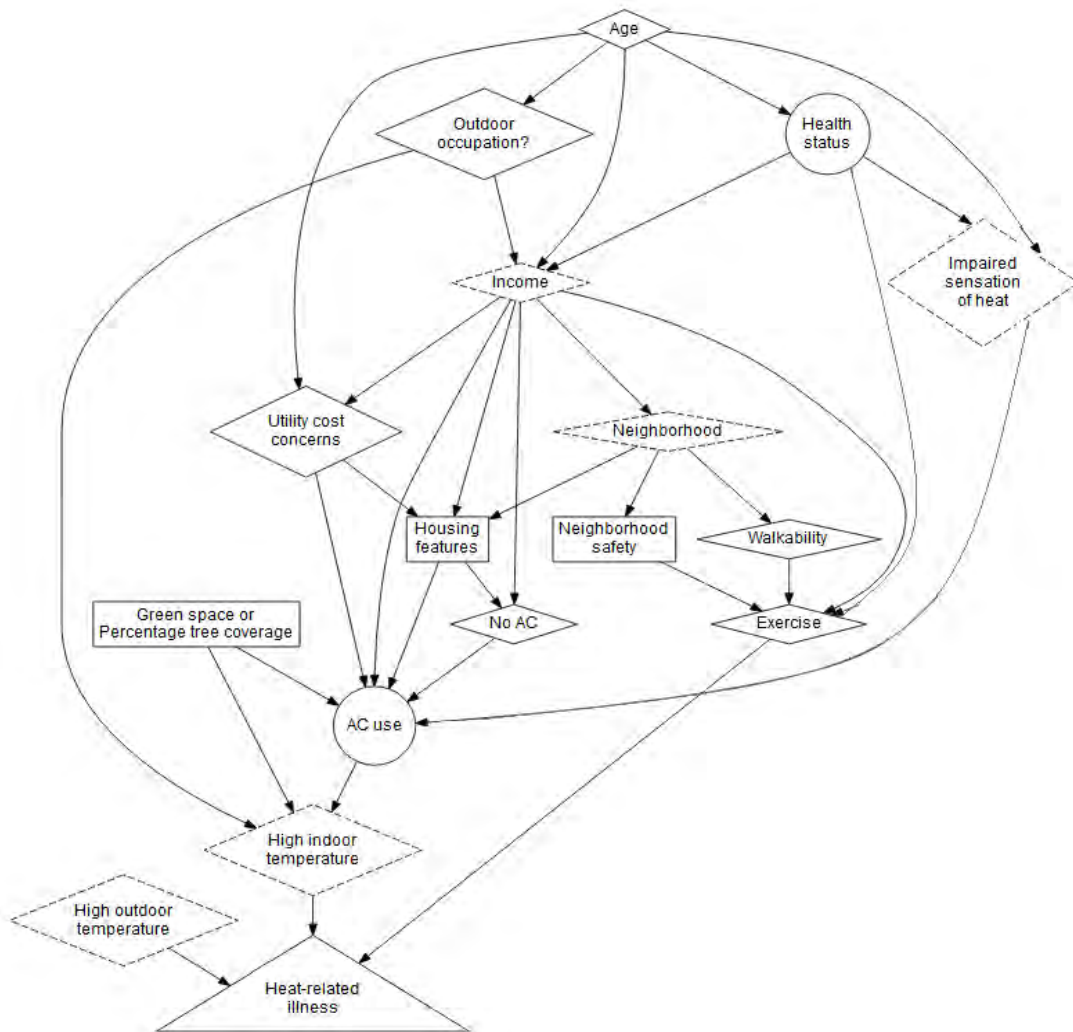


Figure 1. Directed acyclic graph (DAG) of proposed associations between and confounding of air conditioning (AC) use and heat exhaustion and self-reported health status and heat exhaustion.

Variables in circles were the main exposure, the variable in the triangle was the health outcome, variables in diamonds were potential confounders, variables in boxes were potential confounders selected by community partners, variables in dashed diamonds were variables for which information was not available or, in the case of neighborhood, indicators that we could not include in the models because some neighborhoods were represented by only a single respondent.

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2.5. Potential Confounders

Utility cost concerns were measured through the survey question, “When it comes to air conditioning, the cost of electricity is ... ?” where the designated options were Very, Somewhat, Not too, and Not at all limiting. We included this variable due to concerns that individuals with central or window AC would not fully use these features if utility cost concerns were high.

Indoor environments may remain cool in this climate for housing-related reasons besides AC ownership, such as proximity of the roof to living spaces or surrounding shade. Therefore, housing stories, housing family size, and the percent of tree canopy were included as potential confounders. Tree canopy from the 2010 Southeast Michigan Council of Governments (SEMCOG) high-resolution land cover data created by Light Detection and Ranging (LIDAR) was summarized by 2010 census tract and City of Detroit parcel boundaries using the Tabulate Intersection tool in ArcGIS 10.6.

Given that individuals may be more likely to have heat illness due to outdoor exposure if their neighborhood is walkable, we included measures of physical walkability and neighborhood safety. Walk Score measures the walkability by awarding points based on the distance from each respondent’s address to a category of amenities [22]. Amenities within a 5 min walk (0.25 miles) are awarded the most points and no points are given if they are more distant than a 30 min walk. The Walk Score compiles data from sources including Google, Education.com, Open Street Map, the U.S. Census, Localeze, and places added by the Walk Score user community. Neighborhood safety was measured through the survey question, “How safe or unsafe do you feel in your neighborhood?”.

2.6. Statistical Analysis

Coding and analysis of the variables was conducted in SAS version 9.3 and R version 3.4.3. Linearity was confirmed visually through plots of natural cubic splines of each variable, and bivariate correlations and variance inflation factors (VIFs) were assessed. The web tool DAGitty [23] was used to visualize the causal relationships between the heat exhaustion outcome and the two main exposures, AC use and health status, and identify which variables should and should not have been included in each model to adequately control for confounding of the exposure–health outcome association. Multicollinearity between covariates was assessed using VIFs.

3. Results

Forty-eight residents reported experiencing heat exhaustion, 52 residents reported not experiencing heat exhaustion in the last 5 years, and one resident did not know. Among those who reported experiencing heat exhaustion, 17 (35%) did not have any AC, 24 (50%) had window AC units, and 7 (15%) had central AC (Table 1). The respondents who reported having no AC had 3.78 times the odds of experiencing heat exhaustion compared to respondents who had central AC ($p = 0.03$) (Table 1). A similar increase in the odds of experiencing heat exhaustion was seen for those having no AC compared to those who had central AC among respondents who lived in their homes for 5 years (odds ratio (OR) = 9.16, $p = 0.01$). Additionally, the respondents who reported having poor/fair health status had 2.88 times the odds of experiencing heat exhaustion compared to respondents who had excellent/good health status ($p = 0.01$) (Table 1). Respondents who felt their neighborhood was very/somewhat unsafe had 4.24 times the odds of experiencing heat exhaustion compared to respondents that felt their neighborhood was very/somewhat safe ($p = 0.04$). All VIFs were under 2, indicating an absence of multicollinearity. The mean age for those living in their home for at least 5 years was 51.52 years old (Table 2).

Table 1. Counts, means, and relative risks of experiencing vs. not experiencing heat exhaustion in the previous five years by demographic, housing, and neighborhood characteristics for all study participants who knew whether they had experienced heat exhaustion in the previous 5 years ($n = 100$) and for those residing in their home in the previous 5 years ($n = 61$) in Detroit, MI, 2016–2017.

Variable	Heat Exhaustion		No Heat Exhaustion		Relative Risk (95% CI)	<i>p</i> -Value ^a
	<i>n</i>	%	<i>n</i>	%		
Total	48	47	52	53		
Total—in home for 5 years	26	43	35	57		
AC use						
No	17	35	10	19	3.78 (1.13, 13.13)	0.03
Window	24	50	26	50	2.09 (0.73, 6.39)	0.21
Central (reference)	7	15	16	31	1.00	NA
AC use—in home for 5 years						
No	10	38	6	17	9.16 (1.40, 75.35)	0.01
Window	14	54	17	49	4.78 (0.96, 34.47)	0.09
Central (reference)	2	8	12	34	1.00	NA
Health Status						
Poor/Fair	26	54	15	29	2.88 (1.24, 6.80)	0.01
Good/Excellent (reference)	22	46	37	71	1.00	NA
House Stories						
1 (reference)	5	10	2	4	1.00	NA
1.5	18	37	13	2	0.56 (0.07, 3.53)	0.68
2–3	21	44	36	69	0.24 (0.03, 1.30)	0.11
4	4	8	1	2	1.54 (0.09, 57.66)	1.00
House Stories—in home for 5 years						
1 (reference)	3	11	2	6	1.00	NA
1.5	9	35	7	20	0.86 (0.09, 7.14)	1.00
2–3	14	54	26	74	0.37 (0.41, 2.63)	0.35
4	0	0	0	0	NA	NA
Housing family number						
Multiple	10	21	20	38	0.42 (0.17, 1.06)	0.08
Single (reference)	38	79	32	61	1.00	NA
Utility Costs Concerns						
Somewhat/very limiting	21	44	33	63	0.45 (0.19, 1.01)	0.07
Not too/not at all limiting	27	56	19	36	1.00	NA
Neighborhood Safety						
Somewhat/Very unsafe	10	21	3	6	4.24 (1.09, 19.14)	0.04
Somewhat/Very safe (reference)	38	79	49	94	1.00	NA
Neighborhood Safety—in home for 5 years						
Somewhat/Very unsafe	4	15	3	9	1.92 (0.38, 10.64)	0.45
Somewhat/Very safe (reference)	22	85	32	91	1.00	NA

NA = not applicable. ^a Fisher's exact test. CI: confidence interval.

Table 2. Means and t-tests of experiencing vs. not experiencing heat exhaustion in the previous five years by respondent age and neighborhood characteristics for all study participants providing addresses ($n = 101$) and for those residing in their homes in the previous 5 years ($n = 61$) in Detroit, MI, 2016–2017.

Variable	n	Min.	Max.	Heat Exhaustion		No Heat Exhaustion		Difference (95% CI) ^a	p -Value ^a
				Mean	SD	Mean	SD		
Age	97	18	77	44.30	0.90	49.96	0.90	1.83 (−0.50, 11.83)	0.07
Percent Tract Trees	101	2.40	31.08	14.63	0.81	14.86	2.08	0.22 (−1.86, 2.33)	0.83
Percent Parcel Tree	101	0	74.07	17.04	2.48	12.88	2.54	−1.04 (−12.11, 3.80)	0.30
Walk Score	101	23	78	57.73	1.20	54.81	2.41	−1.32 (−7.31, 1.47)	0.19
Age–in home for 5 years	57	19	77	51.52	0.83	54.75	0.77	0.89 (−4.12, 10.58)	0.38
Percent Tract Trees–in home for 5 years	61	3.66	25.66	14.99	0.57	14.83	1.83	−0.11 (−3.00, 2.68)	0.91
Percent Parcel Tree–in home for 5 years	61	0	74.07	19.59	2.17	13.92	0.99	−1.05 (−16.50, 5.17)	0.30
Walk Score–in home for 5 years	61	23	78	59.11	0.81	53.54	2.01	−1.78 (−11.87, 0.73)	0.08

^a Independent two-group t-test.

To block non-causal pathways in the DAG (Figure 1) between heat exhaustion and AC, age, health status, percent tree canopy, house stories, family size, and utility cost concerns needed to be included in the regression model. After doing so (model 1, Table 3), the odds of heat exhaustion among those with window AC (1.43, 95% confidence interval (CI) = 0.42, 4.82) and with no AC (3.35, 95% CI = 0.80, 14.08) were not significantly higher than the odds of heat exhaustion compared to those with central AC.

Table 3. Associations (odds ratios and 95% confidence intervals) of heat exhaustion with main exposures AC use and poor/fair health status for the study participants in Detroit, MI, 2016–2017.

Model Number	n	Window AC	No AC	Health Status (Poor/Fair)
Model 1 ^a	96	1.43 (0.42, 4.82)	3.35 (0.80, 14.08)	–
Model 2 ^b	96	1.41 (0.42, 4.79)	3.27 (0.76, 14.00)	–
Model 3 ^c	57	3.38 (0.50, 22.58)	10.39 (1.13, 95.88)	–
Model 4 ^d	97	–	–	3.15(1.33, 7.48)
Model 5 ^e	96	2.02 (0.64, 6.39)	4.66 (1.22, 17.72)	–
Model 6 ^f	57	3.84 (0.65, 22.83)	12.47 (1.63, 95.21)	–

^a Heat Exhaustion = Window AC + No AC + Age + Health Status + Percent Tract Trees + House Stories + Family Size + Utility Costs. ^b Heat Exhaustion = Window AC + No AC + Age + Health Status + Percent Parcel Trees + House Stories + Family Size + Utility Costs. ^c Same model as model 2 but restricted to people who lived in their home for at least 5 years. ^d Heat Exhaustion = Health Status (Poor/Fair) + Age. ^e Heat Exhaustion = Window AC + No AC + Age + Health Status. ^f Same model as model 5 but restricted to people who lived in their home for at least 5 years.

In Model 2, in which we controlled for the percent of trees in the parcel instead of in the tract, the main exposure, AC use, was not statistically significant for either level compared to respondents with central AC. The odds of experiencing heat exhaustion among those with window AC were 1.41 (95% CI = 0.42, 4.79) and with no AC they were 3.27 (0.76, 14.00) compared to those with central AC.

Given that heat exhaustion was asked in a 5 year timeframe, Model 3 was restricted to individuals residing in the same home for the previous 5 years. Model 3 shows that window AC use was not

significantly associated with heat exhaustion, but no AC use was associated with heat exhaustion. However, the confidence intervals were very wide.

For Model 4, from examination of the DAG, only one variable, age, needed to be included in the model because control for this variable blocked the paths between potential confounders of the association between the main exposure, health status, and heat exhaustion. (Note that many of the other variables in the DAG are mediators, or are on the causal pathway, between health status and heat exhaustion and should therefore not be controlled for when estimating the total, or direct + indirect, effect.) In the final model, self-reported health status was statistically significantly associated with heat exhaustion. The odds of experiencing heat exhaustion among people with fair/poor health vs. those with good/excellent health was 3.15 (95% CI = 1.33, 7.48).

In Model 5, the association between heat exhaustion and AC use was analyzed while adjusting for only health status and age. The odds of experiencing heat exhaustion among those with window AC were 2.02 (95% CI = 0.64, 6.39) and with no AC they were 4.55 (1.22, 17.72) compared to those having central AC.

Model 6 is similar to Model 5 but restricted to individuals residing in the same home for the previous 5 years. The odds of experiencing heat exhaustion among those with window AC were 3.84 (95% CI = 0.65, 22.83) and with no AC they were 12.47 (1.63, 95.21) compared to central AC.

4. Discussion

Among Detroit residents, not having central AC was associated with increased odds of heat exhaustion, as hypothesized, when the dataset was restricted to the 57 people who lived in their homes for at least 5 years. However, the wide confidence intervals suggested that the sample size was insufficient to examine this relationship with adequate adjustment for relevant confounders. In contrast, the DAG exercise did not identify a need to control for housing characteristics in assessing the association between health status and heat exhaustion. Therefore, our finding of a 3.15-times increased odds of heat exhaustion among individuals with fair/poor health compared to those with good/excellent health, without reason to exclude individuals who had changed residences in the previous 5 years from the analysis, was more robust. Our findings regarding AC and heat-related illness were consistent with findings in a recent survey of New York City, New York, USA residents. In this survey, low-income individuals had a 3.1-times higher odds (95% CI: 1.8, 5.5) of not having AC, and in turn, these low-income individuals were more likely to be concerned that heat could make them ill and that climate change would affect their health than participants with a higher household income, OR = 1.6 (95% CI: 1.0, 2.3) [24].

We did not examine associations between the number of individuals living in the home, utility cost concerns, and neighborhood safety, respectively, and heat exhaustion in controlled analyses. However, their associations with heat exhaustion in unadjusted analyses suggested that our decision to control for these characteristics was justified. Furthermore, these associations would likely benefit from analysis with a larger sample size, and we look forward to analyzing them with the other cities, Phoenix and Atlanta, in the study.

In addition to contributing to the identification of relevant new variables for the analysis, community partners highlighted the practical difficulties in using the CDC-based definition to define the heat exhaustion outcome. The community partners questioned whether residents understood the health-based terms in the definition well enough to personally identify with the experience named “heat exhaustion” and appropriately respond to the question. For example, heat discomfort and exhaustion experienced with high frequency was potentially not perceived by some of our respondents as a medical problem. Alternatively, the fairly broad definition provided may have resulted in over-reporting of heat exhaustion. Community partners suggested that future research should use more relatable terms such as “feeling too hot” instead of technical terms. The exposure, AC use, also may not have been communicated in terms that community members would understand, as the community partners indicated that some residents may not have been aware of whether their housing had central AC.

The DAG co-construction exercise, a CBPR co-analysis technique, proved highly useful, and we recommend this approach to enhance the analysis phase of research, from which community partners are often excluded. Although it took additional time and energy for the community and academic partners to meet and discuss the DAG, this approach highlighted the unique and critical perspective community members have in regard to environmental exposures and health outcomes as well as the more general benefits of taking the time to discuss a complex analysis with a team possessing a broad range of expertise and local knowledge. The goals of the analysis aligned with the concerns of the community partners as the health outcome was a non-emergency outcome, not morbidity or emergency department visits as is often researched in secondary analyses. An outdoor environmental exposure, neighborhood safety, was included as a confounder as a result of the input from community partners. Local knowledge of the benefits of certain housing features in keeping indoor environments cooler resulted in inclusion of potential negative confounders—larger multi-family homes with more stories—that, by virtue of their age and the incomes of the residents, may not have central AC but may still remain cool on hot days.

In the months between the survey design, data collection, and analysis, community partners expressed increased interest in underlying health causes of heat exhaustion (relating to the results of Model 4) and the uncertainty remaining around the strength of association between AC use and heat exhaustion (Model 1) given the sample size. These questions from the community members reflect the shared interest and pursuit of better understanding exposures and their associations with health outcomes and suggest topics of future research. CBPR co-analysis can enhance epidemiologic analyses of community-specific social and health vulnerabilities to reach enhanced understanding.

5. Conclusions

Pre-existing self-reported health status was associated with heat-related illness. Access to central AC was also associated with heat-related illness, so consideration of this factor for interventions is warranted, especially given the consistency of this finding with other literature. The community partners, as experts in climate, housing, and health issues in Detroit, provided important additional confounders during the co-construction of a DAG, indicating that DAG co-construction is a useful CBPR co-analysis technique. Additional topics and future research questions discussed with the community partners focused on social determinants of health and environmental conditions that cause health concerns or exacerbate existing health conditions.

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STATE OF MICHIGAN
BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **CONSUMERS ENERGY COMPANY** for authority to increase its rates for generation and distribution of electricity and for other relief.

Case No. U-21870

ALJ Jonathan F. Thoits

PROOF OF SERVICE

I, Mark N. Templeton, certify that an electronic copy of the Official Exhibits of Sergio Cira-Reyes on Behalf of Urban Core Collective, UCC-9 to UCC-26 (Part 2 of 6), was served on the following on November 13, 2025.

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The statements above are true to the best of my knowledge, information, and belief.

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