

Water Insecurity in Southeast Michigan: The Impacts of Unaffordability and Shutoffs on Resident Well-Being

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Abstract

Water insecurity, broadly understood to be a lack of access to safe, reliable, and affordable drinking water and wastewater services, is a pressing, but frequently hidden issue in Southeast Michigan. From rising water bills that force families to prioritize water over food and medicine, to water shutoffs that completely disrupt service to people's homes, many Detroit-area residents lack support or assistance to maintain uninterrupted access and affordable bills. This research employs quantitative and qualitative methods to explore the impacts of water insecurity on households in Southeast Michigan. We find that low-income residents in Detroit and the Detroit Metro area pay water bills that exceed an affordable rate, as defined by the United States Environmental Protection Agency. Many households must adopt coping behaviors to mitigate the financial burden of expensive bills, potentially jeopardizing personal health and well-being. While existing assistance programs provide some support in the short-term, support is not adequate to address all facets of water security. From these insights, water security is defined as reliable access to water without fear of disconnection, regular bills that households can afford without making trade-offs, assistance in times of economic shock or prolonged distress, and increased public participation and administrative transparency at the system level.

Water Security, Affordability, and Impact

Water Security

Water security is a multidimensional concept, lying at the intersection of various disciplines, including public health, hydrology, environmental science, national security, and development.¹ Given the complexity of the issue, it is unsurprising that over 50 indices measure water security across diverse geographic contexts and scales.²

The most cited definitions of water security are from the United Nations and the Global Water Partnership. The United Nations defines water security as the “capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability.”³ The Global Water Partnership explains water security: “at any level from the household to the global...[to mean] that every person has access to enough safe

¹ Cook and Bakker, “Water Security: Debating an Emerging Paradigm.”

² Plummer, de Loë, and Armitage, “A Systematic Review of Water Vulnerability Assessment Tools.”

³ United Nations-Water Task Force on Water Security, “Water Security & the Global Water Agenda. The UN-Water Analytical Brief.”

water at affordable cost to lead a clean, healthy and productive life, while ensuring that the natural environment is protected and, enhanced.”⁴

Water security is a question of geography and context, best addressed with a localized, tailored approach.⁵ This is particularly true in the United States where, according to the World Health Organization, 99% of the population has access to water, yet, as demonstrated by water shutoffs and rising prices, people’s access remains precarious.⁶

After interviews with experts in the water security field, we developed a holistic definition for household *water security*. This includes the reliable access to water without fear of disconnection; regular bills that households can afford without trading-off the necessities for a healthy and productive life; assistance in times of economic shock or prolonged distress; increased public oversight and participation; and well-run utilities with clear and reliable administrative processes. Without achieving each of these components, a community or household cannot be deemed water secure.

Water affordability

Water prices are rising on a national level due to a combination of aging water and sewage infrastructure and increasing operation and maintenance costs. Water utilities are tasked with providing safe, clean, and affordable water to residential and commercial customers and price water to cover their expenses. A decrease in the number of customers served or an increase in maintenance, construction or administrative costs requires water rate increases to absorb these expenses.⁷

The United States Environmental Protection Agency (EPA) has estimated that \$472.6 billion is needed over the next 20 years to fund drinking water infrastructure nationwide.⁸ In fact, public spending on water and wastewater utilities has increased from roughly \$28 billion in 1956 to roughly \$110 billion in 2014.⁹ At the same time, federal funding for water and wastewater systems declined from around \$17 billion in 1977 to only \$4.4 billion in 2014.¹⁰ This left state and local governments with an ever growing burden. In 2014 state and local governments spent \$105 billion, or 24 times more than the federal government.¹¹ These costs get passed on taxpayers and water customers through water rate increases. While water departments and authorities are implementing cost-saving efficiencies, costs remain high.

How these costs are distributed among customers is complex and a reflection of the goals of the water department or authority. While there is no consensus on best approach, public utilities prioritize a *cost-of-service* model, which calculates rates to directly cover all service and

⁴ Global Water Partnership, “Towards Water Security: Framework for Action.”

⁵ Global Water Partnership.

⁶ World Health Organization/UNICEF, “Joint Monitoring Programme for Water Supply and Sanitation 2015 Data.”

⁷ Mack and Wrase, “A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States.”

⁸ United States Environmental Protection Agency, “Drinking Water Infrastructure Needs Survey and Assessment.”

⁹ Eskaf, “Four Trends in Government Spending on Water & Wastewater.”

¹⁰ Eskaf.

¹¹ Ibid.

maintenance expenses.¹² This, in effect, passes all costs to the consumer. While some state and federal support is available, that amount is limited and continues to fall, so public water utilities are primarily reliant on their customers - both residents and commercial - to pay their bill.¹³ Interventions or alternative models are needed to keep water flowing to customers and revenue returning to the utility. Alternative models exist, including tying water prices to incomes, or an *ability-to-pay* model. This model is less common as it can be controversial, add to administrative expenses, or open them up to legal challenge.¹⁴

When costs rise, water bills become expensive and, at times, unaffordable, especially to low income residents and those living on a fixed income. In the United States, an affordable water bill is calculated at 2-3% of a household income for water or 4.5% for both water and wastewater service.¹⁵ Although this is not the only benchmark for affordability, and there have been criticisms of this model, the lack of consideration for household's ability to purchase water services presents real challenges to customers' health and well-being.¹⁶

Impact

In the face of water insecurity and water shutoffs, residents can make-up for their lack of access to treated water through coping behaviors, sacrificing access to other necessities to secure water. Coping behaviors range from modified consumption to using gray water, or water that was previously used for cooking or other household tasks.¹⁷ Modified consumption implies that people are cutting back on water-intensive cleaning tasks, drinking less water, collecting rainwater for drinking, replacing water with prepackaged and sweetened beverages, or prioritizing the water needs of some family members over others.¹⁸ Using gray water and cutting-back on water use for hygiene can lead to social stigma, as poor hygiene and uncleanliness are markers of social failure.¹⁹ This can impact employment, success in school, and emotional health. When people experience water insecurity, they tend to report higher levels of shame, stress, and depression.²⁰ Women, particularly mothers and heads of household, tend to experience more blame and shame for not meeting cultural standards of cleanliness due to gendered norms of beauty and cleaning.²¹

¹² Barberán and Arbués, "Equity in domestic water rates design."

¹³ Eskaf, "Four Trends in Government Spending on Water & Wastewater."

¹⁴ Beecher, "Water affordability and alternatives to service disconnection."

¹⁵ Beecher.

¹⁶ Teodoro, "Measuring Household Affordability for Water and Sewer Utilities."

¹⁷ Wutich and Brewis, "Food, water, and scarcity toward a broader anthropology of resource insecurity."

¹⁸ Wutich and Brewis.

¹⁹ Ennis-McMillan, "Suffering from water: social origins of bodily distress in a Mexican community."

²⁰ Wutich and Brewis.

²¹ Wutich, "Intrahousehold disparities in women and men's experiences of water insecurity and emotional distress in Urban Bolivia."

The Southeast Michigan Context

In the spring of 2014, Detroit's municipal water utility, the Detroit Water and Sewerage Department (DWSD), announced that it would discontinue service to customers in arrears.²² At the time, roughly 80,000 Detroiters were behind on their payments; a quarter to a third of these residents had their water shut off in 2014 and 2015.^{23,24}

In recent years, Southeast Michigan residents have fallen further behind on their water bills because they simply cannot afford to pay. Although the EPA recommends that Americans should pay no more than 4.5% of their household income on water and wastewater services, Detroiters, specifically, have paid 10 or even 20 percent of their earnings.^{25,26} Simultaneously, water rates more than doubled over the past decade, largely because of a decreasing number of paying customers and massive, aging infrastructure in need of repair and improvement.²⁷

Recognizing the growing problem, the Detroit City Council proposed a Water Affordability Plan in 2005, which was never implemented.²⁸ A decade later, a new regional water authority, the Great Lakes Water Authority, authorized a short-term assistance program known as the Water Residential Assistance Program (WRAP). To date, WRAP is the primary assistance program helping residents pay their water bills and keep the water on.²⁹ However, hundreds of people continue to get their water shut-off each year even with access to WRAP. Despite legal challenges by the American Civil Liberties Union (ACLU) and the National Association for the Advancement of Colored People (NAACP) Legal Defense Fund, water shutoffs continue.³⁰ Michigan ranks 12th in projections that rank states for high risk of water unaffordability in upcoming decades.³¹

Given this context, our study aims to address the question of holistic water security by focusing on the experiences of low-income residents in the Southeast Michigan region, specifically Detroit and the Detroit Metro area. By responding to our survey, residents speak to the impact that water rates have on their daily lives.

²² Detroit Water and Sewerage Department, "DWSD responds to misinformation about water shut offs and suburban water rates."

²³ Fried, "Groups Pressure United Nations to Restore Water Service in Detroit."

²⁴ Food & Water Watch, "Issue Brief - Detroit Needs a Water Affordability Plan."

²⁵ United States Environmental Protection Agency, "National-Level Affordability Criteria."

²⁶ People's Water Board Coalition, "Affordability is a Regional Responsibility."

²⁷ Food & Water Watch, "Factsheet: Keep Southeast Michigan's Water in Public Hands."

²⁸ Fisher, Sheehan and Colton, "FSC'S LAW & ECONOMICS INSIGHTS - A Water Affordability Program for the Detroit (MI)."

²⁹ Community Action Alliance WRAP, "Community Action Alliance WRAP."

³⁰ Moss, Kary, "LDF and ACLU of Michigan Ask for Immediate Moratorium on Detroit's Water Shut-offs."

³¹ Mack and Wrase, "A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States."

Methods

The research team gathered data through a 35-question survey related to low-income household's experiences with water affordability and water shutoffs in Wayne, Oakland, and Macomb counties. All three counties receive water and wastewater services from the Great Lakes Water Authority, and all three hold seats on the authority's board. To test the survey questionnaire, we administered seven cognitive interviews to residents in their homes or over the phone. Time was given at the end for residents to give their input on the survey structure and content. All

participants received a \$15 cash incentive for participating. Participants were identified by contacting households who received an in-home water audit by the non-profit, EcoWorks, within the past two years. The research team also gathered input from two non-profit organizations who conduct water and energy justice work in the greater Detroit region: EcoWorks and We the People of Detroit Research Collective. The final survey was submitted and approved by the University of Michigan Institutional Review Board (IRB). Once verified, the survey was loaded into the survey management platform, Qualtrics, for administration.

The survey was administered to 413 residents of Wayne, Oakland, and Macomb counties from October of 2017 to March of 2018. Of those that reported their county of residence, 252 were from Wayne, 81 from Oakland, and 77 were from Macomb. This exceeded our minimum sample size needed to achieve a 95% confidence level and a 5% margin of error for the three counties: 384 households in total (236 for Wayne, 71 for Macomb, and 77 for Oakland). Because the United States Census does not collect data on water access or affordability, to target low-income residents who struggle to pay their water bill, we chose to look at the total population of groups most likely to lack water security: the population of residents at or below 200% of the federal poverty line. As of 2015, the total number of residents earning at or below the 200% FPL was 774,628 in Wayne County, 266,608 in Oakland County, and 243,263 in Macomb County.^{32,33,34} There were two sub-target populations: those on assistance plans and those not on assistance plans.

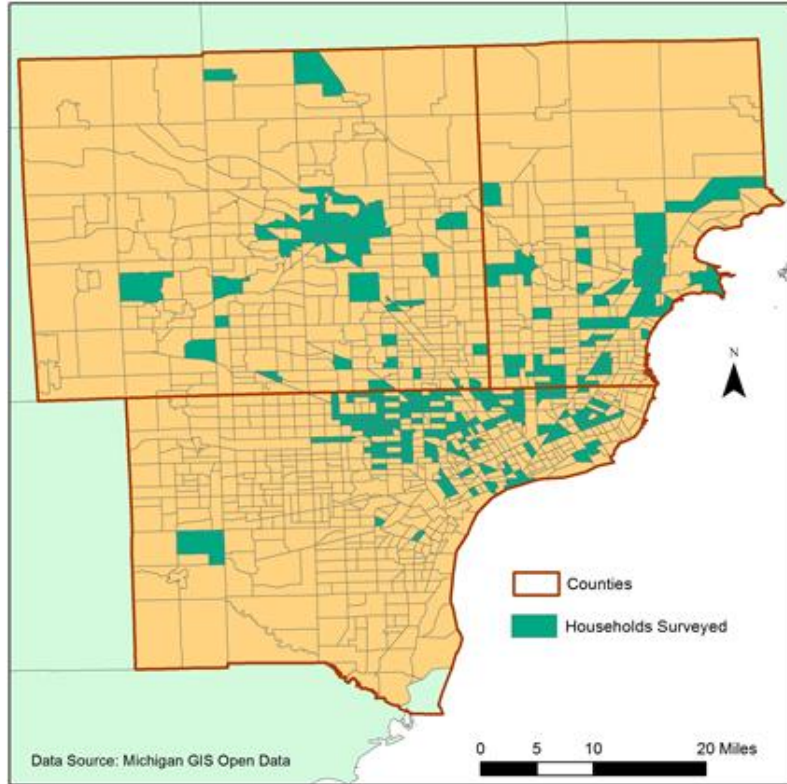


Figure 1: Survey Study Area (Oakland, Macomb, and Wayne Counties)

³² United States Census Bureau - American Fact Finder, "Community Facts."

We conducted surveys conducted surveys face-to-face and over the phone. All participants were read a consent form to explain the objective, risks, and benefits of participating in the study, and received \$5 compensation after completing the survey. In-person survey respondents had the option to have the survey read to them, or fill out the survey themselves. All phone surveys were read to the respondent. Surveys were primarily administered at community action agencies. Additional sites included soup kitchens and community meetings. The survey took approximately 15 minutes to administer. Only one member of each household could participate. Participants for the over-the-phone surveys were identified using a list of households who received water audits in 2016-17 by EcoWorks but had not participated in the cognitive interviews.

Once all surveys were collected, the data was downloaded from Qualtrics into Microsoft Excel. The data was then cleaned and standardized for analysis. All respondents who reported that their water bill was included in the rent were removed from the sample for most questions since they did not have direct experience paying water bills in Southeast Michigan. Open-ended questions were coded and binned into broader categories for analysis.³⁵ For questions where people self reported quantitative data (e.g., average monthly water bills), outliers were removed by calculating the first and third quartiles of the data, determining the interquartile range, and removing values that were beyond the upper or lower bounds. Respondents reported income as ranges, though many earning less than \$1,500 clarified verbally that they were receiving social security, which was typically on the order of \$700 per month. To determine income using these brackets, the midpoint was taken for all categories.³⁶ However, for the category \$3,500+, \$3,500 was used as the reported income as the lowest amount prevents overestimates.

Results

Demographics

Households earning less than \$1,500 per month accounted for the majority of respondents at 59%, followed by 28% of respondents in the next income range (\$1,500 to \$2,500). A few surveys were collected from households who earn above the 200% federal poverty line. These responses were included since the majority still reported struggling with water bills. Including the few who did not struggle would not significantly affect the data (<1%). Table 1 summarizes the demographics of the survey population. Although residents answered all questions on behalf of their household, we asked for the gender of the person completing the survey and the majority were women at nearly 73%. The majority of respondents, 71.19%, identified as African American, 11.62% of residents identified as white, and 5.33% identify with more than one race.

The typical household size was between 2 and 4 people, while nearly a third of respondents reported living alone. This is consistent with the area's median household size of 2.5

³³ United States Census Bureau - American Fact Finder.

³⁴ Ibid.

³⁵ Lietz, et al., "Implementation of Large-Scale Education Assessments."

³⁶ Borenstein, et al., "The Equity and Efficiency of Two-Part Tariffs in U.S. Natural Gas Markets."

people. Homeowners made up the largest share of respondents compared to renters, and over half the residents reported living in their home for over seven years. Half of the households reported someone living in the home with a disability.

Responses by County (%) (n=410)		Household Size (%) (n=393)		Households with Needs (%) (n=400)	
Wayne	61.02%	1 person	31.72%	Disability	50.84%
Oakland	19.61%	2-4 people	49.15%	Nebulizer	19.04%
Macomb	18.64%	5 or more people	14.29%	Oxygen	5.06%
				Walking Aid	13.73%
Household Incomes (%) (n=402)		Race (%) (n=400)		Home Health Care	10.36%
under \$1,500	59.08%	African American	71.19%		
\$1,500-\$2,500	28.09%	White	11.62%	Gender Responding (%) (n=401)	
\$2,500 to \$3,500	4.60%	Multiple races	5.33%	Female	72.88%
\$3,500+	5.57%			Male	21.55%
		Years in Home (%) (n=393)			
Children and Elderly in Household (%) (n=393)		Less than 1 year	7.26%	Ownership (%) (n=408)	
Under 18 years	39.44%	1-7 years	34.87%	Own	56.42%
65 or more years	11.20%	7 or more years	53.03%	Rent	39.95%

Water and Sewerage Bills

Table 2 shows the average income-to-bill ratio, disaggregated by income range. The average water bill for all three counties was around \$98, which is higher than the reported average water bill in Detroit of \$75 in 2016.³⁷

On-average residents pay around 10% of their monthly income to their water and wastewater bill. Those with the highest incomes are paying below 4% of their income to the water and wastewater bill, while those in the lowest income range are paying nearly quadruple that. When asked what they believed they could afford to pay, residents reported that they could afford an average bill of \$62.08. This represents an average of 5.28% of their monthly income.

³⁷ Ferretti, “Detroiters to see 'modest' increase on water rate.”

Table 2: Income and Average Water and Sewer Bill

Income Range (\$)	Midpoint Used (\$)	Average Bill (\$)	Average Income to Water and Sewer Bill (%)	Average Payable Bill Amount Reported (\$)	Average Income to Payable Bill Reported (%)
Less than 1500	750	\$100.12	13.61%	\$52.79	7.04%
1500 to 2500	2000	\$97.69	4.88%	\$54.80	2.74%
2500 to 3500	3000	\$98.82	3.29%	\$54.42	1.81%
3500	3500	\$96.55	2.76%	\$56.06	1.60%
Average Across All Incomes	N/A	\$98.61	9.96%	\$53.53	5.28%

Assistance

Table 3 shows the percentage of residents surveyed that receive assistance. Over half of the surveyed households are on some form of assistance plan. Of those receiving assistance, 95% are enrolled in the WRAP program while the remaining 15% are either not sure or on Detroit Water and Sewerage Department’s 10/30/50 payment program.

Table 3: People Receiving Assistance		
Receiving Assistance (n=373)		
Yes		54.96%
No		41.82%
Don't know		3.22%
Of those Receiving Assistance		
Fraction Cutting back (n=176)		94.32%
Average Bill (n=185)		\$102.25
On WRAP (n=205)		95.61%

Impacts on Residents

Table 4 highlights coping behaviors that residents undertake to pay their water bills on-time. Over 80% of households reported cutting back on rent or property tax to pay their water bill. Clothing purchases were reduced by 82% of residents, with 25% cutting back dramatically or completely on clothing purchases. 63% of residents reported reducing their purchases of produce and 68% cut back on transportation. Nearly half cut back on medical care, with 40% cutting back on medicine purchases.

Water reduction behaviors were also substantial. Nearly three-quarters of respondents reduced the number or length of showers and baths while 81% reduced the frequency of laundry

and cleaning. A third of respondents reported reusing water to keep the bill low. When asked what other behaviors residents undertook to keep the water bill paid, 55% reported purchasing bottled water. Another 10% reported missing other bills and 12% reported cutting-back on entertainment.

Table 4: Coping Behaviors			
Reduction of Requisites (%) (n=349)	Cutting Back (%)		Cutting Back Dramatically (%) (a lot/completely)
Rent or Property Tax	84%		6%
Transportation	68%		12%
Medicine	40%		25%
Medical Care	49%		15%
Fruits and Vegetables	63%		22%
Clothes	82%		25%
School Supplies	60%		54%
Reduction of Water Use (%) (n=348)			
Reducing Showers	72%		
Reducing Frequency of Laundry and Cleaning	81%		
Reusing Water	33%		
Any Other Behaviors We Didn't Mention (%) (n=150)			
Purchasing Bottled Water	55%		
Receiving Help from Family and Friends	5%		
Pursuing a Supplemental Income	5%		
Reducing entertainment	12%		
Not paying off other bills	10%		

To discern the emotional impacts of water bills on residents, we asked what word best describes their feelings regarding their struggles to access water. In the event that more than one word was used, we chose the first word mentioned and categorized similar words into nine generalized emotions (see Table 5). When aggregated by positive and negative emotions, residents were overwhelmingly negative, with 86.62% reporting negative emotions. Of the 13.8% of surveys that reported positive emotions, two-thirds of these households receive WRAP assistance. Yet another two-thirds reported struggling to pay the bill at least some of the time.

Table 5: Emotional Impacts		
When asked for a word that best describes their feelings about their water struggles responded with the following emotions: (n=269)		
Afraid		1.86%
Angry		14.13%
Bad		13.75%
Depressed		11.90%
Impoverished		17.47%
Positive or Neutral		13.38%
Struggling		11.15%
Uncertain		3.35%
Worried		13.01%
Positive vs. Negative Feelings (n=269)		
Positive Emotions		13.38%
Negative Emotions		86.62%
Of those Reporting Positive Emotions (n=30)		
On WRAP		66.67%
Struggle to Pay Bill at Least Sometimes		66.67%

Discussion

As the data demonstrates, low-income households across the Detroit Metro area are paying water and wastewater bills that greatly exceed the 4.5% affordability benchmark determined by the United States Environmental Protection Agency.³⁸ While respondents pay on-average 10% of their monthly income for water, respondents with the lowest income are paying over 13% of their earnings, meaning those who are least able to pay are bearing the highest water burden.

Although residents of the Tri-County area are generally paying their bills, the bills remain unaffordable at a fundamental level. Individuals must engage in behaviors such as cutting back on basic necessities or trading-off which bills are paid month-to-month. These coping behaviors can have short and long-term effects. An overwhelming percentage of respondents engaged in water reduction behaviors, including reducing showers, cutting back on laundry, and reusing water. Cutting back on water consumption is detrimental to human health, and can lead to

³⁸ Mack and Wrase, “A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States.”

dehydration, water-related illnesses and infections, and poor hygiene.^{39,40} In conjunction with reductions in purchases of medicine or medical care visits, this can degrade the health and physical well-being of households using these coping behaviors. Residents also experience negative mental health effects in the form of stress, worry, shame, anger, and feelings of helplessness. For households that have young children, elderly, and disabled members (a high percentage of our respondents), these cutbacks can have dire consequences for physical and mental wellbeing. The mental and emotional toll that water struggles have on these households is striking, as the vast majority of participants responded with disparaging words when asked to describe their experiences with water struggles in Southeast Michigan. Emotions and percentage of struggle have a significant impact on residents well-being and have been used as a gauge of whether or not a utility can truly be considered affordable.⁴¹

At a broader level, decreased access to transportation and new clothing can make it difficult for residents who struggle with water to get a job.⁴² That being said, employment alone does not necessarily get at the root causes of unaffordable bills. Nearly a third of our respondents who struggle have people living in the household who are on disability or are retired. Another 39% of those responding were employed. This implies that only increasing job opportunity in the area would not make water bills more affordable, as nearly 70% of those responding to this study are already employed or unable to consistently work. As bills remain unaffordable, we cannot only increase the number of jobs without also considering the main factors that contribute to one's well-being, such as a living wage, sufficient compensation and care for those on disability, and pensions or retirement plans.

Assistance has helped many residents. Results show that respondents on an assistance program report struggling less than those not on assistance. Even so, people are still struggling to afford their monthly bill. A striking 94% of people on assistance engage in one or more cut-back behaviors. While programs like WRAP can assist residents with lower bills by paying back debts, fixing leaky pipes, and discounting monthly bills, a gap remains between what households can afford to pay and what they are currently required to pay for water and wastewater services. To preserve water security, utilities must set affordable rates while maintaining assistance programs as a short-term solution rather than a long-term necessity. Based on the findings of our survey, interviews with experts, and a literature review, we define *water security* as: reliable access without fear of disconnection; regular bills that households can afford without trading-off necessities for a healthy and productive life; assistance in times of economic shock or prolonged distress; strengthened at a system's level by public oversight and participation - accountability - and well-run utilities with clear and reliable administrative processes.

³⁹ Kenney, et al., "Prevalence of Inadequate Hydration Among US Children and Disparities by Gender and Race/Ethnicity: National Health and Nutrition Examination Survey, 2009–2012."

⁴⁰ Plum, et al., "'The Impact of Geographical Water Shutoffs on the Diagnosis of Potentially Water-associated Illness, with the Role of Social Vulnerability Examined.'"

⁴¹ O'Sullivan, et al., "Heating Practices and Self-disconnection among Electricity Prepayment Meter Consumers in New Zealand: A Follow-up Survey."

⁴² Gregs, "Job accessibility and the modal mismatch in Detroit."

Conclusion

Unaffordable water bills have negative impacts on households struggling to balance low income, household needs, and monthly payments and debt. Water rates in Southeast Michigan, along with rates in the rest of the United States, are consistently increasing.⁴³ Our findings confirmed that low-income residents are paying unaffordable bills, which are over double what the United States government considers to be an affordable bill. Additionally, low-income residents believe they can afford two-thirds of what they are currently paying for water and wastewater services. Fear of disconnection or other negative repercussions of unpaid bills lead residents to engage in coping behaviors, such as bill switching, water reduction and reuse, and trade-offs between water bills and other expenses needed to live healthy and productive lives. Assistance programs are helping, but are not adequate in stemming the tide of unaffordable bills.

As water bills continue to rise, low-income households will have an even harder time keeping-up on their bills and water departments will have a harder time recouping their costs. Policy and programmatic interventions should be considered that promote a more holistic approach to water security, including safeguarding access, generating more affordable bills and offering assistance when customers fall behind. Future research is needed to assess the feasibility and effectiveness of these policies and programs.

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⁴³ Mack and Wrase, “A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States.”

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