

The Costs of Water Insecurity in Philadelphia

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REPORT

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Appendix on Cost Estimates

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PEACH  **LAB**
Psychology of Eating and Consumer Health Lab

Executive Summary

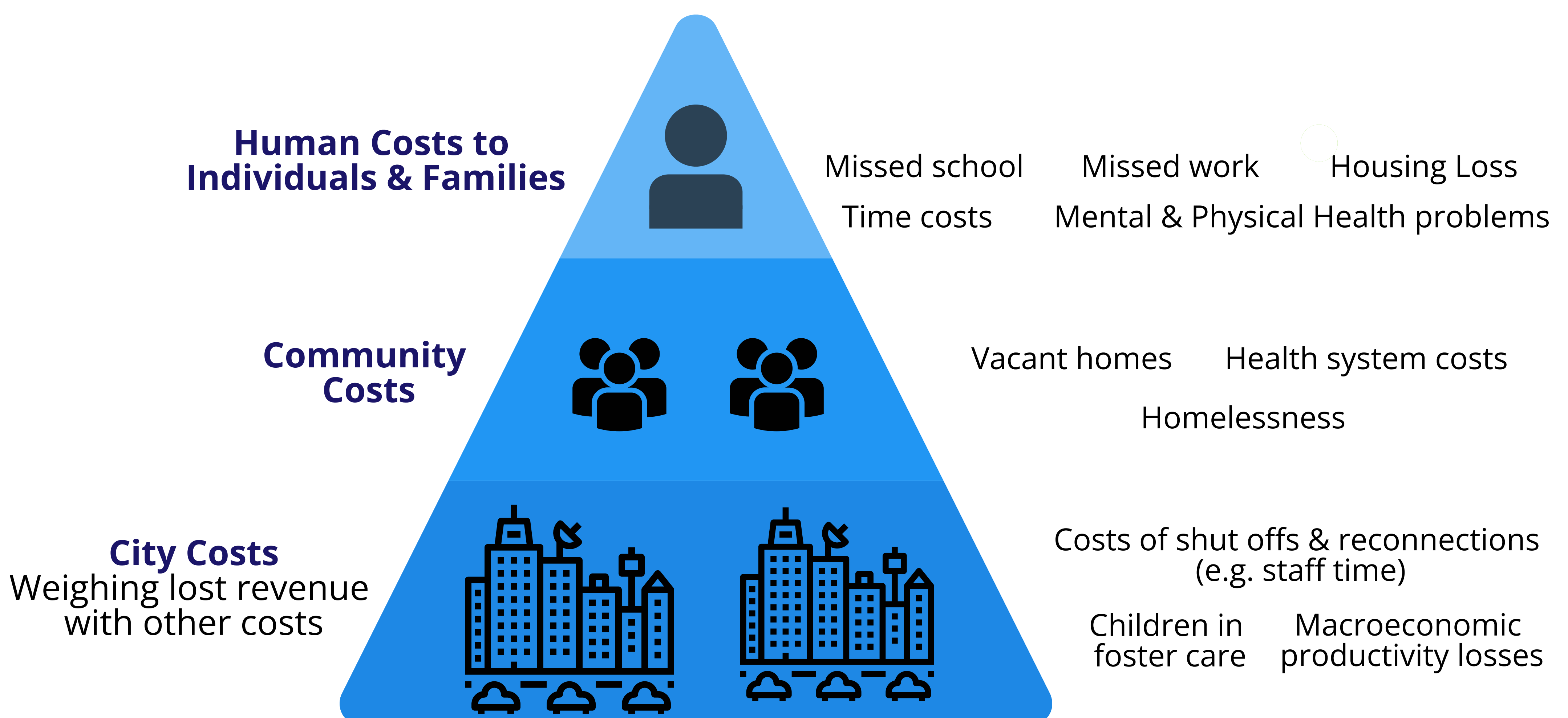
Water security is a human right.

Water security—the ability to reliably access and benefit from safe and acceptable water—has been recognized by the United Nations as a human right.(1-3) Despite its importance, access to safe water is an understudied area, with especially sparse data on its prevalence and impacts in the United States.

Many U.S. cities, including Philadelphia, disconnect water service when a household does not pay its bill on time. Large disparities in water security exist across racial and ethnic groups, regions, and socioeconomic status (3-5). In the U.S., Black and Hispanic individuals are less likely to be connected to piped water and lower-income households are more likely to have water systems with greater contamination violations. (3-5) The Covid-19 pandemic elevated the recognition that water is essential for proper hygiene and disease control. For that reason, Philadelphia along with other U.S. cities placed a moratorium on shutting off water service. Philadelphia also reconnected over 15,000 properties’ water service.(6) Since then, at least 5 U.S. cities (Chicago, Buffalo, Oakland, Detroit, Phoenix) have decided they will permanently ban water shut offs.

It is critically important for cities to ensure a well-maintained and safe water infrastructure. In Philadelphia, the revenue generated from the payment of water bills is a key way to support that goal. At the same time, when designing water policy, the City must also consider the economic and social costs that are not only borne by individuals experiencing water insecurity, but that spill over to adversely affect communities and organizations and the City itself when people do not have reliable access to safe water. Thus, as with many other public issues, the city government faces the difficult task of weighing the costs and benefits of water shutoffs or alternatives to shutoffs to many different parties, including the Water Department and the city’s water infrastructure, the households that lose access to water, and the larger community.

Costs of Philadelphia Water Shut Offs



Report Goals

The goals of this report are to: **1)** begin identifying the complete set of costs associated with water insecurity and water shut offs in the City of Philadelphia; **2)** conduct a very preliminary cost analysis of water shut offs with the limited existing data; **3)** identify important areas for future research on water insecurity in urban areas; and **4)** identify several City water policies or initiatives that may help to further address water insecurity and ensure sufficient revenue generation. The costs we have identified are based on a search of peer-reviewed research and published reports as well as personal communications with members of interested organizations or the community who are knowledgeable about water insecurity. We also partnered with researchers at [Altarum](#), who have provided initial estimates of some of the costs associated with water shut offs in the City of Philadelphia. The current list of costs and the cost analysis, however, are limited because much of the existing research is from low- and middle- income countries or rural areas in the U.S. Far less is known about water insecurity in urban U.S. areas, making this a critical area for future research.

Next Steps

As the City of Philadelphia considers its future water policies and practices, it will be essential to work across City departments to identify data sources that can help us understand the needs of the Water Department to maintain a safe water supply as well as the effects of water shut offs and water insecurity on the households left without water and on the broader community. The City of Philadelphia also offers a financial assistance program that can help people who have difficulty paying their water bills, but additional research may help generate ideas for how to increase enrollment in the program for eligible individuals. It will also be important to understand the experiences of people coping with water insecurity and how different programs and policies can best be designed to help people pay bills on time and gain reliable access to safe water. We hope to create a public sector and academic partnership that can explore these issues and generate innovative solutions.





Financial and Employment Costs

- **Healthcare costs** from mental and physical health impacts, part of which are paid by individuals. Altarum estimates the total costs for mental health conditions to all payers as \$302 per household per year.(7)
- **Money spent** purchasing bottled water, paying a neighbor for a hose connection, paying to shower at a gym or other facility, paying reconnection fees, paying attorney fees to dispute shutoff and/or ramifications of it (8) (9). Altarum estimates the cost of purchased water to vary from \$0.50 to \$1.25 per gallon, so from \$1950 to \$4950 per household per year.
- **Time costs** (e.g., lost labor, leisure, and home productive hours) of collecting water. (8-10)
- **Missed work** and loss of productivity and employment from physical and mental health impacts.(7)
- **Accumulating debt** (disconnected customer accounts continue to incur fees and penalties)(11)
- **Diminished credit** and dismantled borrowing potential.(11)



Family and Educational Costs

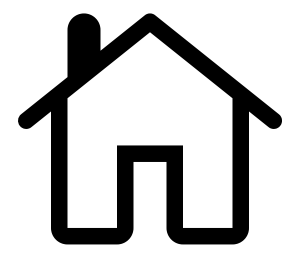
- **Children removed from homes** by Child Protective Services or forced to relocate away from family because of lack of water. (1,9)
- **Missed school** days. (12)
- **Poor hygiene**, which increases risk of children being bullied; some parents keep kids home from school to prevent bullying. (9)
- **Reduction in spending on school supplies** because parents need to make tradeoffs to pay utility bills. (12)



Physical and Mental Health Costs

- Increased **psychological distress** and mental health effects. (7,13–17)
- Increased risk for **infectious diseases and death** among children and adults. (9,18–21)
- **Premature loss of life** during covid-19. (22)
- **Dehydration**, which can disrupt cognitive function including concentration, alertness, and short-term memory and negatively impact mood and organ function. (23)
- Increased risk for **obesity, type 2 diabetes, and oral health problems**, partly because people substitute sugary drinks for water. (24,25)
- Water shut offs create **elevated health risks for certain vulnerable groups** such as babies and children, older adults, people with disabilities, people with chronic diseases, pregnant people, nursing mothers, and women who are menstruating.(26,27)

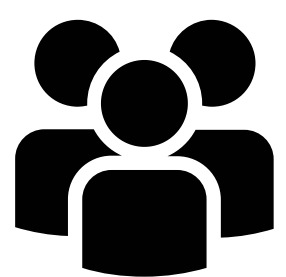
Human Costs of Water Insecurity



Housing Costs

- **Housing loss** because the house is uninhabitable without water, or a lien may be placed on an occupant for unpaid debt. This can lead to high penalties and interest, with some households facing tax foreclosure or renters evicted for not paying utility bills (if billed separately by the landlord). (22)(28)

Community Costs



- **Vacant homes** that are abandoned following a water shut off (9)
- Increases in **homelessness**. (28)
- **Costs to health systems and payers** for increases in hospitalization, ambulatory, and ER visits and prescription drugs driven by rises in infectious and chronic diseases (though some of these costs are borne by insurers, by state and federal governments, and, as noted above, by individuals).
- Tens of thousands of **pro-bono hours for legal and community services**. (29)

City Costs



- **Costs of shut offs** and reconnections, including staff time, travel, and materials.
- **Children placed in foster care** following a neglect finding for not having a utility service.(9)
- **Homelessness** (as a result of eviction, foreclosure, not being able to stay in a water-less home). (28)
- **Public safety** (including illegal, sometimes unsafe water reconnections). (9)
- Macroeconomic impacts of **lost productivity**.

Costs to Water Department

- **Lost revenue** from unpaid bills that can impact water infrastructure.

Future Research Needs

- Understanding the revenue needs of the Water Department to ensure a safe water system for all.
- Understanding the costs and yields from bill collection efforts.
- Identifying data sources to estimate the household and community costs listed in this report for urban areas, as much of the existing research comes from low- and middle- income settings or rural areas of the U.S. that do not necessarily generalize to water insecurity in an urban setting like Philadelphia.

Potential Water Policies & Initiatives Requiring Further Study

- Default enrollment in the tiered water assistance program.
- New outreach strategies to promote enrollment in the tiered water assistance program.
- New communication methods to encourage bill payment.
- Extension of the moratorium on water shut offs.
- New title/ownership policy to allow occupants to pay for water even while title/ownership is not established.

Appendix: Altarum Cost Estimates

Authors: George Miller, PhD, Corwin Rhyan, MPP

Introduction

While there is considerable anecdotal evidence of the hardships, including economic impact, associated with water shutoffs, there is little direct quantitative evidence of the magnitude of these hardships in Philadelphia. To help address this issue, these cost estimates were prepared by Altarum Institute, Ann Arbor, Michigan, drawing on our prior analysis of the costs to households that do not have piped water. [1] In adapting these previous estimates, we have omitted costs that do not apply to the Philadelphia water shutoff scenario and have modified the remaining costs to apply more closely to the Philadelphia population at risk for water shutoffs. In the long run, it would be useful to collect more evidence that is specific to Philadelphia.

Most of the costs we show will accrue to households, local residents, local businesses, and state or federal governments, rather than to the city of Philadelphia. However, showing these economic impacts is important because (1) the city presumably cares about the economic wellbeing of its households and citizens who are impacted by shutoff harms; (2) some of the shutoff harms will affect local worker productivity and hence local businesses; (3) some of these harms will affect the city via decreased economic activity; and (4) if the city chooses to resume shutoffs, all other major stakeholders (households, businesses, and other government entities) will be made worse off, likely creating a net societal loss. This is an example of one of the most important economic problems we face when dealing with social determinant of health issues: the “wrong pockets” problem, wherein any one entity cannot see enough savings to justify making the societally beneficial choice.[2] In this case, the city has the opportunity to avoid the societal loss from resuming shutoffs by foregoing the associated revenue.

Cost of Purchasing Water

Summary. Restarting water shutoffs for 75,000 households in Philadelphia would likely cost each household between \$1,980 and \$4,950 to purchase water. The total cost of purchased water for 75,000 households would be \$149 million (75,000 households * \$1,950) to \$371 million (75,000 *\$4,950) per year (or between \$12.4 million and \$30.9 million per month).

Explanation. In households that rely on purchased water for everyday use the average number of gallons per person is estimated to be 3.96 gallons per day.[3] The average household size for households lacking water access in Philadelphia is 2.74 (2.12 adults),[4] so the average Philadelphia household that experiences a water shutoff would have to purchase 3960 gallons per year (2.74 persons/household * 3.96 gallons/person/day *365 days/year). For water purchased in bulk (5-gallon containers or larger), we found prices per gallon ranging from \$0.50 to \$1.25 and even higher. At \$0.50 per gallon the total annual cost of purchased water would be \$1,980 per household per year (3960 gallons * \$0.50). At \$1.25 per gallon the total cost would be \$4,950 per household per year.

[1] <https://www.rwjf.org/en/how-we-work/grants-explorer.html#k=water%20access%20altarum&start=2020&closed=false>

[2] <https://jamanetwork.com/channels/health-forum/fullarticle/2760141>.

[3] <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2017WR022186>

[4] Family size data are for those lacking complete plumbing facilities in Philadelphia County, possibly resulting in a conservative (i.e., understated) estimate of the average size of a household at risk of a water shutoff. This would cause our shutoff cost estimates also to be conservative. Source: American Community Survey 2018 5-year data, accessed via IPUMS (<https://www.ipums.org/>).

Appendix: Altarum Cost Estimates

Water Acquisition Time Costs

Summary. It would take each household experiencing a water shutoff 20 minutes per day to acquire water. Valued at the average household wage, the cost would be \$3.13 per day and \$1,142 per year. The cost for 75,000 households would be about \$86 million per year (or \$7.1 million per month).

Explanation. For people who have to haul water from a remote location the data indicate that 25% of household members spend 30 minutes a day acquiring water.[5] Thus each household (average size, 2.74 persons) would spend 20.55 minutes per day acquiring water ($0.25 \times 2.74 \text{ persons} \times 30 \text{ minutes}$). Philadelphians would likely be able to buy water from a nearby store; getting to the store, purchasing the water, and getting it home might take less time than this. The average hourly earnings for the population at risk in Philadelphia County is \$9.15 across all household members.[6] So the time cost would, valued at this average wage, come to \$3.13 per household per day, \$1,142 per household per year, and nearly \$86 million per year for 75,000 households.

Mental Health Costs

Summary. Mental health conditions such as anxiety and depression are more prevalent in adults who live in households coping with water shutoffs. Restarting shutoff notices and shutoffs for 75,000 water accounts in Philadelphia could lead to 7,314 additional cases of mental health conditions among adult Philadelphians in the next year, at an annual cost of \$312 per household and a total cost of \$23.4 million per year (\$2.0 million per month) for treatment and lost earnings.

Explanation. Surveys from the National Institute of Mental Health show that, in 2019, 20.6% of U.S. adults suffered from mental health conditions, or 20.6 of every 100 adults.[7] Mental health conditions such as anxiety and depression are more prevalent in adults who live in households coping with water shutoffs, 22.1% higher.[8] Thus, instead of 20.6 adults with mental conditions per 100 adults in the general population, 25.2 adults have mental health conditions per 100 adults in households with water shutoffs – 4.6 more adults per 100 than in the general population.

The average cost of treating mental conditions, from the Medical Expenditure Panel Survey,[9] is \$2,560/patient/year in 2020 dollars, for a total additional cost per 100 adults of \$11,776 (4.6 adults * \$2,560). The average household with water shut off has 2.12 adults.

Thus, restarting water shutoff notices and water shutoffs for 75,000 households in Philadelphia could lead to 7,314 additional cases of anxiety and depression among adult Philadelphians (75,000 households * 2.12 adults/household * 4.6 excess cases/100 adults), at an annual cost of \$2,560 each: total treatment cost, \$18.7 million per year.

[5] Based on expert judgment informed by https://apps.who.int/iris/bitstream/handle/10665/68568/WHO_SDE_WSH_04.04.pdf?sequence=1&isAllowed=y.

[6] All household wage data are for families lacking complete plumbing facilities in Philadelphia county; source: American Community Survey 2018 5-year data, accessed via IPUMS (<https://www.ipums.org/>).

[7] <https://www.nimh.nih.gov/health/statistics/mental-illness>, using 2019 data.

[8] <https://www.sciencedirect.com/science/article/abs/pii/S0277953619305143>

[9] <https://www.meps.ahrq.gov/mepsweb/>.

Appendix: Altarum Cost Estimates

Additionally, mental health conditions such as anxiety and depression are linked to decreased labor force participation and lower average earnings for those affected. Research on depression has found that on average it causes 2.6% lower average earnings compared to those without a mental health condition.[10] Combining this 2.6% decrease in earnings (assuming it applies to all mental health conditions) with the same population described above (75,000 households * 2.12 adults per household), and average annual earnings per adult for those in Philadelphia county (\$24,609)[11], lost earnings from mental health conditions caused by water shutoffs can be estimated.

The additional annual costs of lost earnings for those suffering from mental health conditions is thus \$4.7 million (75,000 households * 2.12 adults/household * \$24,609 in earnings across all adults * 0.026 decrease in earnings).

Together, these two estimates total \$23.4 million in annual economic losses from mental health conditions potentially caused by water shutoffs, or \$312 per household.

[Note that these estimates only capture estimated mental health impact among adults in those households; the impact on children's mental health has not been estimated.]

[10] https://www.nber.org/system/files/working_papers/w19451/w19451.pdf

[11] All household wage data are for families lacking complete plumbing facilities in Philadelphia county; source: American Community Survey 2018 5-year data, accessed via IPUMS (<https://www.ipums.org/>).

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