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Lessons from Flint: A Comparative Study of Water Lead Levels In Jackson, MS and 11 Southeastern Cities

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Abstract

The severity and scale of the Flint, Michigan water crisis elevated the issue of water quality across the United States. A 2016 Reuters study of national lead testing results found almost 3,000 areas with poisoning rates higher than Flint (Pell and Schneyer, 2016). This research brief compared water lead contamination levels in Flint, Michigan, Jackson, Mississippi, and 10 other Southeastern cities. A comparative mixed-method research design guided this study's data collection and analysis activities. Findings indicated water lead levels in the City of Jackson were higher than other comparison cities as of 2017. Additional findings included other cities conducting more rigorous and timely testing of water quality; strong linkages between aging infrastructure, housing, and water quality; and the importance of developing viable comprehensive plans to guide water quality improvement. This brief concludes by proposing several policy recommendations to help improve water quality. Those recommendations included more frequent site testing and reporting than the current 3-year EPA requirement; pursuing more federal financial assistance for water quality projects; higher accountability levels for government officials regarding the timely reporting of water quality issues; and free pre-emptive blood testing for high levels of lead exposure.

Introduction

The severity and scale of the Flint, Michigan water crisis elevated the issue of water quality across the United States. Not only does lead contamination poses a serious health risk, it has a disproportionate impact on certain communities that tend to be predominantly poor and/or populated by racial minorities (Health Affairs, 2017). A 2016 Reuters study of national lead testing results across the United States found almost 3,000 areas with poisoning rates higher than in Flint, with many of those areas receiving little attention or funding (Pell and Schneyer, 2016).

Overexposure to lead can cause serious health issues including high blood pressure and damage to the brain, kidneys, and red blood cells that carry oxygen throughout the body. Lead

exposure particularly affects pregnant women, infants, and young children. In the case of pregnant women, lead builds up in the bones and then transfers to the fetus affecting its growth and development. Other health-related impacts of lead exposure include lower IQs in children, behavioral problems, learning deficiencies, auditory and physical development (especially growth), and anemia (United States Environmental Protection Agency, 2019). Over time, communities with high levels of lead exposure experience detrimental health and social outcomes (United States Environmental Protection Agency, United States Consumer Product Safety Commission, United States Department of Housing and Urban Development, 2013).

Lead and Drinking Water

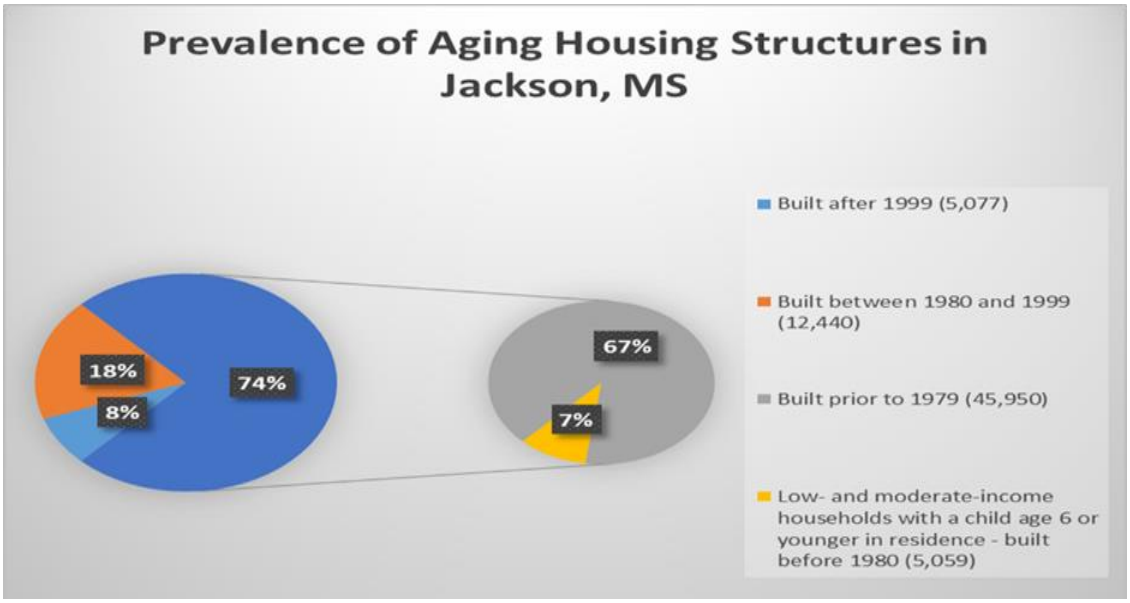
Common throughout the environment, sources of lead include the soil, certain types of porcelain pottery, dust, air, lead-based paints, and water. Lead enters the drinking water supply mainly due to corrosion of service pipes. This is particularly true when the water is acidic or has low mineral content that facilitates the corrosion of pipes and fixtures. Brass or chrome-plated brass is often used to make faucets and other fixtures using lead solder that dissolves into water (especially in pipes which run hot water) (Plumbing Manufacturers International, 2019). Homes built before 1986 have a higher risk for lead contamination due to lead in the pipes themselves, or as solder for plumbing fixtures (United States Environmental Protection Agency, United States Consumer Product Safety Commission, United States Department of Housing and Urban Development, 2013). A 2011 amendment to the Safe Water Drinking Act of 1974 reduced the maximum allowable lead content in pipes and fixtures to "a weighted average of 0.25 percent calculated across the surfaces of pipes, pipe fittings, plumbing fittings, and fixtures; and 0.2 percent for solder" (United States Environmental Protection Agency, 2019). Known as the 'Reduction of Lead in Drinking Water Act,' this amendment aimed to tighten the regulations around lead exposure from pipes and fixtures, and had a three-year transition period making it effective in 2014.

Also contributing to the lead problem is an aging water infrastructure system. The American Society of Civil Engineers (ASCE) reports there are approximately 1 million miles of pipes delivering water across the nation, many of which date back to the early to mid-20th century. In 2017, an official report by ASCE gave the nation's water systems a D+ "near failing" grade (ASCE, 2017 Infrastructure Report Card). Jackson's water system as a whole dates back to 1896 with the drilling of the city's first large-scale well. Today, Jackson's water supply is largely surface water flowing from a reservoir linked to the Big Black River and the Pearl River (Harvey et al., 1964).

As early as 2011, Hinds County (where the city of Jackson is located) was one of 16 counties flagged by the Mississippi Department of Health as being at high risk for lead poisoning (Nave, 2016; Mississippi State Department of Health, 2011). That finding occurred again in June 2015, when 22% of homes in a particular sample in the city of Jackson contained elevated lead levels, or levels of lead that exceeded the federal action level (Galbraith and Teague, 2016). For example, one home sampled was found to have 476 parts per billion (ppb) of lead, exceeding the Environmental Protection Agency's federal action level of 15 ppb. Other homes in that sample had lead levels ranging from 50-106 ppb. A prior year's findings showed homes in the range of 96-106 ppb (Galbraith and Teague, 2016).

Lead is most often present in plumbing fixtures of homes built before 1986, but it is also commonly present in the paint of homes built before 1978 (United States Environmental Protection Agency, United States Consumer Product Safety Commission, United States Department of Housing and Urban Development, 2013). According to U.S. Census data, there are approximately 63,467 occupied housing units in Jackson, Mississippi. Of those units, 45,950 (representing 72.4%) were built prior to 1979. In the City of Jackson's 2015-2019 Consolidated Plan, 5,059 homes built before 1980 consisted of households with a child age 6 or younger. (U.S. Census Bureau American Community Survey, 2012-2016; City of Jackson, MS FY 2015-2019 Five Year Consolidated Plan and FY 2015 Annual Action Plan). Figure 1 illustrates the percentage of aging houses reported in the Consolidated Plan that potentially contain some type of lead poisoning. Those households have a higher risk of experiencing some type of lead poisoning.

Figure 1. Prevalence of Aging Housing Structures in Jackson, MS



Source: "Selected Housing Characteristics", 2012-2016 American Community Survey (5-Year Estimates). US Census Bureau American Community Survey.

Increases in water lead contamination poses serious health, education, and social challenges in urban areas across the United States. This research brief compares water lead contamination levels in Flint, Michigan with contamination levels in Jackson, Mississippi and 10 other Southeastern cities. The purpose of this brief is to discuss water quality issues impacting urban areas, and to offer potential solutions that can help cities improve their water quality. By exploring this issue, the Mississippi Urban Research Center is seeking to fulfill its mission of helping to improve the quality of life in urban areas.

Methodology

This study used a comparative mixed-method research design to examine water quality issues in 11 Southeastern capital cities and the City of Flint, MI. The 11 Southeastern cities included Jackson, MS; Montgomery, AL; Tallahassee, FL; Atlanta, GA; Frankfort, KY; Baton Rouge, LA; Raleigh, NC; Columbia, SC; Nashville, TN; Richmond, VA; and Charleston, WV.

Because the listings of states comprising the U.S. Southeastern region sometimes vary, the listing identified by the American Association of Geographers was utilized (Southeastern Division of the American Association of Geographers, 2019). In addition to collecting quantitative data identifying contamination levels, qualitative data helped identify solutions to water quality issues facing each city under review. That data included reviewing strategic action plans addressing water quality issues in each respective city. The timeframe for this study's analysis included the five-year period 2013-2017. Data tables and graphical displays present study findings.

Findings

In 2015, both Jackson and Flint changed water supplies in an attempt to cut costs (Nave, 2016). But in water samplings performed in both cities for that year, 22% of Jackson homes sampled exceeded the federal action level of 15 ppb, while in Flint, 16.7% of homes exceeded the federal action level. Preliminary testing indicated that 90% of homes in Flint were below 25 ppb, whereas in Jackson, 90% of homes were below 28 ppbs. This meant for the testing period, a larger percentage of homes in Jackson had higher ppb rates than in Flint. Figure 2 presents a comparison between Jackson, MS and Flint, MI for the timeframe under review.

In a 2016 sampling, the testing sample size increased to 100 homes and the overall percentage of homes exceeding the federal action level decreased to 11%. However, there was an increase in the range of ppbs detected. The highest level reported in the 2015 Jackson sampling was 128 ppb; however, in the 2016 sampling, it was 476 ppb. By way of comparison, the highest level reported in the 2015 Flint sampling was 397 ppb (Galbraith and Teague, 2016).

Figure 2. Lead Levels Found in Water Quality Testing – Jackson, MS and Flint, MI (2013-2017)

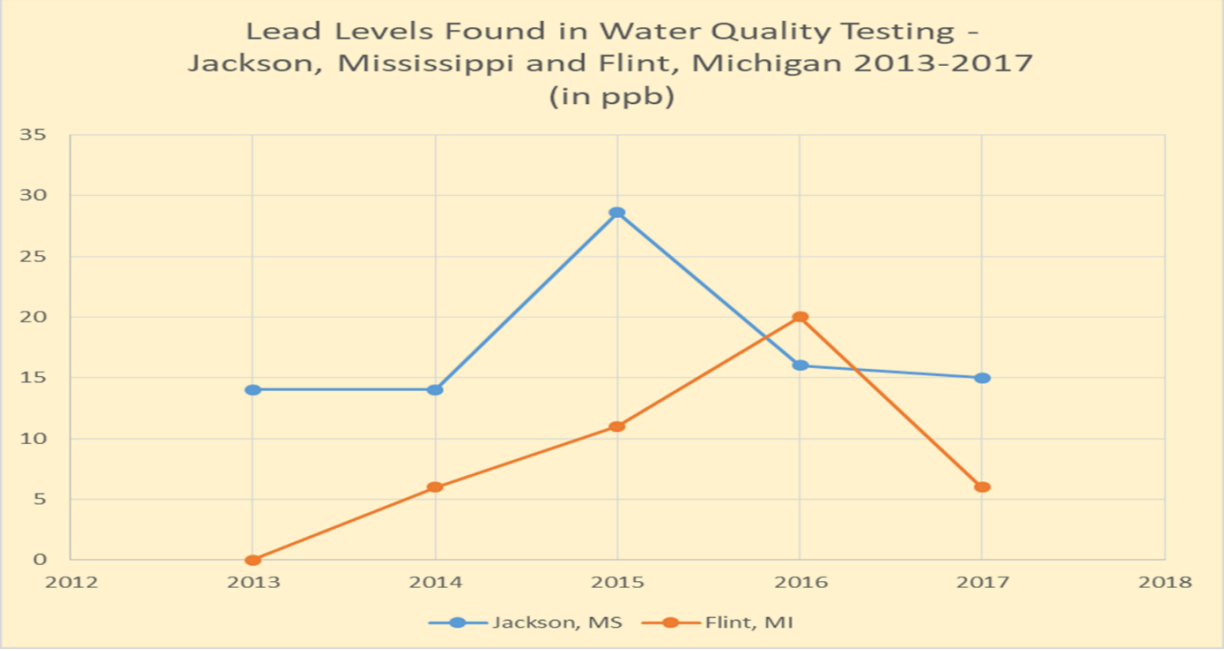
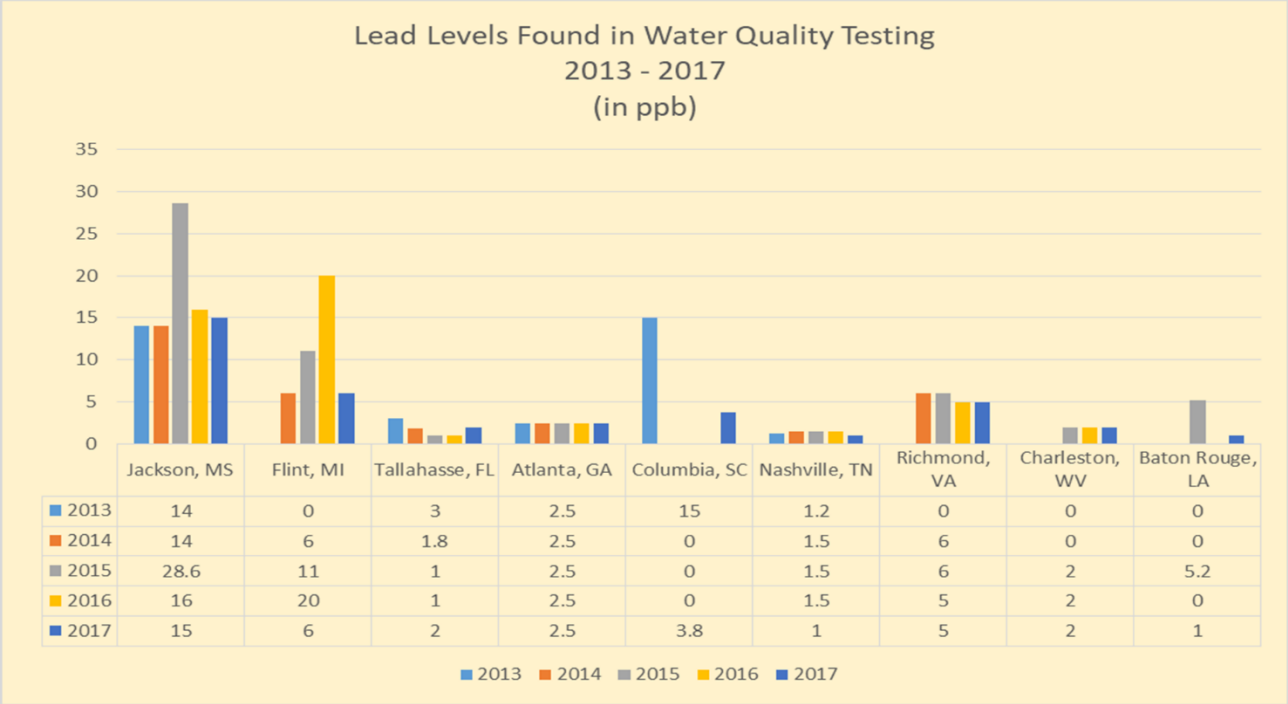


Figure 3 compares water lead levels across various cities as stated in each city's 2013–2017 Water Quality Report. As can be seen, lead levels in the City of Jackson's public water supply were higher than those in Flint and the other capital cities for the year 2015.

Figure 3. Lead Levels Found in Water Quality Testing Reports (2013-2017)



	Jackson, MS	Flint, MI	Tallahasse, FL	Atlanta, GA	Columbia, SC	Nashville, TN	Richmond, VA	Charleston, WV	Baton Rouge, LA
2013	14	0	3	2.5	15	1.2	0	0	0
2014	14	6	1.8	2.5	0	1.5	6	0	0
2015	28.6	11	1	2.5	0	1.5	6	2	5.2
2016	16	20	1	2.5	0	1.5	5	2	0
2017	15	6	2	2.5	3.8	1	5	2	1

** Figure 3 Note: *This bar graph does not include the cities of Montgomery, AL, Frankfort, KY, or Raleigh, NC: Montgomery and Frankfort due to a reporting of N/D ("non-detectable") for the years 2013–2017; Raleigh gave the non-specific reporting of "<3.0" for 2013, 2016, and 2017, with data unavailable for 2014 and 2015.*

Review of Strategic Action Plans

A review of available strategic action plans for cities included in this study revealed several commonalities and distinctions in practices to reduce detectable lead levels. For example, the use of chemical additives (i.e., "orthophosphates blends" such as zinc orthophosphates) to reduce the corrosiveness of water traveling through pipes was standard practice. Other common practices included the replacement of lead service lines on a "priority basis" at various sites throughout each city; compliance with the 3-year EPA mandated testing requirement; and conducting public education campaigns.

In addition to the previous listing of common practices to reduce detectable water lead levels, there were also several noteworthy distinctions.* Below is a listing outlining common practices in each city included in this study:

<u>Tallahassee, FL</u>

- Rigorous site testing schedule.

- Pediatricians advocating for protective policies such as installing point-of-use, industry-certified lead removal water filters on drinking water sources used by young children.

- Assessing pregnant women for lead exposure using a risk assessment questionnaire at the initial prenatal visit, blood lead testing for women identified as being at risk for lead exposure.

- Encouraging public support for universal blood lead level testing for children ages 1 and 2 using point-of-care technologies and capillary ("finger-stick") blood.

- Recommended limit of 1 ppb lead in water as a public health standard, particularly in schools, rather than the widely used EPA action level of 15 ppb (City of Tallahassee, 2019).

Columbia, SC

- A certified laboratory performs more than 200,000 analyses each year to insure the water supply meets all EPA and South Carolina Department of Health and Environmental Control standards at all stages of the treatment process and at hundreds of points throughout the City's distribution system.

- Free testing of tap water for households (City of Columbia, 2019).

Baton Rouge, LA

- Act 632, passed during the 2018 Regular Louisiana State Legislative Session, mandates testing elementary schools built before 1986 for lead contamination of drinking water (Louisiana State Legislature, 2018).

Flint, MI

- Building a new water treatment plant costing $108 million over 4 years (2017-2020).

- "F.A.S.T. (Fast Action and Sustainability Team) Start" program designed to replace lead pipes in specific geographic areas. The program consists of Six Phases running through 2019. A study by the University of Michigan found as many as 29,100 Flint residences had lead or galvanized steel service lines needing replacement.

- As of April 18, 2018, the total number of lines replaced was 6,264 and the total number of full copper lines identified for replacement was approximately 2,500 since March 2016 (Michigan FAST Start Pipe Replacement Program, 2019).

- Beginning in March 2016, high–risk households in Flint received first priority for pipeline removal and replacement. High-risk households include those containing children under age 6, children with elevated blood lead levels, pregnant women, senior citizens, residential day care facilities, persons with compromised immune systems, households where water tests indicate high levels of lead at the tap.

* It should be noted the cities of Tallahassee, Columbia, Baton Rouge, and Flint, were able to reduce or maintain lead levels below the federal action level based on the city water quality reports from 2013-2017.

Discussion

This research brief compared water lead contamination levels in Flint, MI, Jackson, MS, and 10 other Southeastern U.S. cities. It also identified common issues impacting water quality levels in urban areas across the United States. While the City of Jackson is currently experiencing water lead levels exceeding allowable limits, the crisis intensifies given the number of aging households in Jackson, combined with other aging infrastructure issues. Urban areas across Mississippi and the United States are facing similar crises. The federal action level for lead is 15 ppb after which a municipality's water supply is in violation of the Safe Drinking Water Act. However, exposure to lead at any level has high potential for creating developmental issues in young children, including diminished brain functionality, and for causing serious health problems in adults (Oram, 2014).

Lead seeping into water systems via corrosive pipes is common in many urban areas. In part to address this issue, the City of Jackson changed its water supply back to the original well water system. However, this move did not stop lead from seeping into the Jackson water system via corrosive pipes. Older houses built before 1980 and aging water infrastructure systems also contribute to lead contamination. Many urban areas face funding challenges that delay and/or prevent infrastructure improvements. This deferring of maintenance is having a direct impact on efforts to reduce lead levels in water systems. This study's review of selected strategic plans revealed major differences in how each city is addressing these issues. For example, the City of Jackson's compliance plan issued under the former Director of Public Works (Ms. Kishia Powell) is less than two full pages in length (Compliance Plan for City of Jackson, 2016). Whereby in comparison, the City of Flint's (MI) plan for water treatment improvement is 397 pages in length (CDM Smith, 2017).

Another issue emerging from this study concerns notification of the public regarding high lead levels. For example, the 2015 Jackson water sampling results were not made widely known until January 2016. This meant for approximately six months, residents did not receive any warning about high lead levels in their water supply. Similarly in September 2015, the City of Flint issued an advisory alerting resident of high lead levels. This occurred approximately seven months after the detection of high lead levels in February 2015. In both cities, the lack of early notification regarding the health risks posed by contaminated water created a response of distrust towards the government and its officials. In a February 2016 interview with a local news station (WAPT), Mayor Richard White of Byram (a small suburb south of Jackson) stated "he worries that this has been going on for a while and something should have been done a long time ago" (CNN, 2016). A Flint resident echoed this sentiment of distrust in an April 2018 interview, stating that despite city officials declaring the water as "safe" now, she will never drink from the public water supply again (Baptiste, 2018). Despite claims by city officials that Flint no longer has unsafe drinking water, residents still report problems such as discolored water and skin rashes after bathing (Baptiste, 2018).

One other issue emerging from this study concerns the role state governments play in helping address local water quality issues. One of the key differences in addressing the water quality crisis in Flint (MI) and Jackson (MS) was the State of Michigan's level of support and involvement. For example, the State of Michigan required accountability for officials who acted improperly with regard to transparency and protecting the health of citizens. This accountability resulted in criminal charges against 15 people involved with the Flint water crisis. The State of Michigan also provided $25 million to the Flint FAST Start program in 2017; and allocated approximately $100 million in funds from the Federal Water Infrastructure Improvement for the Nation (WIIN) Act of 2016. Additionally, the State of Michigan provided approximately $47 million from the settlement of the *Concerned Pastors for Social Action v. Khouri* case (Michigan FAST Start Pipe Replacement Program, 2019). To date, the State of Mississippi's response to the City of Jackson's water crisis has not been as direct or financially supportive.

Conclusions

Based upon this study's findings, solving the water lead contamination problem will require time, money, and the prioritization of this issue. Given the disproportionate impact this issue has on marginalized communities, there is a special sense of urgency to mitigate the environmental and other health conditions associated with this problem. In the meantime, governments in urban areas can take cues from the cities examined in this study regarding preventative practices that can help reduce lead levels and improve the quality of life. Going forward, the course of action chosen will make all the difference between cities like Jackson becoming either "the next Flint, or the city that learned from Flint."

Policy & Programmatic Recommendations

Based upon this study's findings, below are several recommendations to help local municipalities improve their water quality levels, and mitigate the adverse effects of lead contamination. Those recommendations include:

- **Pursuit of federal assistance.** Because of limited funding and other financial resources available at the state and local levels, municipalities should seek more federal assistance targeting water quality improvement and lead poisoning prevention efforts. Assistance is available specifically through the Water Infrastructure Improvements for the Nation (or WIIN) Act and the Securing Required Funding for Water Infrastructure Now Act.

- **Widening of Health education campaigns.** To increase awareness regarding the various health effects of lead poisoning, public health campaigns should be expanded to include physicians and clinics (especially pediatric specialists) as regular and ongoing information providers, and to include legislators and other policymakers and officials as advocates for the public.

- **Develop comprehensive compliance plans that address lead paint and water exposure risks.** As discussed earlier, a city's infrastructure problems and older houses containing lead paint are major determinants of water quality. Increasing efforts to improve housing quality and water infrastructure can help reduce lead exposure in thousands of households.

- **Free pre-emptive blood testing for lead exposure and poisoning.** Many urban areas have high poverty rates that often limit residents' ability to pay for medical testing. Since lead poisoning is often undetected until after the health of the individual deteriorates, providing free pre-emptive blood testing, prevention, early detection, and early treatment can help reduce the impact of high lead levels.

- **Require testing and remediation for lead in water at childcare facilities.** Because infants and young children are among the most susceptible to lead exposure, it is critical to safeguard against lead exposure in all environments where they are consuming potentially contaminated water. As such, childcare facilities should be included in a listing of sites requiring regular testing for lead contamination.

- **Requiring accountability for officials who fail to inform the public.** Holding government officials accountable who failed to inform citizens can demonstrate a commitment to protect the public interest. Flint officials who were aware of the presence of high levels of contaminants faced criminal charges for their contribution to endangering the health and welfare of city residents. Holding government officials accountable can help ensure local residents acquire timely information related to water quality issues.

- **Increase site testing and reporting beyond current 3-year EPA requirement.** Daily testing at water treatment plants is a common practice in many cities, but the EPA mandates specific site testing only every three years. Site testing every three years does not sufficiently reveal water quality levels in homes during non-testing years. Increased site testing can provide frequent updates regarding water quality in homes, and it can provide more timely information regarding when to issue advisories and alerts in a timely manner.

Depending upon the severity and scope of water quality issues facing a city, the above recommendations can help provide a general framework for improving water quality, health, and safety of local residents.

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Baton Rouge: http://www.brwater.com/water-quality.html
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