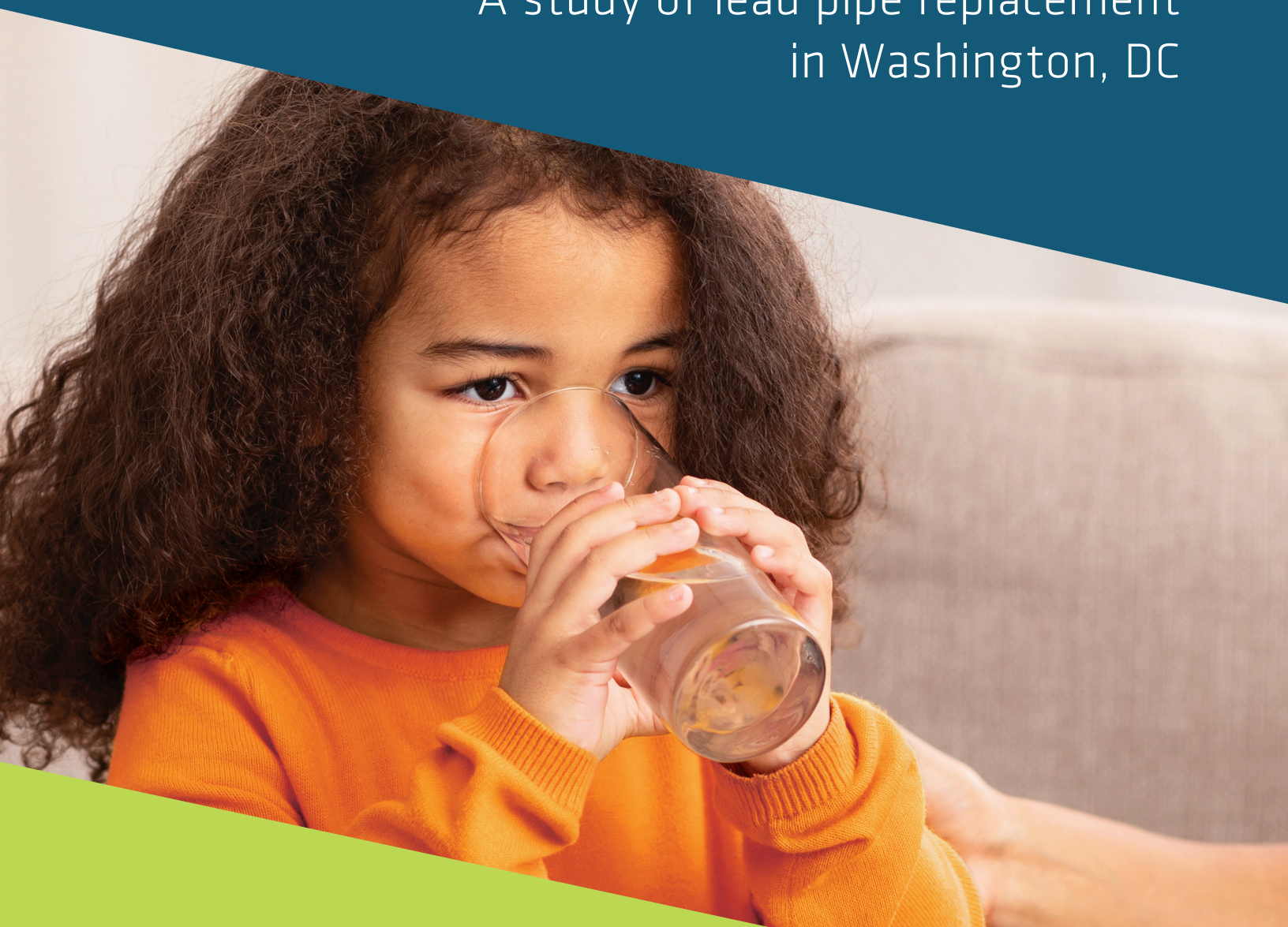


MARCH 2020

Lead Pipes and Environmental Justice

A study of lead pipe replacement
in Washington, DC





Maintaining and rebuilding aging water infrastructure across the United States is essential to providing communities with safe drinking water. Regular infrastructure repair work, such as when a water main under the street is repaired, can disturb service lines, which poses an issue when the line is made of lead. The best approach to prevent lead from leaching into the water is to take special precautions when disturbing lead pipes and to fully replace the lead service line (LSL) to protect residents. Typically, water utilities expect households to pay to replace the portion of the LSL on private property to avoid a partial replacement, which can significantly increase short-term lead in water levels and fails to provide the long-term lead exposure reductions provided by full replacement. Since low-income households may be unable to pay, this practice raises health equity and environmental justice concerns.

To evaluate these concerns, Environmental Defense Fund and American University's Center for Environmental Policy analyzed more than 3,400 LSL replacements (LSLRs) conducted in Washington, DC between 2009 and 2018. In 2009, Washington, DC launched a program to promote full LSLR by streamlining the process for households as part of the utility's Capital Improvement Program to restore water mains. The program required the household to pay for the LSLR on private property, but provided logistical support to the resident. Comparing data provided by the city's water utility with demographic characteristics, we found that the program had the unintended consequence of disproportionately impacting low-income and minority neighborhoods. The study saw similar impacts with a complementary program designed to support households proactively paying to replace their LSL, outside of infrastructure repairs (1,300 households participated).

The federal government, states, communities, and water utilities need to recognize the unintended consequences

of LSLR programs that facilitate access by wealthy households but leave low-income and minority households behind—especially given known health impacts of even low levels of lead exposure. Achieving health equity and environmental justice in LSL replacement is essential, not only because all children and communities deserve to benefit from reductions in lead exposure, but because these residents already bear a disproportionate burden.

The problem of lead service lines

Aging water infrastructure in the United States requires constant investment to ensure residents can enjoy safe water. According to the Environmental Protection Agency (EPA), water utilities must invest more than \$300 billion over the next 20 years to restore the network of transmission lines, water mains under streets, and service lines that deliver water to our homes and other buildings.

Activities associated with regular infrastructure work, such as when a utility digs up a street to restore or replace a water main, can disturb the service lines. If a service line is made of lead—as are an estimated 9.3 million in the country—the disturbance can release lead into the drinking water. LSLs are the most significant source of lead in water, putting the public's health at risk.

The best long-term solution to this issue is to conduct full LSLR—replacing both the portion of the service line on public property and private property (see Figure 1 of a typical full LSLR compared to a partial LSLR). Replacing only part of an LSL can significantly increase lead in drinking water for months and provides limited or no long-term benefit of reduced lead risk. This is a lost opportunity compared to full LSLR, which results in smaller and shorter lead increases and provides lasting and sustainable benefits as it permanently removes a major source of lead exposure.

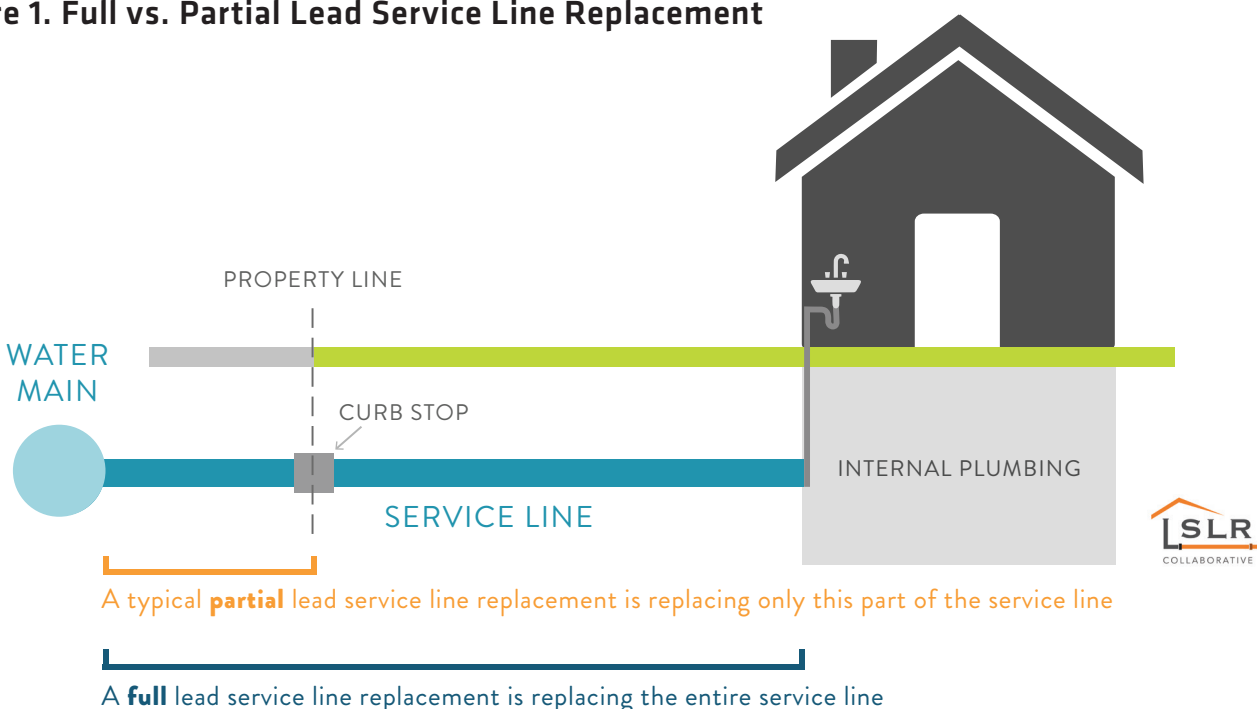
Unfortunately, partial LSLR is the typical practice for most utilities when they are conducting infrastructure repairs and must disturb an LSL. In this situation, the utility replaces the portion on public property, but—due to the shared ownership of the line—the property owner is expected to pay for the replacement on private

property and, in most cases, find a contractor for the project. Many property owners, especially low-income homeowners or those who are landlords, may be reluctant or unable to pay the costs, and they may find it difficult to select and manage a contractor to do the work.

Due to growing national awareness of the dangers of exposure to lead in drinking water, many states and communities are taking steps to support full LSLR. This includes paying for some or all of the replacement cost, waiving permit fees, making it easier for customers to arrange for the work to be done properly, and posting online maps that show the service line material.

Despite this progress, leaving LSLs on private property if a household does not pay for a full replacement is still commonplace for the estimated 11,000 communities with LSLs. The practice puts low-income households in a difficult position—either they pay to avoid a partial LSLR or their families are at an increased short-term risk of exposure (especially if they don't take adequate precautions like filtration) and lose an opportunity for more sustained reduction provided by a full LSLR. We sought to evaluate—with real data—whether the practice results in environmental justice problems and increases health equity disparities.

Figure 1. Full vs. Partial Lead Service Line Replacement





Case Study: Washington, DC

To better understand the health equity concerns presented by LSLR, researchers evaluated data on more than 3,400 full and partial LSL replacements conducted in Washington, DC from 2009-2018. Professor Karen Baehler led this study with a team of researchers at American University's Center for Environmental Policy, supported by Environmental Defense Fund (EDF) and DC Water, the city's water utility, with funding from the Robert Wood Johnson Foundation.

During this ten-year period, DC Water required customers to pay to replace the LSL on private property but covered the cost for the remainder of the pipe. The utility took steps to make it easier for the customer to participate by streamlining the contracting costs and process, coordinating the work, providing pitcher filters, and offering post-replacement sampling. It also negotiated a standard pricing arrangement with contractors and updated its online map so the public could see the service line was no longer lead after replacement. This program was not required by

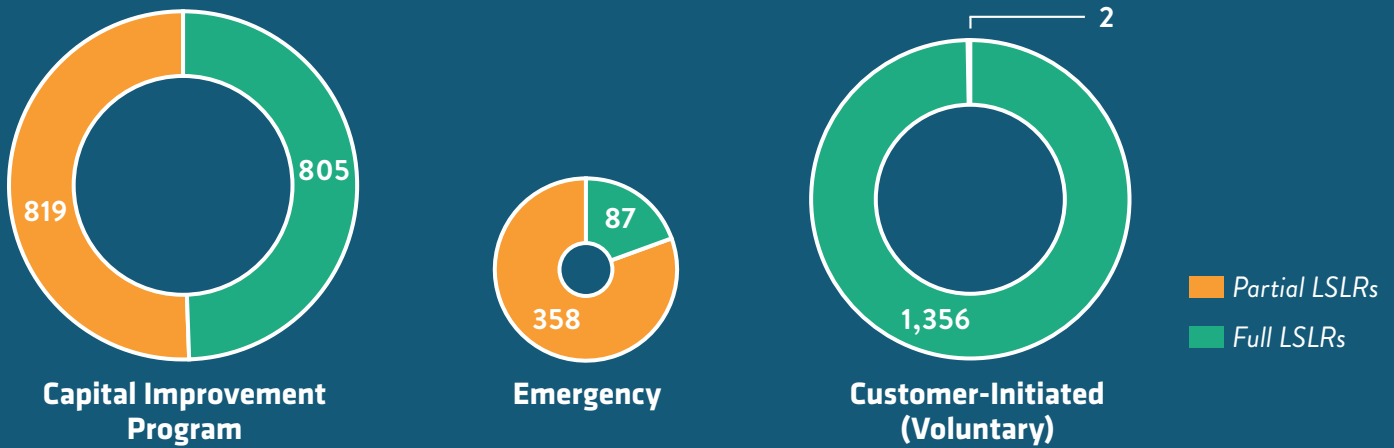
federal or Washington, DC law; these were proactive steps DC Water took to facilitate more LSLRs.

Types of LSLR studied

DC Water categorized the more than 3,400 LSLRs into three scenarios:

- 1. Capital Improvement Program LSLRs:** 1,624 LSLRs resulted from planned infrastructure improvement projects conducted by DC Water that disturbed an LSL. About half were full replacements.
- 2. Emergency LSLRs:** 445 LSLRs resulted from DC Water-initiated emergency repairs to the main under the street that disturbed an LSL. About 20% were full replacements.
- 3. Customer-initiated (Voluntary) LSLRs:** 1,358 LSLRs resulted from proactive requests from the household through a program offered by DC Water (the utility calls these "Voluntary LSLRs"). All but two of these were full replacements.

Figure 2. Types of LSLRs in Washington, DC (2009–2018)



See figure 2 for details on the types of LSLR studied.

A fourth LSLR scenario occurs when a water utility is required to perform replacements because compliance sampling under the Lead and Copper Rule (the federal regulation for controlling lead in water) indicates high levels of lead in the drinking water. Washington, DC was below the Lead Action Level during the study period, therefore, we did not evaluate the impacts of this activity.

LSLRs by ward

Researchers linked information about LSLRs with demographic information for the 179 census tracts in Washington, DC available through the U.S. Census American Community Survey’s (ACS) five-year estimates. They also linked these census tracts to Washington DC’s eight wards—the primary political subdivisions of the city—and looked for statistically-significant relationships. Wards differ not only in geography, but in history, culture, demographics, and governance. Figures 3 and 4 show the breakdown of full LSLRs by Washington, DC ward for Capital Improvement Program-related and customer-initiated replacements.

Figure 3. Capital Improvement Program, Full LSLRs as Percent of Total LSLRs

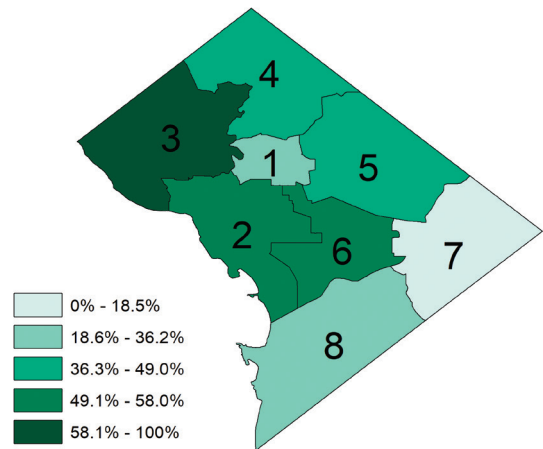
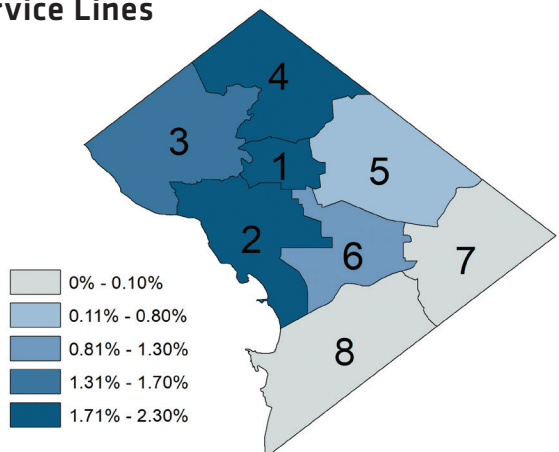


Figure 4. Customer-Initiated (Voluntary) Full LSLRs as Percent of Residential Service Lines



Key Results

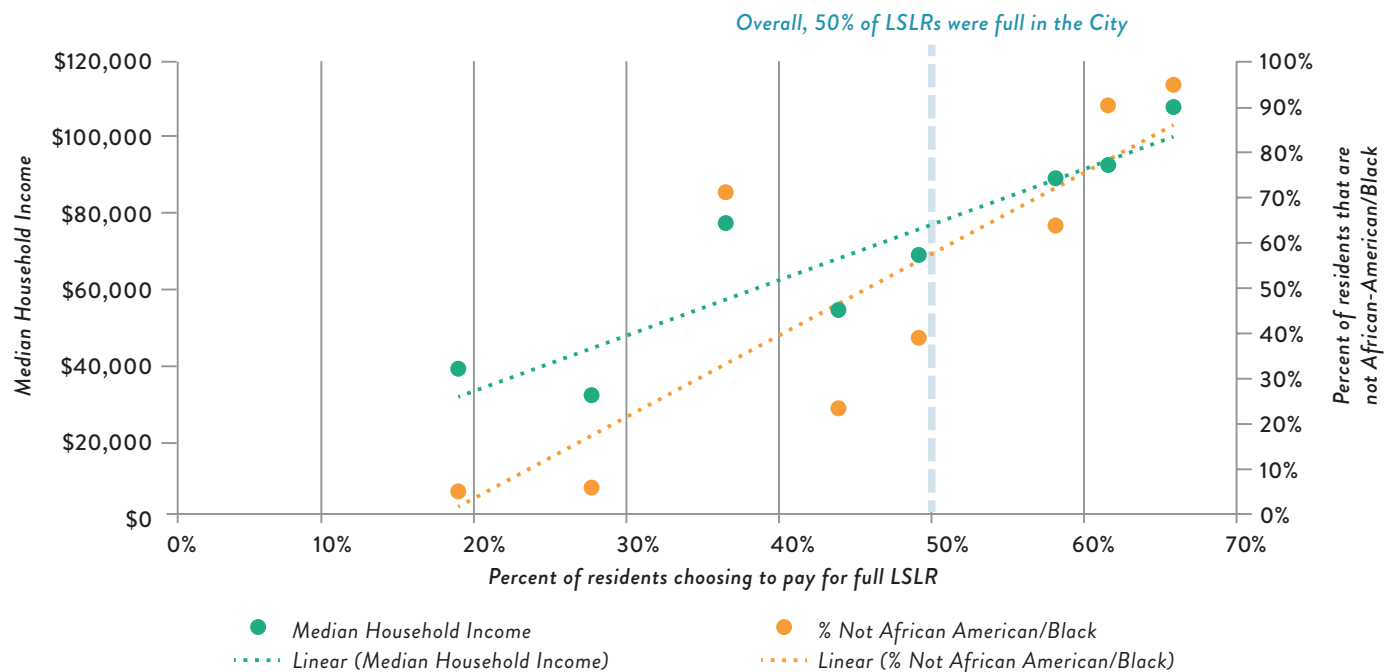
For Capital Improvement Program and customer-initiated LSLRs, researchers found statistically significant relationships between median household income, percentage of residents who self-identified as African American /Black, and an Area Deprivation Index (ADI)—which combines 14 social, economic, and demographic factors associated with deprivation and poor health outcomes. We found no association for other demographic factors or for emergency repairs. See Figures 5 and 6 for results of analysis by ward.

For full details on the study methodology and results [see here](#).

Capital Improvement Program LSLRs and Health Equity Disparities

- Lower rates of full LSLR in wards and census tracts with lower median household incomes, higher percentage of residents self-identified as African American/Black, and a higher ADI.
- City-wide, property owners paid for full LSLR 50% of the time. In the wealthiest wards, the rate was 66% compared to 25% for the two wards with the lowest incomes.

Figure 5. More full LSLR compared to partial LSLR during infrastructure improvement projects in wealthier, predominantly white areas in Washington, DC (2009–2018)



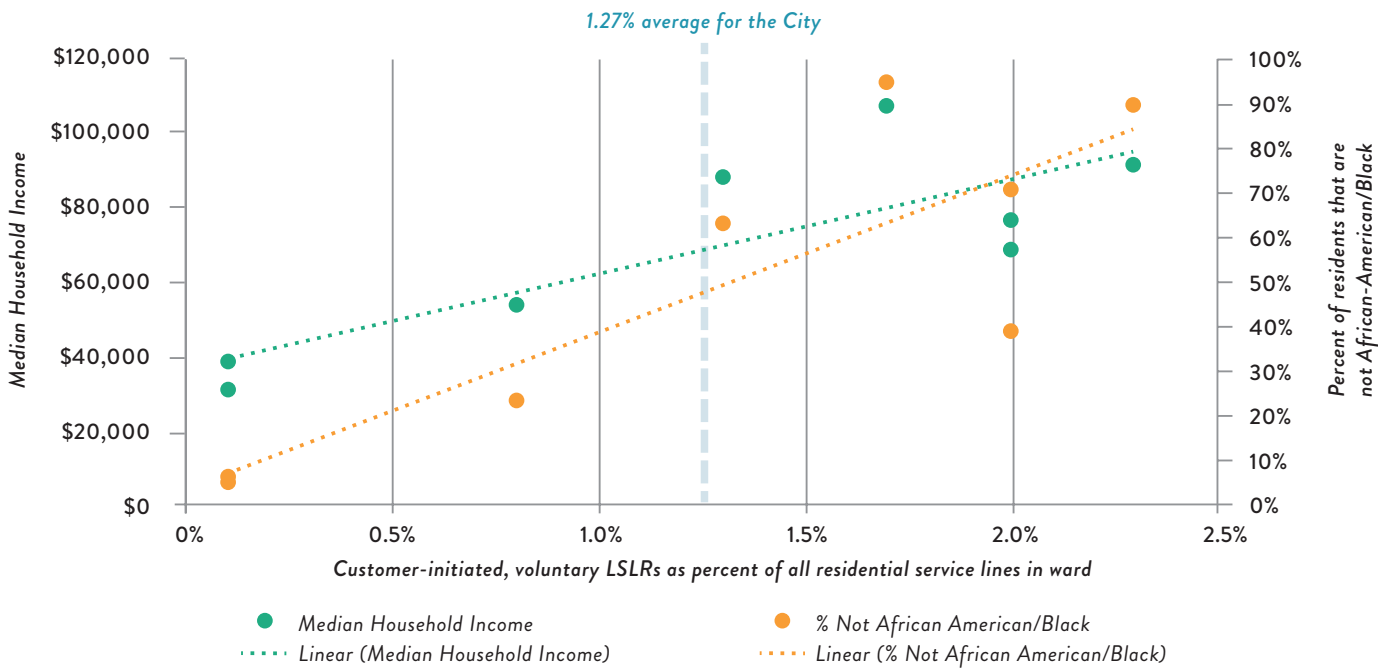
Characteristics of Ward	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8
% Full replacements	36%	61%	66%	49%	44%	58%	19%	27%
Median household income	\$76,610	\$92,025	\$107,499	\$68,277	\$53,986	\$88,477	\$38,374	\$31,097
% of Residents not African American/Black	71%	90%	94%	39%	23%	63%	5%	6%
Number of total replacements	298	361	82	96	275	379	27	106

Customer-Initiated LSLR and Health Equity Disparities

Even outside the context of DC Water-initiated planned infrastructure work, researchers confirmed the same trend for wards when a customer proactively sought to pay to replace their portion of the LSL with DC Water replacing the remainder of the service line. Since almost all were full LSLRs, we compared the number of customer-initiated LSLRs to the total number of residential service lines in the ward.

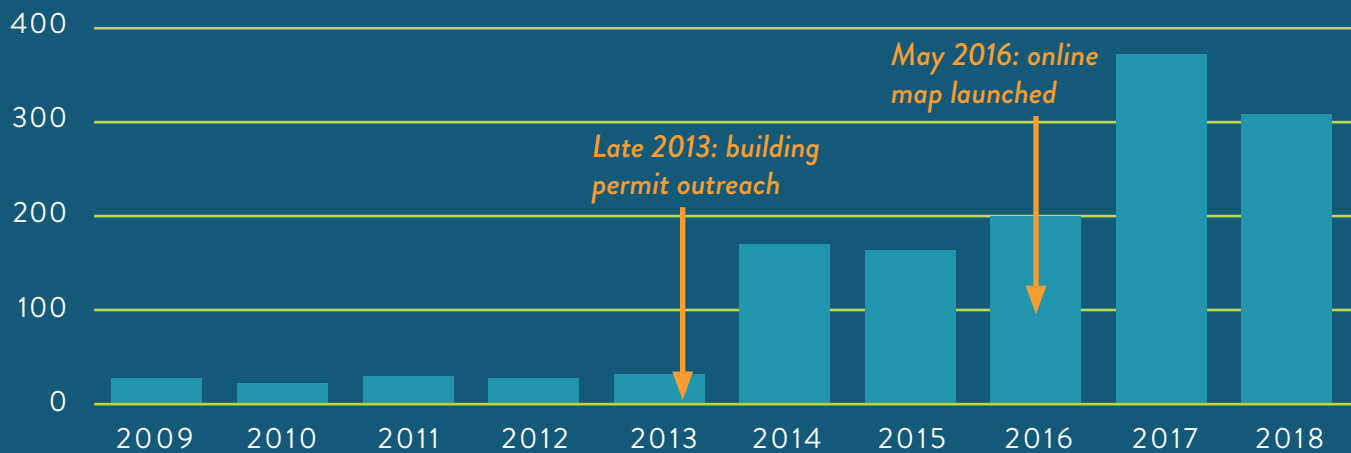
- Lower rates of customer-initiated LSLRs in areas with lower median household incomes, higher percentages of African American/Black residents, and higher ADI.
- In the two wards with the lowest median household income and highest percentage of African American/Black residents only 0.1% of residential service lines were voluntarily replaced. This compares to 2.3% in the ward with more than double the median household income and a 90% non-African American/Black population.

Figure 6. More customer-initiated (voluntary) LSLRs in wealthier, predominantly white areas in Washington, DC (2009–2018)



Characteristics of Ward	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8
No. of customer-initiated LSLRs	179	164	241	403	151	199	13	7
No. of all residential service lines	8,853	7,284	14,364	20,317	18,399	14,846	15,114	7,676
% of customer-initiated LSLRs	2.0%	2.3%	1.7%	2.0%	0.8%	1.3%	0.1%	0.1%
Median household income	\$76,610	\$92,025	\$107,499	\$68,277	\$53,986	\$88,477	\$38,374	\$31,097
% of residents not African American /Black	71%	90%	94%	39%	23%	63%	5%	6%

Figure 7. Customer-initiated LSLRs in Washington, DC (2009–2018)



Impact of efforts to promote customer-initiated LSLRs

For five years, DC Water had few customer-initiated LSLRs, with a modest 25 per year. From 2014 to 2016, the rate jumped about seven-fold to nearly 175 full LSLRs per year, likely a result of a change in the building permits department that provided an incentive for home renovators to participate in the program before applying for a renovation permit. In 2017 and 2018, there was another jump—about 75%—after DC Water posted an interactive map online that made it easier for customers and the public to see which properties had LSLs (see Figure 7). The increase provides critical insight into the importance of effective outreach.

The increase in participation, while positive, also serves as a reminder that communities must be sensitive to the unintended consequences when wealthier residents are the primary beneficiary of a program.

Implications for federal regulation

The Lead and Copper Rule (LCR), established in 1991, is the nation’s main regulation limiting lead in drinking water. EPA proposed revisions to the rule in October 2019, that would require utilities (known as community water systems in the rule) to make it easier for customers to fully replace LSLs. However, it would

continue to hold utilities responsible only for paying to replace the LSL portion they own—implicitly leaving the burden on the household to pay to replace the remainder of the service line for a full replacement.

While many utilities may choose to pay for some or all of the cost of full LSLR during planned infrastructure projects, we expect that most of the 11,000 utilities with LSLs would not. Therefore, under EPA’s proposal, we anticipate that most utilities would adopt programs similar to DC Water’s Capital Improvement Program and customer-initiated LSLR programs. While these changes will have the positive effect of increasing full LSLRs and reducing partials overall by making it easier for those willing and able to pay, our study provides evidence that wealthier customers will be more likely to participate, leaving low-income and minority households with increased risk of harm from lead. The unintended consequences of the changes would be making health equity and environmental justice disparities worse, not better, than the current version of the LCR.

“Household-level changes that depend on ability-to-pay will leave low-income households with disproportionately higher health risks.”

—EPA Environmental Justice Analysis
of the proposed LCR rule

We would anticipate similar problems when a utility has high enough lead levels in drinking water to trigger mandatory LSLRs. While the current LCR proposal only credits full LSLRs to meet annual mandatory replacement milestones—which is a positive step—it provides a strong incentive for utilities to favor projects in wealthier neighborhoods where they are more likely to find willing participants. Here, again, the proposal would make the disparities worse, not better.

We made EPA aware of the study’s findings and implications in [comments on the LCR proposal](#). Fortunately, EPA has an opportunity to fix the proposal’s shortcomings, thereby fulfilling its responsibility to identify and address the disproportionately high and adverse human health and environmental effect of federal actions on minority and low-income populations to the greatest extent practicable and permitted by law pursuant to [Executive Order 12898](#). The agency also should help

states and communities that receive federal funding avoid violating the [Civil Rights Act of 1964](#).

[Learn more](#) about the environmental justice implications of the proposed rule.

Recommendations

Our findings serve as an important reminder that communities, water utilities, states, and the federal government should consider the health equity and environmental justice implications of all scenarios of LSLR. There are several approaches to address these issues, such as strictly limiting partial LSLRs, subsidizing replacements in low-income and minority neighborhoods, and closely tracking



Washington, DC's New Policy

In 2019, Washington, DC passed an ordinance that took steps to resolve the health equity issues by:

- Prohibiting partial LSLRs during infrastructure projects and emergency repairs, using funds paid by rate-payers to cover the cost of replacing the LSL on private property. As a result, there is no cost to property owners. See here for more information.
- Inviting property owners where partial LSLRs had been conducted in the past to fully replace the remaining lead portion. The cost is subsidized between 50% and 100% based on the resident's income. The city designated \$2 million for each of the first two years of this effort. See here for more information.

potential disparities. Fortunately, Washington, DC has begun to take action by effectively banning partial LSLRs and going back to fully replace LSLs that were only partially replaced in the past.

The federal government

Congress has made significant strides in recent years in providing access to more funding for utilities for infrastructure work, especially with its Water Infrastructure Finance Improvement Act. However, the investment still falls short of the need for regular infrastructure improvements and LSLR.

Without effective customer-assistance programs, low-income households are likely to struggle to pay increased rates.

In addition, most of the financial support provided by the federal government consists of loans, not grants, forcing utilities to incorporate the cost into their rates charged to customers. Without effective customer-assistance programs, low-income households are likely to struggle to pay increased rates. The situation will be even more difficult for utilities that primarily serve low-income communities—rural and urban—because many of their customers cannot bear the costs.

The federal government needs to step up, support the overall effort, and put a special emphasis on low-income and minority communities for assistance.

See our public comments for specific recommendations to the EPA to strengthen the LCR.

States

To make progress on LSLR, it is critical to have a solid estimate of the number of LSLs in each state. EPA's proposed LCR will help states—and the public—get that information, and the results will be included in the agency's next update to its drinking water infrastructure needs assessment.

In the meantime, it's fortunate that many of the states in the Midwest, Mid-Atlantic and Northeast (which have the majority of LSLs in the country) have adopted proactive policies to support LSLR, including limiting partial LSLR, with Michigan leading the way.

States need to redouble their efforts, especially in light of the economic benefits of LSLR and the environmental justice challenge. And they need to provide funding and other tools to better support low-income and minority communities.

Communities and drinking water utilities

Utilities should consider options to limit partial LSLR and ensure balanced participation in customer-initiated programs, considering barriers to participation in full LSLR. Cities (including elected officials, water

utilities, health departments, and neighborhood leaders) should look to Washington, DC's new policy as a model to address partial LSLR, or Denver Water, which recently committed to replacing all LSLs in its system at the expense of the water utility, or Greater Cincinnati Water Works, which has provided a need-based subsidy since 2017.

Conclusion

Eliminating lead pipes needs to be a national priority to protect public health, and that work must be a part of the overall investment in the infrastructure that

delivers safe drinking water to more than 11,000 communities across our nation that still have lead pipes. We have seen significant progress in many communities, with states and the federal government providing critical—albeit insufficient—support. But, as our study of Washington, DC makes clear, communities need to recognize the unintended consequences of LSLR programs that effectively facilitate access by wealthy households but leave low-income and minority households behind. Achieving health equity and environmental justice in LSL replacement is essential, not only because all children and communities deserve to benefit from reductions in lead exposure, but because these residents already bear a disproportionate burden.



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