May 4, 2020

Dr. Thomas Armitage, Designated Federal Officer
EPA Science Advisory Board (1400R)
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460–0001

RE: Comments to Science Advisory Board regarding proposed revisions to the Lead and Copper Rule

Dear Dr. Armitage:

Environmental Defense Fund (EDF) respectfully submits the following comments to the Environmental Protection Agency's (EPA) Science Advisory Board (SAB) in advance of its May 11, 2020 public teleconference. The March 16, 2020 *Federal Register* at 85 Fed. Reg. 14,938 indicates the SAB will be discussing the National Primary Drinking Water Regulations: Proposed Lead and Copper Rule Revisions and possible advice and comments from the SAB on the rule.

EDF's mission is to preserve the natural systems on which all life depends. We have more than two million members and a staff of 700 scientists, economists, policy experts, and other professionals around the world. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems. This has drawn us to areas that span the biosphere: climate, oceans, ecosystems and health.

Our Health Program seeks to safeguard human health by reducing exposure to toxic chemicals and pollution, including reducing lead in drinking water by accelerating lead service line (LSL) replacement. These lead pipes connect the main under the street to homes and buildings and are the most significant source of lead in drinking water. In its Economic Analysis, EPA estimated there are 9,267,910 LSLs in use in 11,338 community water systems across the country.[1]

As the SAB reviews EPA's proposed revisions to the Lead and Copper Rule (LCR), EDF requests that it consider the following scientific assessments that have implications for the rule. We have included full studies and reports as attachments.

I. Benefit of reducing cardiovascular disease deaths by replacing LSLs

EDF combined publicly available EPA resources to quantify the benefits from reduced death from cardiovascular disease (CVD) based on the agency's proposed changes to the LCR. We also evaluated an option not considered by the agency of replacing all LSL within 10 years at a rate of 10% per year. We submitted the analysis to the docket and asked EPA to consider reduced CVD deaths in its quantified

[1] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019 in the rulemaking docket at https://www.regulations.gov/document?D=EPA-HQ-OW-2017-0300-0003.

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benefit estimates as it develops options for a final rule.[2] The three EPA sources used in the assessment are:

- **EPA's "Concentration-Response Functions for Lead and Cardiovascular Mortality" report[3] that successfully completed peer review in June 2019.** See https://cfpub.epa.gov/si/si_public_pra_view.cfm?dirEntryID=342855&Lab=NCEE. In the peer-reviewed report that describes the model of the relationship between lead and CVD deaths, several conceptual models were presented. However, the peer reviewers favored Conceptual Model 2 because it averages blood lead levels over a number of years. We used Conceptual Model 1 because we lacked access to EPA's SafeWater LCR tool[4] and the ability to easily track the cohorts over time. In our comments to EPA, we recommended that the agency use Conceptual Model 2, which is feasible to execute within SafeWater LCR as described in the children's analysis where EPA calculated children's lifetime blood lead averages using modeled blood leads for each year of life for various rule scenarios. See Section 6.4.5 of the Economic Analysis and our comments for additional details.
- **EPA's "Economic Analysis for the Proposed Lead and Copper Rule Revisions" that accompanied the rule.** The analysis provided the estimated range of adult lead level reductions from the proposed rule and from removing an LSL. See Section 6.5 and Appendix G.
- **EPA's "Value of a Statistical Life"[5] of $10.2 million in 2016 dollars** based on adjustments for inflation from the agency's estimate of $4.9 million in 1990 dollars. We used 2016 dollars to be consistent with EPA's economic analysis for the proposed rule.

We estimated the societal benefits from reduced CVD deaths at a 3% discount rate over 35 years was $18 to $33 billion. The benefits from replacing all 9.3 million LSLs over 10 years was $205 billion using the same discount rate and timeframe.

II. Communicating information on LSL locations through mapping and disclosure

In early 2019, EDF published two behavioral studies in peer reviewed journals designed to evaluate effective methods to communicate information about LSLs to property owners and renters. We submitted the studies in our comments on the rule and asked the agency to consider the information as it developed the requirements for utilities to communicate the presence of an LSL to the public that may drink the water passing through the pipe and to property owners and customers.[6]

The first study, "Using online tools to publicize lead service line locations and promote replacement"[7] evaluated methods for mapping LSL locations at an address-specific level. Our key takeaways were:

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[2] See https://www.regulations.gov/document?D=EPA-HQ-OW-2017-0300-1442.

[3] Abt Associates, Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality, Updated Draft, 2019. See page 57.

[4] The link to the URL (http://www.epa.gov/safewater/lead) provided in the preamble to the Proposal at p. 61771 redirected us to https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water which provided no information on SafeWater LCR. A search of EPA's website for "SafeWater LCR" provided no additional information.

[5] See https://www.epa.gov/environmental-economics/mortality-risk-valuation.

[6] See https://www.regulations.gov/document?D=EPA-HQ-OW-2017-0300-1524.

[7] Hiltner, S., Romero-Canyas, R., McCormick, L., and Neltner, T. (2019). "Using online tools to publicize lead service line locations and promote replacement," AWWA Water Science, 1(1). https://awwa.onlinelibrary.wiley.com/doi/full/10.1002/aws2.1124.

- Online tools, including interactive maps and simple search engines, that allow anyone to search a specific address are an important way for communities to engage residents in accelerating LSL replacement, especially when searching for a new home to buy or rent.
- When users discover that a property they wish to move into may have an LSL from an online tool, they overwhelmingly indicated they would be likely to pressure the seller to replace the LSL as a condition of purchase. **Only 5%** of survey participants said they would consider moving into a home without taking some action.
- Users want information about both the city-side and private-side of the service line and may be frustrated when they learn a tool only provides information about one side.

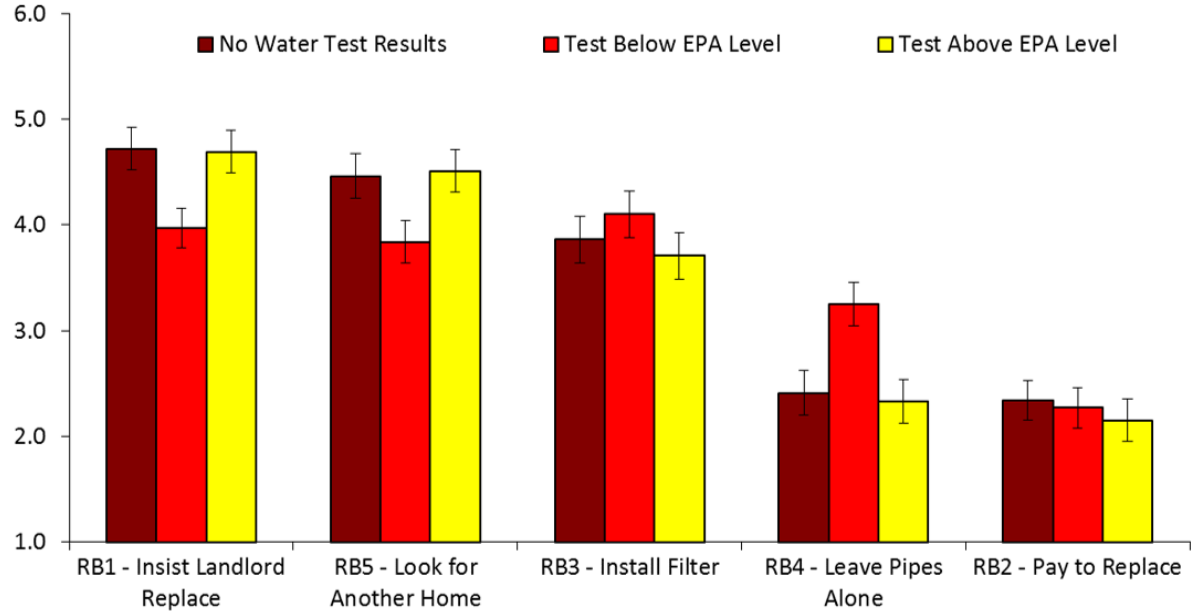
This study is particularly relevant to the proposed LCR revision given EPA's proposal to require water systems make the location of LSLs publicly available, with systems serving more than 100,000 required to make that information electronically available, presumably in a map-like format.

The second study, "Research to Move Toward Evidence-Based Recommendations for Lead Service Line Disclosure Policies in Home Buying and Home Renting Scenarios,"[8] conducted in collaboration with Cornell University, evaluated methods for property owners and home inspectors to disclose the presence of an LSL to potential home buyers or renters. The key findings from the study were:

- Reported levels of perceived risk and willingness to act were consistently high when potential buyers were told the home has an LSL. Regardless of the words used in the disclosure, buyers wanted to deduct the cost or have sellers replace the LSL (5 on a 1 to 6 sale). Other options such as looking for another home, adding the cost to the mortgage, or paying for replacement were less popular. Buyers were unwilling to leave the LSL alone (2 on a 1 to 6 scale).
- Explicit recommendations from a home inspector to replace the LSL, and the presence of information about risk about LSLs, did not further influence levels of perceived risk or willingness to act. In some cases, including specific recommendations may have backfired. One possible explanation for this may be due to a perception that the home inspector could somehow benefit from the replacement.
- Providing water test results that showed lead levels below EPA's current action level of 15 ppb resulted in lower levels of perceived risk and less reported willingness to act from potential renters. See figure below. Note that water tests are a poor indicator of risk from an LSL.

[8] Lu, H., Romero-Canyas, R., Hiltner, S., Neltner, T., McCormick, L., and Niederdeppe, J. (2019) "Research to Move Toward Evidence-Based Recommendations for Lead Service Line Disclosure Policies in Home Buying and Home Renting Scenarios," Int. J. Environ. Res. Public Health, 16(6): 963. https://www.mdpi.com/1660-4601/16/6/963.

Willingness to adopt risk mitigation behaviors, by landlord/renter condition



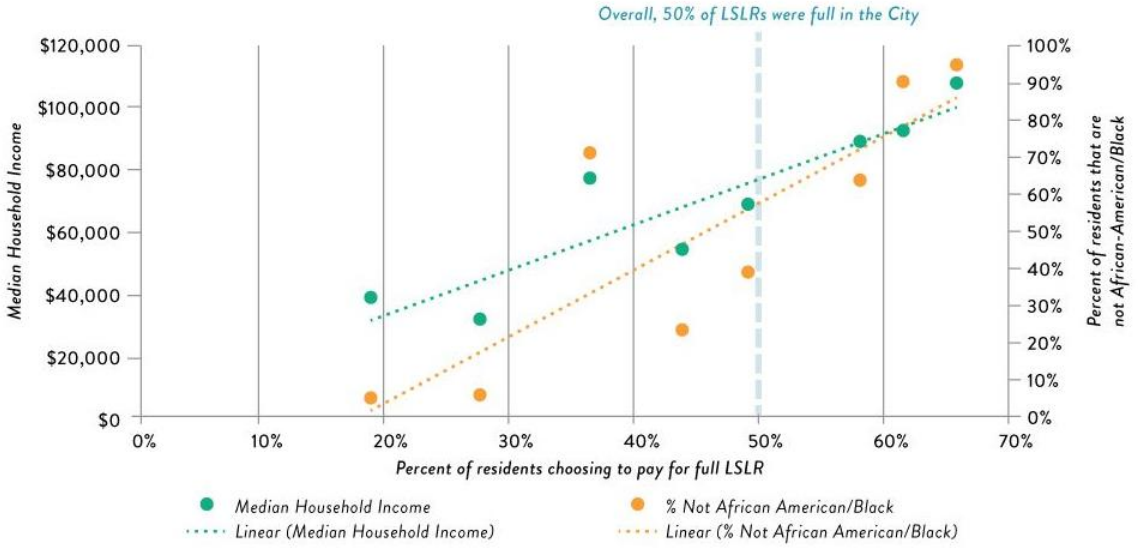
III. Lead pipes and environmental justice

In March, American University and EDF published a report, "Lead Pipes and Environmental Justice,"[9] summarizing the results of a study analyzing data on more than 3,400 LSL replacements conducted in Washington, DC between 2009 and 2018. We submitted the research in joint comments[10] with American University's School of Public Affairs and Harvard Law School's Emmett Environmental Law and Policy Clinic on EPA's proposed LCR revisions, explaining that the proposed rule, if implemented as written, would likely make the health disparities for low-income and minority residents worse, not better. This outcome runs contrary to EPA's obligations under Executive Order 12898 to redress environmental justice problems. And it leaves states and water systems who receive federal funding vulnerable to legal challenges from affected residents who demonstrate that the funds were used to support work that disproportionately impacted minorities and, therefore, violated Title VI of the Civil Rights Act of 1964.

The research found that programs relying on customers to pay to have their lead pipe fully replaced put low-income and African American households at greater risk of lead exposure. Residents in wealthier areas were over two times more likely to pay to have their lead pipe fully replaced during routine water utility infrastructure projects – and thus avoid partial LSL replacement – than their lower-income counterparts. Partial LSL replacement can significantly increase short-term lead in water levels and fails to provide the long-term lead exposure reductions provided by full replacement. See the figure below from the report to see how the different Washington, DC wards compared.

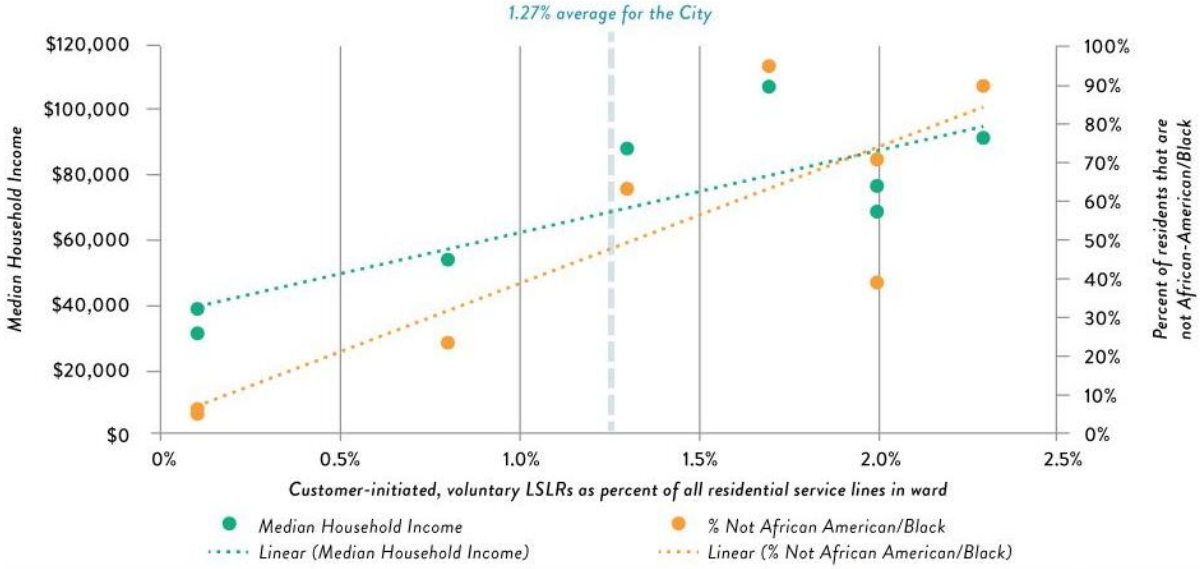
[9] EDF and American University, 2020. "Lead Pipes and Environmental Justice: A Study of lead pipe replacement in Washington, DC." https://www.edf.org/sites/default/files/u4296/LeadPipe_EnvironJustice_AU%20and%20EDF%20Report.pdf.
[10] See https://www.regulations.gov/document?D=EPA-HQ-OW-2017-0300-1084.

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



We also found similar impacts with a complementary program by Washington, DC that was designed to support households proactively paying to replace their LSL, outside of infrastructure repairs. The figure below shows the results.

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



In our comments on the proposed LCR revisions, we recommended that EPA reduce the likelihood of environmental justice problems by in a final rule by:

- Prohibiting or strictly limiting partial LSLRs or otherwise ensuring no disproportionate impact on low-income or minority populations; and

- Requiring balanced participation during mandatory LSL replacement as well as voluntary customer-initiated LSL replacement programs to avoid significant disparities.

Thank you for considering this request. If you have any questions, please contact Tom Neltner at tneltner@edf.org or 202-572-3263.

Sincerely,

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Chemicals Policy Director

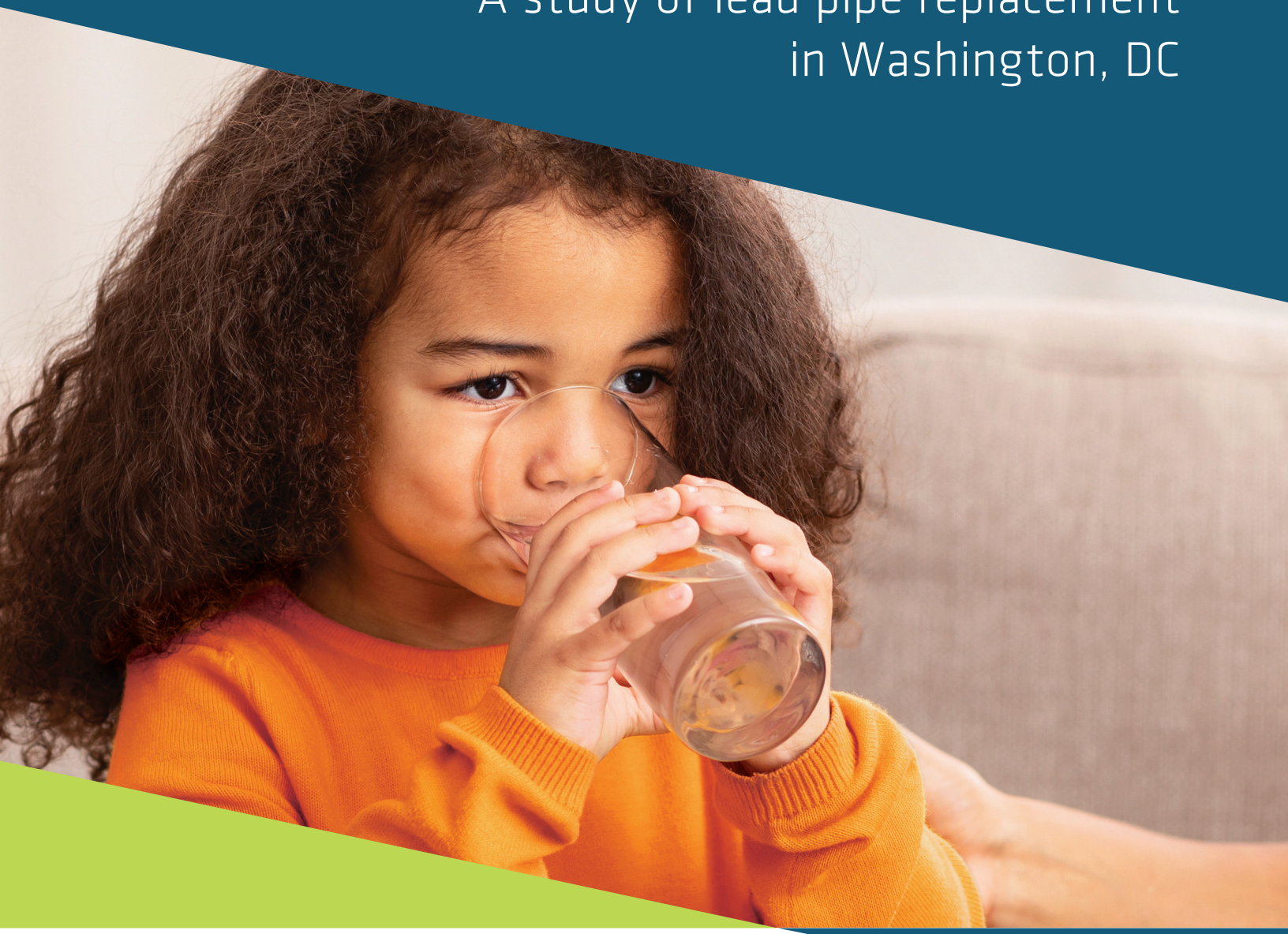
Lindsay McCormick, MPH
Program Manager, Chemicals and Health

Sam Lovell
Project Manager, Health Program

MARCH 2020

Lead Pipes and Environmental Justice

A study of lead pipe replacement in Washington, DC



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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.

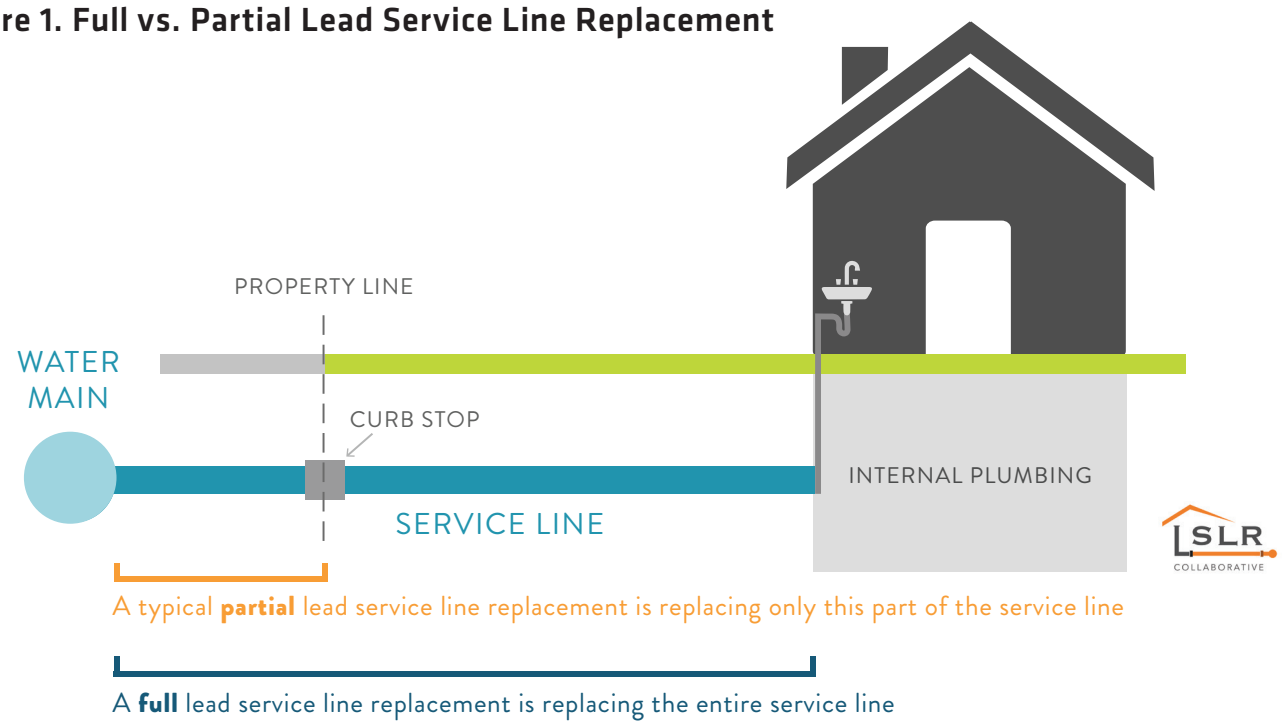
The best long-term solution to this issue is to conduct full LSLR—replacing both the portion of the service line on public property and private property (see Figure 1 of a typical full LSLR compared to a partial LSLR). Replacing only part of an LSL can significantly increase lead in drinking water for 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.

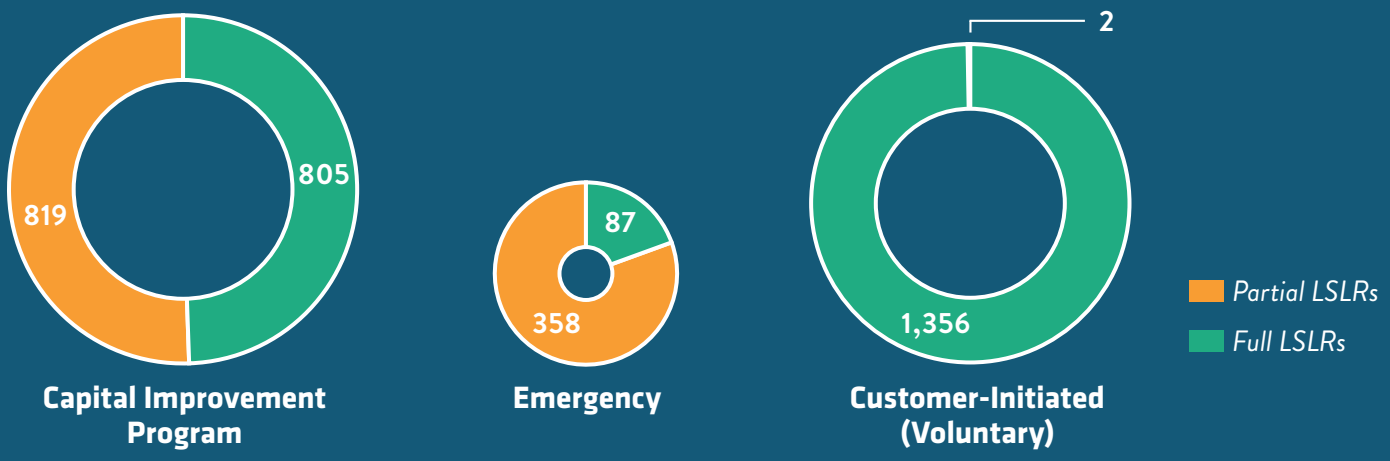
During this ten-year period, DC Water required customers to pay to replace the LSL on private property but covered the cost for the remainder of the pipe. The utility took steps to make it easier for the customer to participate by streamlining the contracting costs and process, coordinating the work, 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

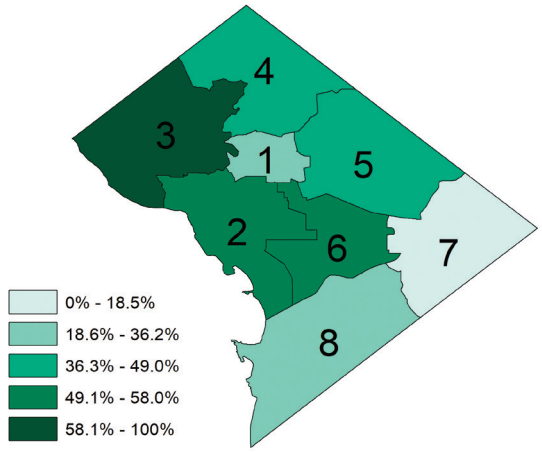
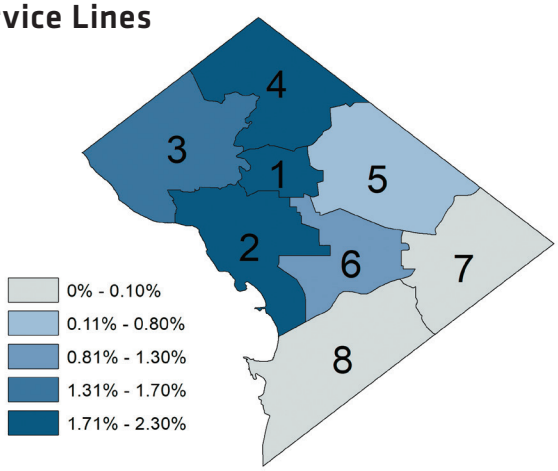


Figure 4. Customer-Initiated (Voluntary) Full LSLRs as Percent of Residential Service Lines



Key Results

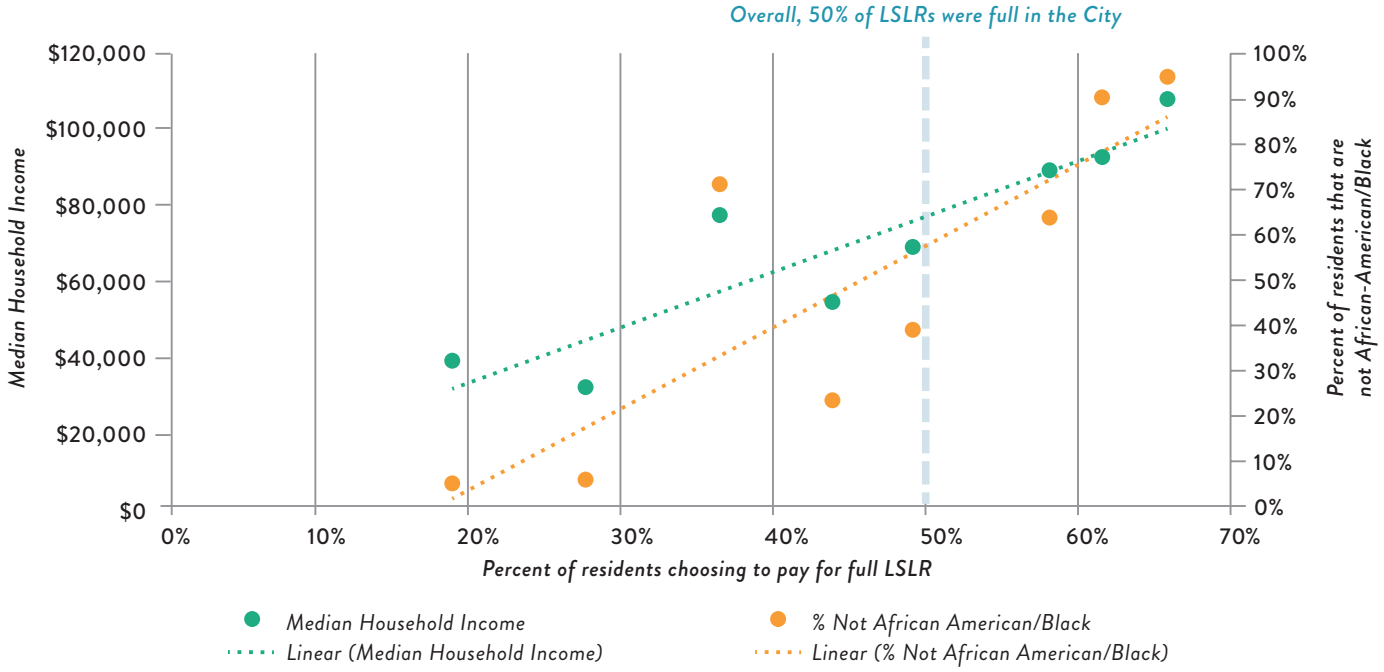
For Capital Improvement Program and customer-initiated LSLRs, researchers found statistically significant relationships between median household income, percentage of residents who self-identified as African American /Black, and an Area Deprivation Index (ADI)—which combines 14 social, economic, and 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)



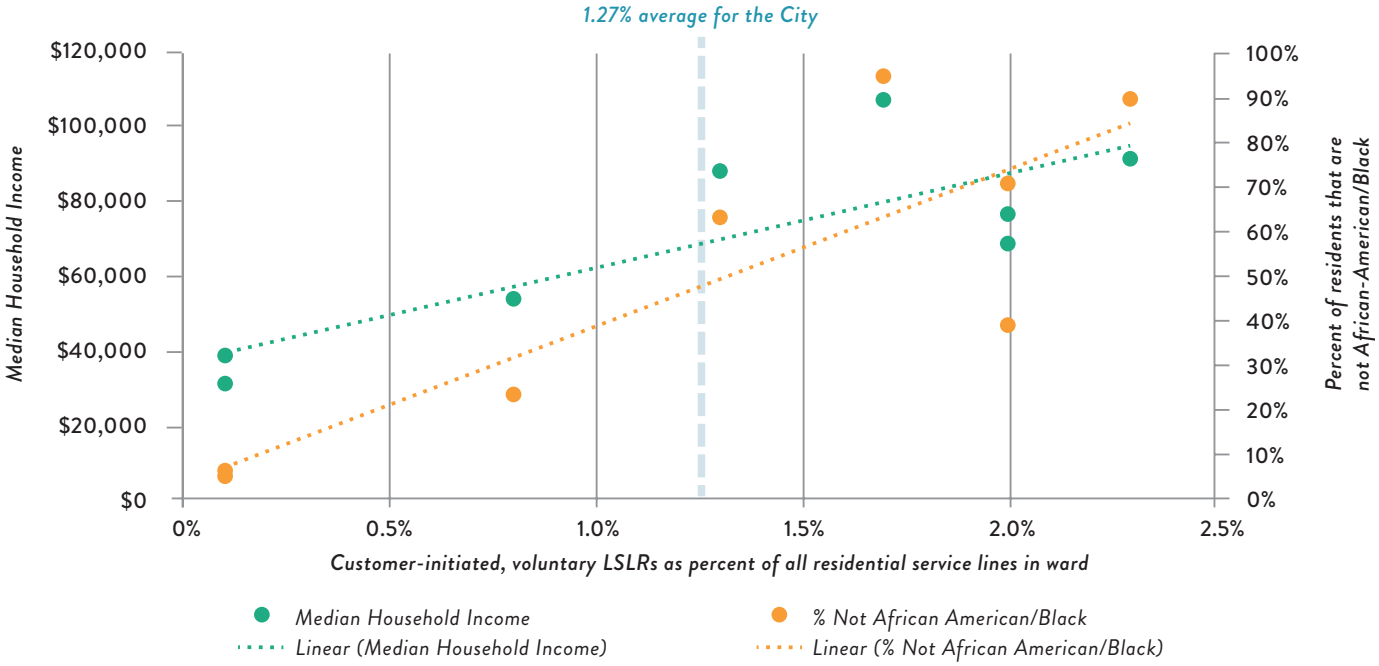
Characteristics of Ward	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6	Ward 7	Ward 8
% Full replacements	**36%**	**61%**	**66%**	**49%**	**44%**	**58%**	**19%**	**27%**
Median household income	**$76,610**	**$92,025**	**$107,499**	**$68,277**	**$53,986**	**$88,477**	**$38,374**	**$31,097**
% of Residents not 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.

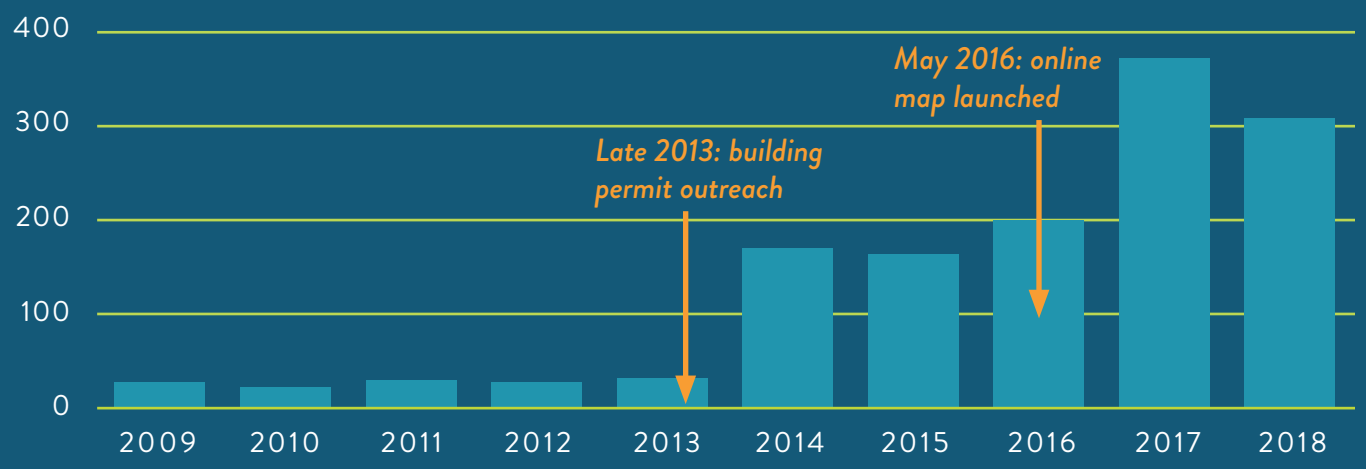
- Lower rates of customer-initiated LSLRs in areas with lower median household incomes, higher percentages of African American/Black residents, and higher ADI.
- In the two wards with the lowest median household income and highest percentage of African American/Black residents only 0.1% of residential 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 ratepayers 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.

ACKNOWLEDGEMENTS AND AUTHORS

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MARCH 2020

February 12, 2020

Mr. David Ross, Assistant Administrator
Office of Water
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW
Mail code: 4101M
Washington, DC 20460–0001

RE: Comments regarding cardiovascular disease benefits from proposed revisions to the Lead and Copper Rule in the National Primary Drinking Water Regulations, Docket No. EPA–HQ–OW-2017-0300

Dear Assistant Administrator Ross:

Environmental Defense Fund ("EDF") respectfully submits the following comments regarding the adult cardiovascular disease ("CVD") aspects of the Environmental Protection Agency's ("EPA") proposed revisions to its Lead and Copper Rule ("LCR") (the "Proposal").[1]

Since EPA promulgated the original LCR in 1991, the scientific consensus regarding the harms of lead exposure, even at low levels, has grown dramatically.[2] Virtually all the scientific evidence since 1991 reaffirms the agency's decision to set a Maximum Contaminant Level Goal of zero for lead.

While much of the focus for reducing lead exposure has appropriately been due to the impacts on young children's brain development, it is increasingly clear that the risk to adults is also significant. We used publicly available information to estimate that the Proposal will prevent 3,430 to 6,150 CVD deaths, delivering societal benefits of between $18 and $33 billion[3] over the next 35 years. When added to the IQ benefits, this results in total societal benefits between $26 and $51 billion.[4] See Table 1.

If EPA had taken the more aggressive approach of requiring that the nation's 9.3 million lead service lines (LSL) be fully eliminated,[5] we estimate that the benefits in reduced CVD deaths would be more than $205 billion. This is 4 to 8 times more than EPA's Proposal would achieve and would return more than $310 for every $100 invested in LSL replacement.[6] LSLs are the lead pipes that connect the main under the street to buildings and homes and are the most significant source of lead in drinking water.

Table 1: Estimated societal benefits* of EPA's proposal and of full LSL replacement in 10 years

	Total CVD benefits**	Total IQ benefits	Total societal benefits
EPA's Proposal	$18-$33 B	$7-18 B***	$26-51 B
10-year full LSLR****	$205 B	Not calculated	$207 B

* Benefits are based on 3% discount.
** Midpoint of high and low estimates for five methods and four studies from Table 2.
***Based on incremental benefits in Exhibit 6-17 in EPA's Federal Register Notice for the Proposal for 35 years.
**** Based on EPA's estimate of 9,267,910 LSLs in use on rule's effective date in 2023. See Exhibit 4-10 in EPA's Economic Analysis for the Proposal.

While our estimates are based on assumptions and rough calculations of publicly available information that warrant refinement, we maintain that EPA's model for lead exposure and the CVD mortality is sufficiently robust that the agency has an obligation under 42 U.S.C. § 300g-1(b) and Executive Order

12866[7] to quantify the benefits. We also maintain that the estimated CVD benefits are sufficiently large that EPA must consider requiring that community water systems ("CWS") fully replace all LSLs.

For these reasons, we respectfully request that the agency refine its CVD model based on the peer review it completed in June 2019, estimate the benefits of reduced CVD deaths, and consider fully replacing LSLs as an option in its revised Economic Analysis. In the final rule, EPA should make full LSL replacement an integral part of every CWS's compliance responsibilities. The societal benefits are too significant to ignore.

In addition, the Proposal's revised description of lead's health effects in the Consumer Confidence Reports and other public education materials that CWSs must use, while a step forward, fails to adequately communicate the risks.[8] We think the mandatory paragraph should be clearer and more concise. We recommend the following:

> Exposure to lead, even at low levels, can cause serious health effects in all age groups. Infants and children who drink water containing lead could have decreases in IQ and attention span and increases in learning and behavior problems. Adults have increased risk of cardiovascular disease and high blood pressure as well as kidney and nervous system problems. Pregnant women have increased risks to their fetus, and women who later become pregnant have similar risks if lead stored in the mother's bones is released during pregnancy.

I. EPA's evolving understanding of lead and adult CVD from 1991 to 2018

In EPA's 1991 final rule, the agency required CWSs to use a one paragraph description of lead's health effects in their public education materials. The only reference to the cardiovascular system was red blood cells. It also captured the scientific consensus at the time that small amounts of lead would not harm adults.

> Lead is a common metal found throughout the environment in lead-based paint, air, soil, household dust, food, certain types of pottery porcelain and pewter, and water. Lead can pose a significant risk to your health if too much of it enters your body. Lead builds up in the body over many years and can cause damage to the brain, red blood cells and kidneys. The greatest risk is to young children and pregnant women. **Amounts of lead that won't hurt adults can slow down normal mental and physical development of growing bodies.** In addition, a child at play often comes into contact with sources of lead contamination--like dirt and dust--that rarely affect an adult. It is important to wash children's hands and toys often, and to try to make sure they only put food in their mouths.[9] *[Emphasis added]*

In 2007, EPA updated the paragraph, clarifying the nature of the harm to red blood cells and suggesting that there was a risk for those with high blood pressure and kidney problems. The revised language continued to imply that small amounts of lead would not harm healthy adults.

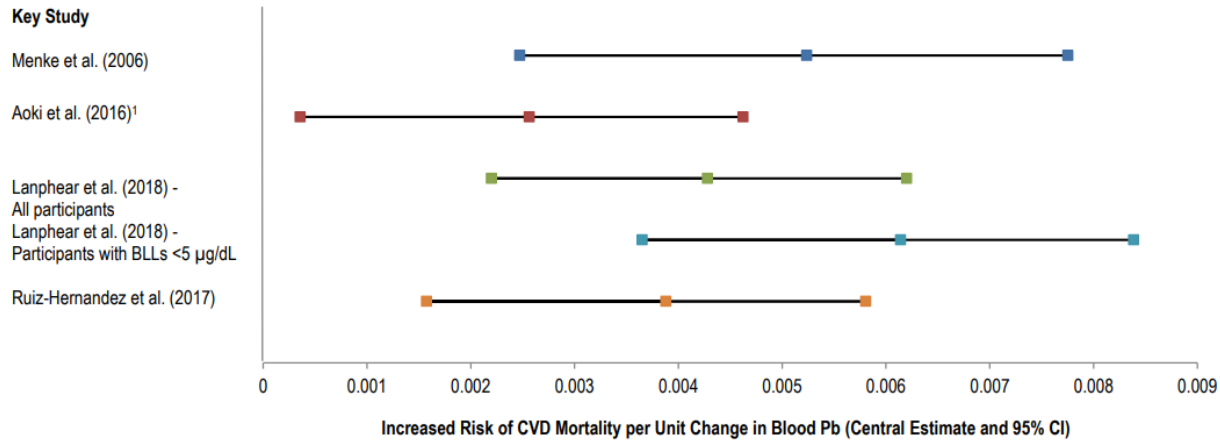
> Lead can cause serious health problems if too much enters your body from drinking water or other sources. **It can cause damage to the brain and kidneys, and can interfere with the production of red blood cells that carry oxygen to all parts of your body.** The greatest risk of lead exposure is to infants, young children, and pregnant women. Scientists have linked the effects of lead on the brain with lowered IQ in children. **Adults with kidney problems and high blood pressure can be affected by low levels of lead more than healthy adults.** Lead is stored in the bones, and it can be released later in life. During pregnancy, the child receives lead from the mother's bones, which may affect brain development.[10] *[Emphasis added]*

The agency's position on lead's risk to adults changed with two critical documents. In 2012, the National Toxicology Program ("NTP") determined that there was sufficient evidence of harm to the kidney, heart, and nervous system, including a risk of hypertension, at low levels of lead exposure.[11] One year later, in its Integrated Science Assessment ("ISA") for Lead,[12] EPA concluded there were *casual relationships*[13] between adult exposure to lead and hypertension, coronary heart disease, decreased red blood cell survival and function, altered heme synthesis, and male reproductive function. With regard to CVD, the agency stated in its ISA that "despite the differences in design and methods across studies, with few exceptions, associations between higher levels of Pb biomarkers and higher risk of [coronary heart disease]-related mortality were consistently observed."[14]

By 2018, the evidence of adult exposure to low level lead and CVD had progressed significantly, with the publication of three studies building on a rigorous 2006 analysis by Menke et al.[15] of National Health and Nutrition Examination Survey (NHANES) data. Those three studies – Aoki et al. (2016),[16] Ruiz-Hernandez et al. (2017)[17] and Lanphear et al. (2018)[18] – expanded on the earlier work, strengthening the scientific evidence demonstrating significant associations between low level lead exposure and CVD mortality. The most recent, Lanphear et. al. (2018), concluded that "Low-level environmental lead exposure is an important, but largely overlooked, risk factor for cardiovascular disease mortality in the USA. A comprehensive strategy to prevent deaths from cardiovascular disease should include efforts to reduce lead exposure."

Based on this research, in 2018, EPA conducted a rigorous review of the literature and developed a quantitative model of the relationship between lead and CVD deaths at low levels of exposure.[19] EPA's model estimated the increased risk of CVD deaths for each unit change of blood lead levels ("BLL") expressed as micrograms of lead per deciliter of blood ("µg/dL") for each of the four key studies discussed above – Menke et al. (2006), Aoki et al. (2016), Ruiz-Hernandez et al. (2017) and Lanphear et al. (2018). It also evaluated the Lanphear study in two ways: "All participants" and "Participants with BLLs < 5 µg/dL." The figure below is Exhibit 21 from the EPA report.[20]

Exhibit 21. Increased Risk of CVD Mortality per Unit Change in Blood Pb, Based on Key Studies



[1] Blood Pb corrected for hematocrit levels.

The baseline CVD mortality risk for adults 40 to 80 years of age is 0.0279 based on 390,000 deaths in a population of almost 140 million.[21] While the increased risk is relatively small, because of the high number of CVD deaths each year, the totals are significant.

II. EPA's proposed health effects paragraph and EDF's recommended improvements

In the Proposal, EPA revised the one-paragraph summary of health effects that would be used by CWSs in public education materials and their Consumer Confidence Reports.[22] The mandatory language would be as follows.

> Exposure to lead can cause serious health effects in all age groups. Infants and children who drink water containing lead could have decreases in IQ and attention span and increases in learning and behavior problems. Lead exposure among women who are pregnant increases prenatal risks. Lead exposure among women who later become pregnant has similar risks if lead stored in the mother's bones is released during pregnancy. Recent science suggests that adults who drink water containing lead have increased risks of heart disease, high blood pressure, kidney and nervous system problems. [23]

In the preamble, the agency explained that it consulted with risk communication experts to revise the mandatory health effects language but provided no further information.[24] Unfortunately, the proposed text is inconsistent with the consensus of the scientific community with regard to lead's risk and should be clearer and more concise. Brevity and clarity are particularly important since CWSs will be obligated to communicate the paragraph verbatim to millions of customers and consumers annually. Specifically, we have the following concerns with the proposed paragraph:

- **Missing emphasis on low level lead exposure risk:** The proposed paragraph does not mention that serious health effects occur at low exposure levels, as concluded by the agency and NTP. We think the public understands that lead is dangerous and harmful but may not realize that those effects occur at low levels that were previously considered safe. We recommend that ", even at low levels," be inserted immediately after "Exposure to lead" in the first sentence.

- **Scientific evidence on adult risks is improperly described as "recent":** The proposed paragraph makes an unnecessary and ambiguous reference to "Recent science suggests" even though the NTP affirmed the conclusion in 2012 and EPA did the same in its 2013 ISA, hardly recent. Further, those findings revealed causal and sufficient evidence, far more than suggestive. Recalling that the original paragraph was in place for 16 years and the current one for 13 years, we recommend that EPA keep the paragraph timeless and drop the opening phrase.

- **Misstates science on CVD risk:** The sentence on adult risks is not consistent with EPA's conclusions in the 2013 ISA. In that assessment, EPA found that there were *casual relationships* between adult exposure to lead and: 1) hypertension; 2) coronary heart disease; 3) decreased red blood cell survival and function; 4) altered heme synthesis; and 5) male reproductive function. In addition, NTP found kidney and nervous system problems at low levels. Therefore, we recommend that EPA simplify the language to say "Adults have increased risk of cardiovascular disease and high blood pressure as well as kidney and nervous system problems." It is shorter and prioritizes CVD where the evidence is now particularly compelling.

- **Redundant:** The paragraph has two consecutive sentences beginning with "Lead exposure among women" that both deal with pregnancy-related risks. We recommend merging the two sentences to say "Pregnant women have increased risk to their fetus and women who later become pregnant have similar risks if lead stored in the mother's bones is released during pregnancy." The single sentence is shorter without losing any substance.

For these reasons, we recommend that EPA use the following shorter and clearer paragraph for its mandatory health effects language in the final rule.

> Exposure to lead, even at low levels, can cause serious health effects in all age groups. Infants and children who drink water containing lead could have decreases in IQ and attention span and increases in learning and behavior problems. Adults have increased risk of cardiovascular disease and high blood pressure as well as kidney and nervous system problems. Pregnant women have increased risks to their fetus, and women who later become pregnant have similar risks if lead stored in the mother's bones is released during pregnancy.

The version below shows the recommended edits in strikeout/underline format.

> Exposure to lead, even at low levels, can cause serious health effects in all age groups. Infants and children who drink water containing lead could have decreases in IQ and attention span and increases in learning and behavior problems. Adults have increased risk of cardiovascular disease and high blood pressure as well as kidney and nervous system problems. ~~Lead exposure among women who are pregnant increases prenatal risks. Lead exposure among~~ Pregnant women have increased risks to their fetus and women who later become pregnant has similar risks if lead stored in the mother's bones is released during pregnancy. ~~Recent science suggests that adults who drink water containing lead have increased risks of heart disease, high blood pressure, kidney and nervous system problems.~~

III. EPA is obligated under SDWA to quantify CVD benefits using its revised model

Section 1412(b)(3)(C)[25] of SDWA requires that EPA conduct a Health Risk Reduction and Cost Analysis for any National Primary Drinking Water Regulation, such as this Proposal.[26] The Analysis must address seven mandatory factors. The first factor is the "[q]uantifiable and nonquantifiable health risk reduction benefits for which there is a factual basis in the rulemaking record to conclude that such benefits are likely to occur as the result of treatment to comply with each level."

In October 2018, EPA began an external peer review[27] of its model to quantify the benefits of reduced CVD deaths due to lower adult exposure to lead. The peer review feedback was generally positive and provided constructive criticism to improve the document and model.[28] In June 2019, EPA responded to peer reviewers' comments and published the comments and responses on December 19, 2019.[29]

We recognize that the agency did not have sufficient time to incorporate the model into its economic analysis for the Proposal.[30] As a result, EPA treated the CVD impacts of the Proposal as "non-quantified non-monetized benefits," and only generally referenced the model and the review.[31]

We maintain that the agency has had adequate time to revise the model consistent with peer reviewers' feedback and incorporate it into the Economic Analysis for the final LCR. The agency made that process simpler because, in the Proposal, it had already developed estimated adult blood lead levels from ingestion of lead in drinking water.[32] Based on our understanding of the law, the agency has an obligation to estimate CVD benefits and incorporate the results into its considerations for the final rule, even if it means delaying promulgation by a few months.

Therefore, for the rulemaking record, we are incorporating that model, along with the associated documents, as attachments to this comment.

IV. EDF's preliminary estimate of societal benefits in reduced CVD mortality from the Proposal

In order to better understand the potential significance of the quantifiable benefits from reduced CVD mortality, EDF, with the assistance of outside experts, applied EPA's model[33] to the estimated adult blood lead levels in the Economic Analysis for the Proposal.[34]

EPA's model includes a Low Cost Scenario and a High Cost Scenario based on the upper and lower ranges of five input uncertainties: 1) the baseline number of water systems with LSLs and the percent of connections in those system that are LSLs; 2) the number of water systems that will exceed the action level or trigger level under the proposed revised tap sampling requirements; 3) the cost of LSL replacement; 4) the cost of corrosion control treatment; and 5) the effectiveness of corrosion control treatment in water systems with LSLs.

EDF estimated the CVD benefits over the 35 years used in EPA's High-Cost and Low-Cost Scenarios based on the four studies discussed above, including the two options for Lanphear et al. (2018). We found that the number of avoided CVD deaths ranged from 3,492 to 8,804 in the Proposal's High Cost Scenario and from 1,977 to 4,980 in its Low Cost Scenario. These translate to total societal benefits for the High Cost Scenario of $18.5 to $46.6 billion and the Low Cost Scenario of $10.5 to $26.4 billion at a 3% discount rate. See Table 2 below for details and annual societal benefits.

Table 2: Societal benefits in reduced CVD deaths due to Proposal

EDF's estimated CVD and IQ benefits of EPA's Proposal.	Aoki	Lanphear (all blood lead)	Lanphear (blood lead <5 µg/dL)	Menke	Ruiz-Hernandez
Low Cost Scenario					
Total avoided CVD deaths	1,977	3,473	4,980	4,206	2,976
Annual societal adult CVD benefits (in $2016 millions)					
3% discount	**$299**	**$525**	**$753**	**$636**	**$450**
7% discount	$136	$239	$342	$289	$205
High Cost Scenario					
Total avoided CVD deaths	3,492	6,137	8,804	7,436	5,260
Annual societal adult CVD benefits (in $2016 millions)					
3% discount	**$528**	**$928**	**$1,332**	**$1,125**	**$796**
7% discount	$240	$422	$605	$511	$362

The following provides more details of the methodology.

- **Only publicly available information used**: We used only information publically available in the EPA documentation and reports to develop the estimates.

- **Access to SafeWater LCR:** We did not have full access[35] to EPA's SafeWater LCR model used in the Economic Analysis.[36] Therefore, we used the information summarized in the tables of EPA's Economic Analysis but those tables did not have information on the year that EPA estimated the lead in drinking water reductions for a modelled CWS would occur. This gap meant that we could not calculate the discounted benefits exactly as done by EPA. Therefore, we used the simplifying assumption that the change in the population's exposure to lead from drinking

water due to the rule were evenly distributed over the 35 year period. If changes due to the rule happen earlier, our estimates will be an underestimate of the benefits.

- **Ages 40 to 80 only:** We only estimated the benefits for adults 40 to 80 years old, because CVD mortality for those younger than 40 were small. All of the studies that informed the relationship between blood lead and CVD mortality included 40 to 80 year-old age group. For the years we considered, we used age-specific rates for the 10-year age categories (e.g., rate for 40-49 year olds) from the Center for Disease Control and Prevention's Wide-Ranging Online Data for Epidemiologic Research (WONDER) database. We assumed the ages of the populations in each CWS were distributed in the same percentages as the US population.

- **$10.2 million value of a CVD death:** We used EPA's Value of a Statistical Life ("VSL") of $10.2 million based on adjustments for inflation from the agency's estimate of $4.9 million in 1990 dollars. We used 2016 dollars to be consistent with the Proposal's Economic Analysis.

- **Conceptual Model 1 used:** In the peer-reviewed report that describes the model of the relationship between lead and CVD deaths, several conceptual models were presented. However, the peer reviewers favored Conceptual Model 2 because it averages blood lead levels over a number of years. We used Conceptual Model 1 because we lacked access to SafeWater LCR and ability to easily track the cohorts over time. In the final rule, we recommend that EPA use Conceptual Model 2, which is feasible to execute within SafeWater LCR as described in the children's analysis where EPA calculated children's lifetime blood lead averages using modeled blood leads for each year of life for various rule scenarios. See Section 6.4.5 of the Economic Analysis.

- **Discounting of benefits:** We applied a 3% and 7% discount rate on the estimated benefits. Benefits were assumed to be evenly distributed over the 35 year analysis period, with benefits occurring after the first year discounted each year back to the first year of the analysis period.

- **Corrosion Control Treatment provided no monetary benefits to households without LSLs:** EPA's analysis calculated only the benefits of reducing lead levels in homes with LSLs.[37] As a result, the reduced lead levels in drinking water in homes without LSLs from system-wide corrosion control was handled as a non-monetary benefit. We took the same approach in our analysis.

V. EDF's estimated benefits if all LSLs were removed in ten years

In reviewing EPA's Economic Analysis, we realized that the societal benefits of $7 to $18 billion from reduced children's exposure to lead was based solely on the risk posed by LSLs. If no LSL was present, the agency assumed the lead concentration would be 0.75 microgram of lead per liter of water (µg/L) and that it could not determine the extent of the benefit.[38] EPA acknowledged that the Proposal would result in improved corrosion control treatment in 14 to 26 million homes that would reduce exposure below 0.75 ppb but considered it a non-monetary benefit.[39]

Recognizing the significance of LSLs, we calculated the economic benefits that would be realized if all 9,267,910 LSLs[40] were replaced. We made the following additional assumptions:

- The lines would be replaced at a steady rate over 10 years. We do not know if ten years is realistic, but used it because it would provide the most aggressive schedule we have seen proposed.

- 28% of the LSLs would be full rather than partial. The partial v. full LSL breakdown is important because EPA estimated that drinking water from a partial LSL would have lower lead concentration than a full LSL.
- Three people were living in each household.
- All corrosion control treatments were "representative" instead of "partial" or "none." Representative means that the treatment is consistent with the requirements of the Proposal and will have lower lead levels in drinking water than those identified as "partial" or "none." As a result, it is a more conservative estimate.
- Estimates of the resulting blood lead levels based on the removal of LSLs were based on those levels provided in Table 6-31 of the economic analysis. These levels represent steady state levels estimated using EPA's Adult Lead Methodology. We used these directly which will result in an overestimate of benefits for those in the first years of the rule, as their blood lead levels will not yet have had time to reach a new steady state. As with the estimates above, these also follow Conceptual Model 1. Both of these simplifying assumptions will increase the benefit estimates, and can be corrected by EPA in the analysis using Safewater LCR.

Based on these assumptions, if all LSLs were to be removed over ten years, we estimate that the total societal benefits would be $205 billion in adult CVD benefits at a 3% discount rate and $109 billion at a 7% discount rate. At $205 billion, each LSL replaced, would provide more than $22,000 in societal benefits. Compared to the $1,882 to $7,056 that EPA estimated for replacing an LSL,[41] the return on an investment of $100 to replace a LSL would yield $310 to $1,175 – an impressive outcome.

VI. Full LSL replacement not considered by EPA

In its Economic Analysis, EPA only considered four options to the one selected in the Proposal:

- Lead public education and sampling at schools and child care facilities;
- Lead tap sampling requirements for water systems with LSLs;
- Reporting of LSL-related information; and
- Small system flexibility.

Each of these options are minor variations of the Proposal. The agency failed to consider more critical options such as reducing the Lead Action Level or requiring water systems to fully replace all LSLs. Not considering the latter is a surprise because it was specifically recommended by the National Drinking Water Advisory Council. The Council stated that "the driving proactive principle to improve public health protection is removing full lead service lines from contact with drinking water to the greatest degree possible and minimizing the risks of exposure to the remaining sources of lead in the meantime."[42] It recognized that the "eventual long term revisions to the LCR will be an important opportunity for removing sources of lead in contact with drinking water and thereby reducing exposure to lead from drinking water," acknowledging that the "removal of all lead service lines will require significant financial resources and time."

We share the observations made by the Institute of Policy Studies in its February 12, 2020 comment on the Proposal. The Institute said that:

> The lack of alternatives for which EPA provides details and analysis is inconsistent both with statutory requirements to consider alternatives,[43] as well as with best practices for regulatory analysis. Despite EPA's recognition that Circular A-4 "recommends careful consideration 'of all appropriate alternatives for the key attributes or provisions of a rule,'"[44] EPA does not fully explore even one of the most fundamental categories of alternatives: different degrees of stringency.[45] Instead, EPA

> announces with very little explanation that it is not changing the lead action level of 15µg/L, which was originally based not on the level required to adequately protect health but instead on a 1991 feasibility determination (which the agency is also not revisiting, despite the significant amount of time that has elapsed since 1991).[46] And while EPA proposes a new "trigger level" for lead to compel some early precautions before systems reach the full action level, EPA presumes with little explanation that 10µg/L is a "reasonable threshold" for the trigger level.[47] Rather than exploring for itself whether alternate action levels or trigger levels would better maximize net welfare, EPA simply asks the public for comments on whether its proposed trigger level is appropriate.[48]

In addition, the Association of State Drinking Water Administrators' in its February 10, 2020 comments called for all LSLs to be replaced stating that:

> Mandatory and consistent LSL [replacement] regulatory requirements provide the necessary incentive, i.e., clear and unambiguous regulatory requirements, for water systems to achieve significant reductions in LSLs across the U.S. While voluntary LSLR programs have made some reduction in the number of LSLs nationally, regulatory requirements are necessary to ensure that all LSLs and lead goosenecks, pigtails, connectors are removed across the country. Mandatory and consistent LSLR programs can also fit into a system's distribution system replacement program.

Based on these concerns, we ask that in the final rule, EPA consider full LSL replacement as an option in its Economic Analysis and make it an integral part of every water system's obligations and not a last resort. The societal benefits are too significant to ignore.

VII. About Environmental Defense Fund

Environmental Defense Fund's mission is to preserve the natural systems on which all life depends. We have more than two million members and a staff of 700 scientists, economists, policy experts, and other professionals around the world. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems. This has drawn us to areas that span the biosphere: climate, oceans, ecosystems and health.

EDF's Health Program seeks to safeguard human health by reducing exposure to toxic chemicals and pollution, including accelerating LSL replacement to reduce lead in drinking water. We have conducted extensive analysis of the LSL replacement aspects of the current rule, coordinated research on the risks and options, and closely tracked state and local innovations. For more information on EDF's lead-related work, see www.edf.org/lead.

Thank you for considering this request. If you have any questions, please contact Tom Neltner at tneltner@edf.org or 202-572-3263.

Tom Neltner, JD
Chemicals Policy Director

Attachments:

A. Abt Associates, Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality, Updated Draft, 2019.
B. EPA, "Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality" Peer Review Combined Documents, 2019.
C. EPA, *Selection of Concentration-Response Functions Between Lead Exposure and Adverse Health Outcomes for use in Benefits Analysis: Cardiovascular-Disease Related Mortality*, Reviewer comments (June 2019) and responses from EPA, 2019.

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[1] EPA published the proposed revisions in the November 13, 2019, *Federal Register* at 84 Fed. Reg. 61,684 and extended the comment period to February 12, 2020 in the December 19, 2019, *Federal Register* at 84 Fed. Reg. 69,695. It is accepting comments at Docket No. EPA-HQ-OW-2017-0300.
[2] NTP, NTP Monograph on Health Effects of Low-Level Lead, 2012.
[3] The estimates are based on EPA's Value of a Statistical Life ("VSL"). See EPA, Guidelines for Preparing Economic Analyses, 2014.
[4] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019, Docket ID EPA-HQ-OW-2017-0300-0003, and its Appendices, Docket ID EPA-HQ-OW-2017-0300-0002. See Exhibit 6-17
[5] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019, Docket ID EPA-HQ-OW-2017-0300-0003, and its Appendices, Docket ID EPA-HQ-OW-2017-0300-0002. See Exhibit 6-17.
[6] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019. See Exhibit 5-11, using the largest estimated cost to replace a LSL.
[7] Presidential Executive Order 12866, September 30, 1993.
[8] Proposed 40 CFR § 141.85(a)(1)(ii).
[9] 56 *Federal Register* 26,548, June 7, 1991.
[10] 72 *Federal Register* 57,814, October 10, 2007.
[11] NTP, NTP Monograph on Health Effects of Low-Level Lead, 2012. At levels below 5 micrograms per deciliter of blood ("µg/dL") that was sufficient evidence of "Decreased glomerular filtration rate; maternal blood Pb associated with reduced fetal growth." At levels below 10 µg/dL there was sufficient evidence of "Increased blood pressure, increased risk of hypertension, and increased incidence of essential tremor." Table 1.1.
[12] U.S. EPA. Integrated Science Assessment (ISA) For Lead (Final Report, 2013). Document No. EPA/600/R-10/075F, 2013. See Table ES-1.
[13] *Id.* "Causal relationship" means "Evidence is sufficient to conclude that there is a causal relationship with relevant pollutant exposures (i.e., doses or exposures generally within one to two orders of magnitude of current levels). That is, the pollutant has been shown to result in health effects in studies in which chance, bias, and confounding could be ruled out with reasonable confidence." Table II.
[14] *Id* at page 4-398.
[15] Menke, A., Muntner, P., Batuman, V., Silbergeld, E. K., & Guallar, E. (2006). Blood lead below 0.48 micromol/L (10 microg/dL) and mortality among US adults. *Circulation, 114*(13), 1388-1394. doi:10.1161/circulationaha.106.628321.
[16] Aoki, Y., Brody, D. J., Flegal, K. M., Fakhouri, T. H., Axelrad, D. A., & Parker, J. D. 2016. Blood Lead and Other Metal Biomarkers as Risk Factors for Cardiovascular Disease Mortality. *Medicine (Baltimore), 95*(1), e2223. doi:10.1097/md.0000000000002223.
[17] Ruiz-Hernandez, A., Navas-Acien, A., Pastor-Barriuso, R., Crainiceanu, C. M., Redon, J., Guallar, E., & Tellez-Plaza, M. (2017). Declining exposures to lead and cadmium contribute to explaining the reduction of cardiovascular mortality in the US population, 1988-2004. *Int J Epidemiol, 46*(6), 1903-1912. doi:10.1093/ije/dyx176.
[18] Lanphear, B. P., Rauch, S., Auinger, P., Allen, R. W., & Hornung, R. W. 2018. Low-level lead exposure and mortality in US adults: a population-based cohort study. *Lancet Public Health, 3*(4), e177-e184. doi:10.1016/s2468-2667(18)30025-2.
[19] Abt Associates, Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality, Updated Draft, 2019.

[20] Abt Associates, Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality, Updated Draft, 2019. See page 57.
[21] Centers for Disease Control and Prevention (CDC), National Center for Health Statistics, Underlying Cause of Death 1999-2014 on CDC WONDER Online Database, 2014. See https://wonder.cdc.gov/.
[22] Specifically at proposed 40 CFR § 141.85(a)(1)(ii); APPENDIX A TO SUBPART O OF PART 141—REGULATED CONTAMINANTS; and APPENDIX B TO SUBPART Q OF PART 141—STANDARD HEALTH EFFECTS LANGUAGE FOR PUBLIC NOTIFICATION.
[23] 84 *Federal Register* 61,684, November 13, 2019 at pp 61,757-58. See also discussion at p. 61,701 and 61,709-10.
[24] *Id* at 61,709-10. "As recommended by the NDWAC (see section VIII.L.2 of this notice), the EPA consulted with risk communication experts to revise the mandatory health effects language in the Consumer Confidence Report (CCR)." National Drinking Water Advisory Council, Letter to EPA Administrator Gina McCarthy, December 15, 2015. NDWAC said "Creating a national clearinghouse of information for the public and templates for PWSs, tailoring the Consumer Confidence Report, immediately engaging the health community to understand contribution of water to overall exposure to lead, adding targeted outreach and remedies to consumers with lead service lines."
[25] 42 U.S.C. § 300g-1(b)(3).
[26] 42 U.S.C. § 300g-1(b)(3)(C)(ii) for treatment techniques requires evaluation of the HRRCA factors under clause (i).
[27] EPA, Science Inventory: Concentration-Response Functions for Lead and Cardiovascular Mortality, accessed on February 1, 2020 at https://cfpub.epa.gov/si/si_public_pra_view.cfm?dirEntryID=342855&Lab=NCEE.
[28] EPA, "Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality" Peer Review Combined Documents, 2019.
[29] EPA, *Selection of Concentration-Response Functions Between Lead Exposure and Adverse Health Outcomes for use in Benefits Analysis: Cardiovascular-Disease Related Mortality*, Reviewer comments (June 2019) and responses from EPA, 2019.
[30] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019, Docket ID EPA-HQ-OW-2017-0300-0003, and its Appendices, Docket ID EPA-HQ-OW-2017-0300-0002. See Appendix I, page I-26.
[31] 84 *Federal Register* 61,684, November 13, 2019 at Section VII.E.2.
[32] 84 *Federal Register* 61,684, November 13, 2019 at Section VII.D.3.
[33] Abt Associates, Selection of Concentration-Response Functions between Lead Exposure and Adverse Health Outcomes for Use in Benefits Analysis: Cardiovascular-Disease Related Mortality, Updated Draft, 2019.
[34] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019. See Section 6.5 and Appendix G.
[35] The link to the URL (http://www.epa.gov/safewater/lead) provided in the preamble to the Proposal at p. 61771 redirected us to https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water which provided no information on SafeWater LCR. A search of EPA's website for "SafeWater LCR" provided no additional information.
[36] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019. See Section 5.2.
[37] 84 Fed. Reg. 61731. See also Exhibit 6-16.
[38] 84 Fed. Reg. 61726.
[39] 84 Fed. Reg. 61731.
[40] EPA, Economic Analysis for the Proposed Lead and Copper Rule Revisions, 2019, Docket ID EPA-HQ-OW-2017-0300-0003, and its Appendices, Docket ID EPA-HQ-OW-2017-0300-0002. See Exhibit 6-17.
[41] EPA, Economic Analysis, Exhibit 5-11, using the largest estimated cost to replace a LSL.
[42] NDWAC, Letter to EPA Administrator McCarthy, December 15, 2015. See https://www.epa.gov/sites/production/files/2016-01/documents/ndwacrecommtoadmin121515.pdf.
[43] Safe Drinking Water Act § 1412(b)(3)(C)(i) (requiring analysis and publication of factors like quantifiable and nonquantifiable health benefits for "each alternative maximum contaminant level that is being considered"); *id.* § 1412(b)(3)(C)(ii) (requiring publication of cost-benefit analysis for "alternative treatment techniques that are being considered").
[44] 84 *Federal Register*, November 13, 2019 at 61,731.
[45] Office of Management and Budget, Circular A-4, 2003 at 8.
[46] 84 *Federal Register*, November 13, 2019 at 61,691.
[47] *Id.*
[48] 84 *Federal Register*, November 13, 2019 at 61,735.

February 11, 2020

Mr. David Ross
Assistant Administrator
Office of Water
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW
Mail code: 4101M
Washington, DC 20460–0001

RE: Comments regarding health equity, environmental justice, and civil rights aspects of proposed revisions to its Lead and Copper Rule in the National Primary Drinking Water Regulations, Docket No. EPA–HQ–OW-2017-0300

Dear Assistant Administrator Ross:

Harvard Law School's Emmett Environmental Law and Policy Clinic ("the Clinic"), Environmental Defense Fund ("EDF"), and Dr. Karen Baehler of American University respectfully submit these comments regarding the health equity, environmental justice, and civil rights aspects of the Environmental Protection Agency's ("EPA") proposed revisions to its Lead and Copper Rule ("LCR") (the "Proposal").[1]

> "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 rule

In EPA's summary of the environmental justice implications of the Proposal, the agency concluded that "the proposed LCR revisions are not expected to have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations."[2] Our analysis of the Proposal as well as Dr. Baehler's study of more than 3,400 lead service line ("LSL") replacements ("LSLR") in Washington, DC, between 2009 and 2018 demonstrates that EPA's conclusion glosses over important aspects of the situation. In fact, the LSLR-related provisions of the proposal are likely to make the environmental justice and health equity issues worse – not better.

For these reasons, we ask that EPA modify its proposed new LSLR planning requirements at 40 CFR § 141.84 to explicitly require water systems to prevent disproportionate impacts from activities that could result in partial LSLRs and from situations in which low-income and minority residents are less likely to benefit from full LSLR programs than wealthier, white residents. The agency should require community water systems ("CWS") to demonstrate that their implementation of the LCR will not result in significant disproportionate impacts on low-income and minority residents. In addition, EPA should require that CWSs track performance in achieving these goals. As a potential model, EPA should consider its recent variance for Denver Water that requires tracking of performance on health equity and environmental justice impacts.[3]

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[1] EPA published the proposed revisions in the November 13, 2019, *Federal Register* at 84 Fed. Reg. 61,684 and extended the comment period to February 12, 2020 in the December 19, 2019, *Federal Register* at 84 Fed. Reg. 69,695. It is accepting comments at Docket No. EPA-HQ-OW-2017-0300.
[2] 84 Fed. Reg. at 61,740.
[3] EPA Region 8, In the Matter of Denver Water, Colorado, Variance Under SDWA Section 1415(a)(3), December 16, 2019 at Docket No. EPA-R08-OW-2019-0404-0005.

The simplest way to prevent the majority of these health disparities would be to follow Michigan's approach and strictly limit partial LSLRs to situations when emergency repairs are needed or when the resident expressly refuses to participate. This clear mandate would ensure that not only are their fewer partials but that all residents are benefit equally in situations when LSLs must be disturbed. It would also reduce the burden to states in reviewing various plans.

By implementing these recommendations, EPA can address the Proposal's shortcomings, thereby fulfilling its responsibilities under Executive Order 12898,[4] reducing health disparities, and helping states and communities that receive federal funding avoid violating Title VI of the Civil Rights Act of 1964.[5]

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I. EPA'S CONCLUSION ON THE ENVIRONMENTAL JUSTICE ASPECTS OF THE PROPOSAL RESTS ON BETTER CORROSION CONTROL BUT IS MISLEADING ON LSLR

In the preamble to the proposed rule, EPA "finds that this action does not have disproportionately high and adverse human health or environmental effects on minority populations, low-income populations and/or indigenous peoples."[6] The agency's conclusion is based on an analysis by its contractor that is available in the rulemaking docket.[7] Recognizing that LSLs – the lead lines connecting the main under the street to homes – are a significant source of lead in drinking water, this analysis finds that, under the current LCR, low-income and minority children suffer disproportionate impacts because:

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[4] Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 59 Fed. Reg. 7629; February 16, 1994. See https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice.

[5] 42 U.S.C. § 2000d et seq. See https://www.justice.gov/crt/fcs/TitleVI-Overview.

[6] 84 Fed. Reg. at 61,740.

[7] Abt Associates, *Environmental Justice Analysis for the Proposed Lead and Copper Rule Revisions, October 22, 2019*, Docket No. EPA-HQ-OW-2017-0300-0008. Consultant prepared the report for EPA pursuant to Contract # EP-W-17-009.

1) Residents in housing with LSLs are expected to be exposed to more lead in their drinking water than those in homes without LSLs;
2) Low-income and minority residents are more likely to live in older housing; and
3) Older housing is more likely to have LSLs.

This conclusion is reinforced by the evidence that these children are more likely to have higher blood lead levels than wealthy or white children.[8]

EPA maintains that the Proposal will reduce this disparity primarily by improving system-wide corrosion control treatment ("CCT") that reduces leaching of lead into drinking water. In essence, the entire community will benefit, and those with LSLs will experience the greatest reductions. We think the analysis for CCT is fair. However, improved CCT is only one aspect of the Proposal.

The agency is more circumspect on the environmental justice implications of the LSLR provisions. These provisions are of crucial importance, both because LSLR provides a permanent solution to lead exposure from LSLs and because of the consequences of partial LSLR. Partial LSLR, in which a CWS removes and replaces only the portion of the line on public property while leaving in place the portion on private property, has been shown to significantly increase lead in drinking water for months and provide limited or no long-term benefit.[9] In contrast, full LSLR results in smaller and shorter lead increases than partial LSLR, while providing the most lasting and sustainable benefits to the community given that it permanently removes a major source of lead exposure.

In the Proposal, EPA does acknowledge that the "LSLR provision[s] may be less likely than the CCT provision to address baseline health risk disparity among low-income populations because LSLR may not be affordable for low-income households."[10] Its only response to this recognized issue is to identify four federal grant or loan programs[11] that can support full LSLR, and to observe that state and local governments may make additional financing support available.

However, the agency's summary omits a critical finding from its contractor's analysis. That finding says "Household-level changes that depend on ability-to-pay *will leave low-income households with disproportionately higher health risks*."[12] In other words, when households are expected to pay to replace all or part of an LSL, low-income residents are likely to be exposed to greater levels of lead than their wealthier and – more likely than not – white counterparts.[13]

This finding undermines EPA's conclusion that the Proposal will not have disproportionate impacts on minority and low-income communities because the Proposal continues to make full LSLR dependent on property owners' ability to pay. Although the Proposal requires CWSs to take steps that may help

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[8] *Id.*

[9] A 2015 study indicated that "elevated lead originating from configurations of partial replacements, in which a copper pipe is placed upstream of the lead pipe, does not necessarily ameliorate with time but can actually worsen." See St. Clair, J., Cartier, C., Triantafyllidou, S., Clark, B., and Edwards, M. (2016) "Long-Term Behavior of Simulated Partial Lead Service Line Replacements." Environmental Engineering Science, 33(1). DOI: 10.1089/ees.2015.0337.

[10] 84 Fed. Reg. at 61740.

[11] EPA states that "financing support for lead reduction efforts may be available from State and local governments, EPA programs (*e.g.*, the Drinking Water State Revolving Fund (DWSRF), the WIFIA Program, and the Water Infrastructure Improvements for the Nation Act of 2016 (WIIN Act) grant programs), and other federal agencies (*e.g.*, HUD's Community Development Block Grants)." *Id.*

[12] Abt Associates, *Environmental Justice Analysis for the Proposed Lead and Copper Rule Revisions, October 22, 2019* at Exhibits ES-1 and 4-1. Emphasis added.

[13] *Id.* at Exhibit 2-1.

minimize the harm from partial LSLRs, this practice is likely to continue under the Proposal – whenever a CWS-initiates infrastructure improvements or emergency repairs.[14] Because wealthier households are more likely to be able to afford to replace the customer-owned portion of the line in conjunction with CWS-initiated replacements, partial LSLRs, when they continue to occur, will predominately affect low-income and minority households.

In addition, when customers initiate LSLR on their privately-owned portion of the line, the Proposal mandates that water systems replace the publicly-owned portion.[15] This approach prioritizes LSLR for wealthy property owners who are able to pay, and could result in fewer replacements for low-income households due to limited water system resources.

Finally, when a CWS has high enough levels of lead in drinking water to trigger mandatory LSLR, the Proposal only gives the CWS credit for full LSLR (which is positive) but does not address how to pay for the replacement of the customer-owned portion of the LSL. Presumably, the property owner must pay. Therefore, the CWS has a significant incentive to prioritize LSLRs in the wealthier neighborhoods where they are more likely to find able participants and where the cost to the water system will be lower. This outcome would disproportionately impact low-income and minority residents. While the CWS should certainly not get credit for partial LSLR, EPA has not set guardrails to prevent inequitable practices during mandatory LSLR.

The agency's list of four federal funding sources fails to cover the shortfall to pay for replacement of customer-owned LSLs. Two are essentially loans that must be repaid, another consists of only $10 million to deal with a billion-dollar challenge, and the fourth is already overcommitted.

As a result, the rule, when finalized and implemented as written, is likely to make the health disparities for low-income and minority residents worse, not better. This outcome runs contrary to EPA's obligations under Executive Order 12898 to redress environmental justice problems. And it leaves states and water systems who receive federal funding vulnerable to legal challenges from affected residents who demonstrate that the funds were used to support work that disproportionately impacted minorities and, therefore, violated Title VI of the Civil Rights Act of 1964.

II. FRAMEWORK FOR EVALUATING LSLR CHALLENGES AND SUMMARY OF ANALYSIS

As noted in the previous section, EPA acknowledged in its Environmental Justice Analysis that the current LCR disproportionately impacts low-income and minority residents. Any analysis of the LSLR provisions of the Proposal must consider the different scenarios under which an LSL may be fully or partially replaced because the health equity and environmental justice implications – and therefore, the solutions – are different. We divide the triggers for LSLR into four categories:

1. **CWS-initiated infrastructure improvements that disturb LSLs:** This category consists of LSL disturbances associated with capital improvement projects that involve replacing or rehabilitating the drinking water main under the street. The projects are initiated and planned by the CWS, typically based on concerns that the main will leak or otherwise fail. The work on the main disturbs the portion of the LSL that is connected to the main and requires the replacement of that portion. Because the work must be done to maintain the integrity of the water system, the

[14] The provision at § 141.84(d) does not limit when partial LSLRs may be conducted. Rather it establishes conditions, albeit important ones, on how partial LSLRs are conducted.
[15] 84 Fed. Reg. at 61,698.

central issue is whether the LSL will be partially or fully replaced, not whether the CWS needs to conduct the project.

2. **Emergency repairs that disturb LSLs:** This category consists of repairs to a leaking or otherwise failing main or service line. They are typically initiated by the CWS when the main fails or by the customer when the service line fails. As with the prior category, the work disturbs the portion of the LSL or main that is failing and requires the replacement of that portion. Because the work must be done to maintain the integrity of the system, the central issue is whether the LSL will be partially or fully replaced on an expedited timeline, not whether the CWS needs to conduct the project.
3. **CWS-initiated mandatory LSLR:** This category consists of LSLs that the CWS must fully replace to comply with the LCR because the compliance sampling indicates that it has high levels of lead in the drinking water. Under the current LCR, that means that the 90th percentile exceeds the 15 parts per billion (ppb) Lead Action Level. The central issue is how the CWS selects which LSLs to prioritize.
4. **Customer-initiated LSLR:** This category consists of LSLRs initiated by the customer who seeks to replace the service line because of concerns with lead or that the line may fail.

Table 1 below summarizes our analysis of the health equity and environmental justice aspects for each of the four categories of LSLR. The following explains the rows in the table:

- **Situation with the current LCR:** Our understanding of the current situation focuses on the frequency of LSLRs and the likelihood of partial LSLRs occurring. For the first three categories, we maintain that partial LSLRs are common and much more likely than full LSLRs except for those CWSs that have a special program to make it easier for residents to participate, including those that fully fund or subsidize through grants or zero-interest loans the cost of a full LSLR. Customer-initiated LSLRs are uncommon, but when done, likely to be full. See Section V for details.
- **Health equity implications of the current situation:** We briefly describe our assessment of the health equity concerns with the current situation and our findings from Dr. Baehler's study of the LSLR data for Washington, DC between 2009 and 2018. For the first three categories, our primary health equity concern is that low-income and minority residents are more likely to have partial LSLRs because they cannot afford to pay for full replacement. For customer-initiated LSLRs, our health equity concern is that wealthier residents are more likely to participate because they can afford the cost. See Sections III and V for details.
- **Impact of EPA's Proposal:** We briefly describe the changes in EPA's Proposal, its impact on the frequency of LSLRs, and our analysis of the impacts of those changes on health equity concerns. See Section VI for details.
- **Recommendations to improve the Proposal:** We summarize our recommended changes (see Section IX) that EPA should make when it finalizes the LCR so it can fulfill its responsibilities under Executive Order 12898 (see Section VII) and help states and communities that receive federal funding avoid violations of Title VI of the Civil Rights Act of 1964 (see Section IX).

Table 1: Summary of health equity and environmental justice aspects for four categories of lead service line replacements under current and proposed revisions to Lead and Copper Rule.

Situation		CWS-initiated infrastructure improvements that disturb LSLs	Emergency repairs that disturb LSLs	CWS-initiated mandatory LSLRs	Customer-initiated LSLRs
Situation with current LCR	Frequency of LSLR (full or partial)	Common. Customers typically expected to pay to replace portion they own.		Only if CWS finds high lead levels through compliance sampling.	Uncommon unless CWS has special program.
	Likelihood of partial LSLR	High unless CWS has special program to ensure full LSLR.			Low since customer won't pay for partial LSLR.
Health equity concerns with current LCR	Health equity concern	Low-income and minority residents are more likely to have partial LSLRs because they cannot afford to pay for full replacement.			Wealthier residents are more likely to participate because they can afford costs.
	Findings of Washington, DC LSLR study	Health equity concern confirmed.	Not confirmed.	Not evaluated.	Health equity concern confirmed.
Impact of proposed LCR revisions	Change proposed by EPA	CWS must provide 45-days advance notice, provide filters, offer to coordinate full LSLR, and conduct post-replacement samples in 3-6 months.	Same as left, but only 24-hour notice required.	Same as left, except that no credit given for partial LSLR.	CWS must replace portion it owns, if given timely notice by customer that portion he/she owns will be replaced.
	Impact on frequency of LSLR	Because of advance notice, customers are more likely to fully replace LSLs to avoid increased risk from partial LSLR.		More CWSs likely to have to meet full LSLR milestones.	More customers likely to participate in full LSLR.
	Impact on health equity concern	Increased disparities since wealthier customers are more likely to have full LSLRs because they can afford to pay.		Greater concern because CWS may prioritize wealthier residents to reduce costs of full LSLR and meet milestones.	Potentially increased disparities because wealthier customers more likely to participate.
Recommendations to improve the Proposal		Prohibit or strictly limit partial LSLRs or otherwise ensure no disproportionate impact on low-income or minority populations.		Require balanced participation to avoid significant disparities.	

III. DR. BAEHLER'S STUDY OF WASHINGTON, DC LSLRS BETWEEN 2009 AND 2018

The Robert Wood Johnson Foundation funded EDF to partner with American University and DC Water – the CWS that provides drinking water to Washington, DC residents – to evaluate whether there are health equity or environmental justice impacts when property owners are required to pay for LSLR on their property. Our hypothesis was that such programs have a disproportionate impact on minority and low-income residents, who may be less able to participate due to financial constraints, and thus, may have higher lead exposure.

In early 2019, DC Water provided Dr. Baehler and her team at American University (AU) with data on LSLRs that occurred between 2009 and 2018. The data included:

- Location of the property in terms of a premise ID (assigned by DC Water), and street address.
- Whether the property was residential or multifamily housing.
- The construction material of the service line on public and private property, categorized as lead, brass, copper, or "nonlead." For our purposes a line was an LSL if any portion was made of lead pipe.
- Whether a full or partial LSLR was done. For our purposes, a full LSLR meant there was no lead pipe remaining after the work was completed.
- Classification of LSLR according to DC Water's three categories[16] described below:
    - **Capital Improvement Projects ("CIP"):** 1,666 LSLRs – either full or partial – that resulted from CIPs conducted by DC Water. A full LSLR only occurred if the property owner paid for a contractor to replace the portion on private property. During the study period, DC Water continued to streamline the process to make it easier for property owners to participate. Dr. Baehler assigned these to our "**CWS-initiated infrastructure improvements that disturb LSLs**" category described earlier.
    - **Emergency:** 453 LSLRs – either full or partial – that resulted from DC Water-initiated emergency repairs to the main under the street. A full LSLR only occurred if the property owner paid for a contractor to replace the portion on private property. Dr. Baehler assigned these to our "**Emergency repairs that disturb LSLs**" category described earlier.
    - **Voluntary:** 1,367 LSLRs that were requested by the property owner through a program offered by DC Water. The property owner paid to replace the portion on private property and DC Water paid for the remaining portion. All but two of these LSLRs were full. We do not know why the remaining two were partial. Dr. Baehler assigned these to our "**Customer-initiated LSLR**" category described earlier.
- Date that the work was completed.

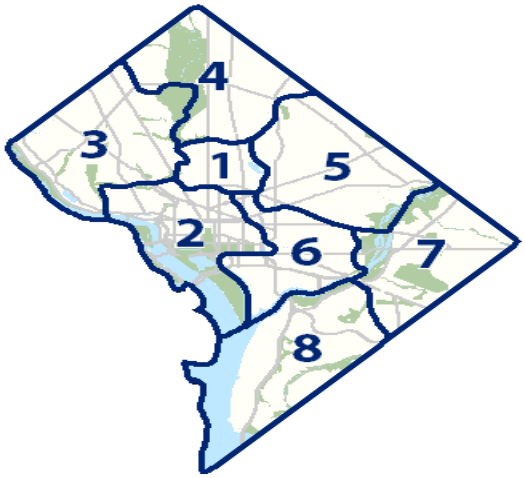
The AU Team removed 59 records where there were multiple entries for a single service line – 43 for CIP, 8 for Voluntary and 8 for Emergency – producing a final set of 3,427 LSLRs. Many of the removed records consisted of partial LSLRs that were followed by a full replacement. If the full replacement occurred within two years of the earlier partial, the premise was coded once as a full LSLR. If more than two years elapsed between the partial and full replacements, the premise was counted twice – once as a partial LSLR and once as a full LSLR

Next, the AU Team geocoded the data and assigned every address to a census tract using ArcGIS. This enabled them to link information about spatial patterns of LSLRs with demographic information about the

[16] Note that DC Water was not mandated to replace LSLRs during the study period so the fourth of our categories was null and could not be evaluated.

179 census tracts in Washington, DC available through the U.S. Census American Community Survey's (ACS) five-year estimates. Total LSLRs (including both partial and full) occurred in 151 census tracts. Within census tracts, the total LSLR count ranged from one to 177 after duplicates were removed.

Figure 1: Map of Washington, DC's wards for City Council



Using geocodes, the AU Team linked those census tracts with Washington, DC's eight wards. Wards are the primary political subdivision of the city and are displayed in Figure 1. Within wards, the total LSLR count ranged from 58 to 628 after duplicates were removed.

The percent of all LSLRs across the city that involved full replacement ranged from 20% for Emergency to 50% for CIP and almost 100% for Voluntary.

For CIP and Emergency LSLRs, the AU Team compared the percentage of full LSLRs (the outcome variable) to the demographic information and found statistically significant correlations between CIP-related outcomes and key demographic data but none for Emergency-related outcomes. Table 2 provides the results for the CIPs. Figure 2 summarizes the analysis for CIP LSLRs by ward.

For Voluntary LSLRs – those initiated by the customer instead of DC Water – the percent of full LSLRs was not relevant because all but two of the 1,359 LSLRs were full. In addition, comparing raw numbers of Voluntary LSLRs across census tracts and wards was not appropriate because the number of all residential service lines in these areas varied dramatically.

Therefore, the AU Team used the total number of service lines in each ward and census tract as a denominator for the outcome variable in the analyses of Voluntary LSLRs. Focusing on the number of Voluntary LSLRs as a percent of all residential service lines provided a standardized measure of the likelihood that low-income or minority residents in different wards and census tracts would participate in Voluntary (full) LSLR. That outcome measure (Voluntary LSLRs as a percentage of all service lines) can be compared to the outcome measure used for CWS-initiated LSLRs under DC Water's CIP program (i.e., full LSLRs as a percentage of total LSLRs), as in Table 2.

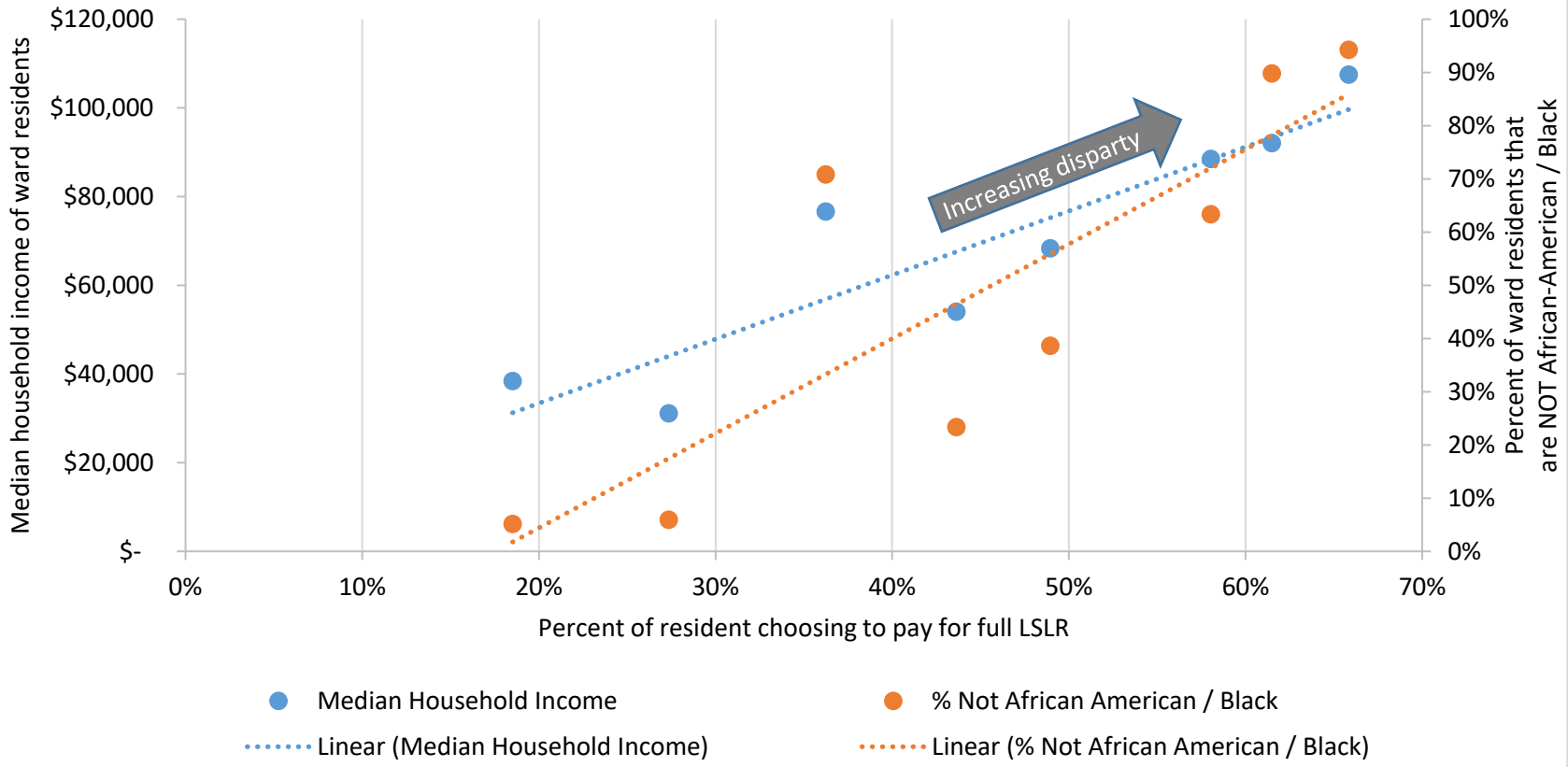
The analysis of Voluntary LSLRs revealed statistically significant correlations with the same three demographic characteristics seen for CIP LSLRs for wards. The analysis was not attempted for census tracts. Table 2 provides the results for the Voluntary LSLRs alongside the CIPs. Figure 3 summarizes the analysis for Voluntary LSLRs by ward. For more details on the analysis, see Appendix 1.

Table 2: Statistically significant bivariate correlations for with full LSLRs associated with Capital Improvement Projects (as a percentage of all CIP replacements, full and partial) in Washington, DC between 2009 to 2018.

Statistically-significant demographic characteristics	% of LSLRs associated with DC Water-initiated Capital Improvement Projects that were full*		% of customer-initiated Voluntary LSLRs as a percent of all residential service lines**	
	Census Tracts	Wards	Census Tracts	Wards
% of residents that are African American / Black***	**R = - 0.306**	**-0.864**	NA	**-0.869**
Household Median Income	**R = 0.246**	**0.898**	NA	**0.847**
Area Deprivation Index (ADI)**** for Washington DC	**R = - 0.310**	**-0.888**	NA	**-0.878**
Degrees of freedom	94	6	NA	6
R-value needed for statistical significance of 0.05	> 0.205 or < -0.0205	< 0.707 or < -0.707	NA	< 0.707 or < -0.707

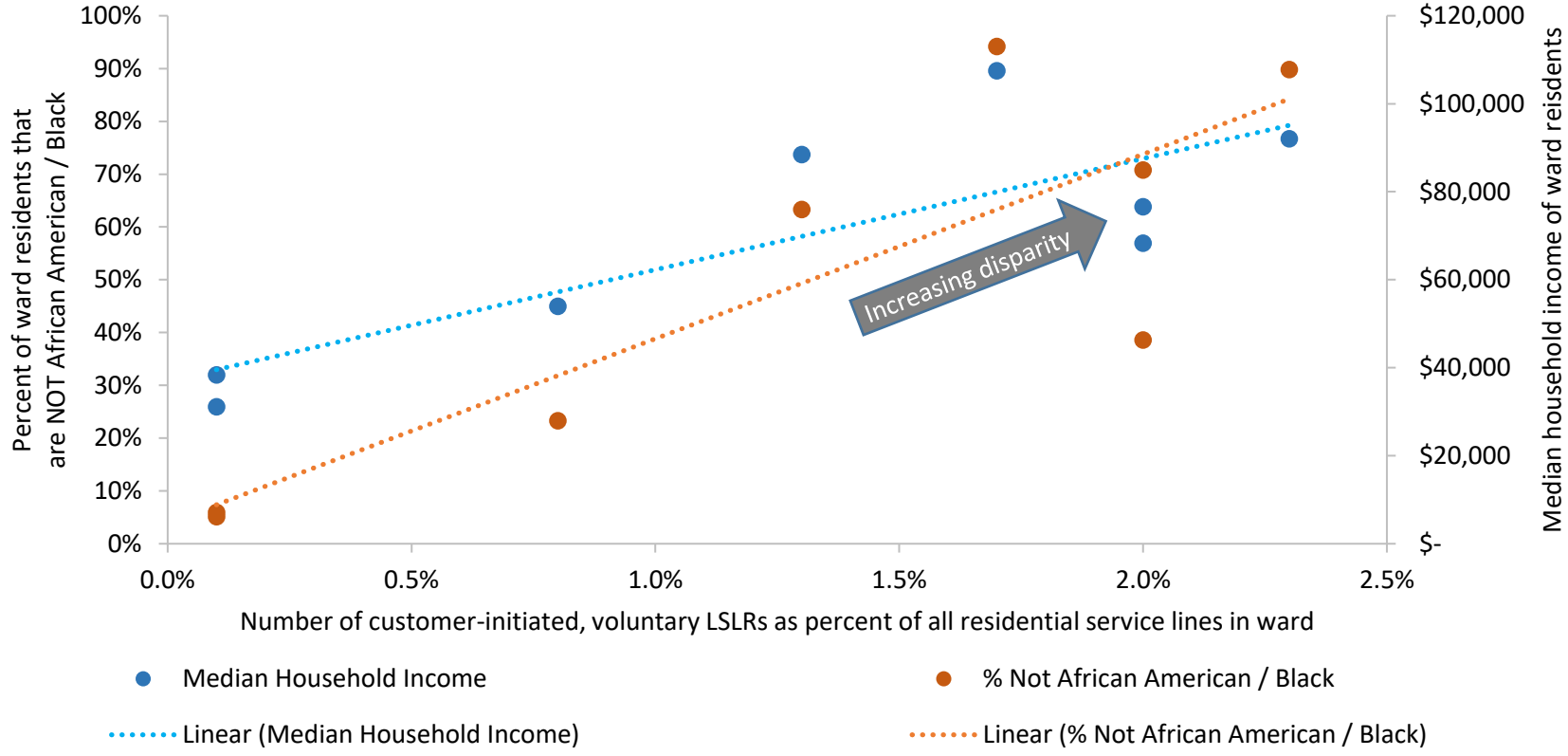
* Based on 1,623 CIP-related LSLRs consisting of 805 (49.5%) fulls and 818 (50.5%) partials.
** Based on 1,359 Voluntary LSLRs.
*** Data available through the U.S. Census American Community Survey's (ACS) five-year estimates.
**** See Appendix 1 for details on ADI.

Figure 2: Percent of full LSL replacements (CWS-initiated) compared to demographic characteristics in Washington, DC between 2009-2018, by ward



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

Figure 3: Full, voluntary LSL replacements as percent of residential service lines compared to demographic characteristics in Washington, DC between 2009-2018, by ward



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%

IV. WASHINGTON, DC'S NEW LSLR PROGRAM

It is important to note that, in 2019, Washington, DC passed an ordinance that took steps to resolve the health equity issues moving forward and began to replace the private-side lead pipes at properties with past-partials to address the legacy issue. Specifically, the city now:

- Prohibits partial LSLRs for CIP and emergency repairs, using funds paid by ratepayers to cover the cost of replacing the LSL on private property. As a result, there is no cost to property owners except through the rates paid by all customers and through taxes.
- Invites property owners at locations 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 resident's income compared to the area median income. The city designated $2 million for each of the first two years of this effort.

V. CURRENT LCR FOR LSLRS – HEALTH EQUITY ANALYSIS

For each LSLR scenario, this section explains the study results, relevance to other CWSs, and recommendations for the final LCR.

1. **CWS-initiated infrastructure improvements that disturb LSLs:**
    - Dr. Baehler's study confirmed that these activities in Washington, DC, from 2009 to 2018 were likely to result in health equity and environmental justice disparities. She found statistically significant impacts by census tract and ward, with lower rates of full replacement in areas with lower mean household incomes, higher percentages of African American / Black residents, and higher deprivation rankings according to the Area Deprivation Index (ADI), which combines 14 social, economic, and demographic factors associated with deprivation and poor health outcomes.
    - While city-wide, property owners paid for full LSLR almost half the time, the rate was 66% in the ward with the highest income and greatest percentage of non-African American / Black residents (Ward 3) compared to 25% weighted average for the two wards (Wards 7 and 8) with the lowest median household income and greatest percentage of African American / Black residents.
    - We expect the study's findings to apply to any CWS that expects property owners to pay to replace the portion of the LSL on their property in order to avoid a partial LSLR.
    - *Therefore, the Proposal MUST take measures to prevent the disproportionate impacts on low-income and minority residents during CWS-initiated infrastructure improvements.*

2. **Emergency repairs that disturb LSLs:**
    - Dr. Baehler's study did not confirm health equity and environmental justice disparities for these activities. We suspect that the lack of confirmation stemmed from three factors: 1) the circumstances of an emergency repair vary widely; 2) the numbers of emergency repairs were much smaller than for CIP (445 v. 1,623); and 3) a smaller percentage of the residents overall opted for full LSLR in this scenario (20% for emergency repair v. 50% for CIP).
    - Despite the lack of confirmation, we expect that the disparities are likely present and would be present in any CWS that expects property owners to pay to replace the portion of the LSL on their property in order to avoid a partial LSLR.
    - *Therefore, the Proposal SHOULD take measures to prevent the disproportionate impacts on low-income and minority residents during emergency repairs.*

3. **CWS-initiated mandatory LSLR:**
    - Because Washington, DC was below the Lead Action Level during the study period of 2009 to 2018, it was not obligated to conduct mandatory LSLR. Therefore, Dr. Baehler's study did not evaluate the activity.
    - We expect that the health equity concerns are likely the same as the first category because, under DC policy during the study period, the work was similar to a planned infrastructure improvement project where the CWS expected property owners to pay to replace the portion of the LSL on their property.
    - *Therefore, the Proposal MUST take measures to prevent the disproportionate impacts on low-income and minority residents during CWS-initiated mandatory LSLR.*

4. **Customer-initiated LSLR:**
    - Dr. Baehler's study confirmed that these activities in Washington, DC, from 2009 to 2018 were likely to result in health equity and environmental justice disparities. She found statistically significant impacts by census tract and ward, with lower rates of customer-initiated LSLRs in areas with lower mean household incomes, higher percentages of African American / Black residents, and higher deprivation rankings according to the ADI.
    - The differences between wards was significant. In the two wards (Wards 7 and 8) with the lowest median household income and greatest percentage of African American / Black residents (5% and 6% non-African American / Black, respectively), only 0.1% of all LSLRs were customer-initiated. By comparison, 2.3% of LSLRs were customer-initiated in Ward 3, which has more than two-and-a-half times greater median household income and a 94% non-African-American/Black population.
    - We expect health inequities because wealthier residents concerned about lead in drinking water are more likely to initiate a LSLR based on their ability to pay whereas others may find it difficult to make the issue a priority and commit the resources.
    - *Therefore, the Proposal MUST take measures to prevent the disproportionate impacts on low-income and minority residents of customer-initiated LSLR.*

For convenience, Table 3 is the portion of Table 1 that applies to EPA's Current LCR.

Table 3: Health equity and environmental justice aspects for four categories of lead service line replacements under current Lead and Copper Rule.

<table>
<tr><th colspan="2">Situation</th><th>CWS-initiated infrastructure improvements that disturb LSLs</th><th>Emergency repairs that disturb LSLs</th><th>CWS-initiated mandatory LSLRs</th><th>Customer-initiated LSLRs</th></tr>
<tr><td rowspan="2">Situation with current LCR</td><td>Frequency of LSLR (full or partial)</td><td colspan="2">Common. Customers typically expected to pay to replace portion they "own."</td><td>Only if CWS finds high lead levels through compliance sampling.</td><td>Uncommon unless CWS has special program.</td></tr>
<tr><td>Likelihood of partial LSLR</td><td colspan="3">High unless CWS has special program to ensure full LSLR.</td><td>Low since customer won't pay for partial LSLR.</td></tr>
</table>

Table 3: Health equity and environmental justice aspects for four categories of lead service line replacements under current Lead and Copper Rule.

Situation		CWS-initiated infrastructure improvements that disturb LSLs	Emergency repairs that disturb LSLs	CWS-initiated mandatory LSLRs	Customer-initiated LSLRs
Health equity concerns with current LCR	Health equity concern	Low-income and minority residents are more likely to have partial LSLRs because they cannot afford to pay for full replacement.			Wealthier residents are more likely to participate because they can afford costs.
	Findings of Washington, DC LSLR study	Health-equity concern confirmed.	Not confirmed.	Not evaluated.	Health-equity concern confirmed.

VI. EPA'S PROPOSAL FOR LSLRS – HEALTH EQUITY ANALYSIS

The Proposal addresses the shortcomings of the current LCR with regard to LSLs by requiring CWSs to encourage and support full LSLR. As a result, we expect that many more full LSLRs will occur and, therefore, reduce consumer's overall exposure to lead in drinking water. However, the Proposal continues to adhere to the fundamental concept that the customer is fully responsible for the portion of the LSL it owns, even where the CWS has control – but not ownership – of the service line.

Despite EPA's broad assurances, we expect that the Proposal, by retaining this concept, will have the unintended consequence of making the health equity and environmental justice disparities of the current LCR significantly worse. Currently, virtually all CWS-initiated LSLRs result in partial LSLRs, and few customers initiate full LSLR. Under the Proposal, those with ability to pay for full replacement will choose that option, resulting in the unintended consequence of disproportionate harm to low-income and minority residents. In essence, those with access to money will preferentially benefit from the Proposal.

We recognize that the Proposal takes important steps to minimize consumers' exposure from LSL disturbances. Specifically sections 141.84(c), (d), and (e) and 141.85(e) require that CWSs that disturb LSLs proactively provide filters and a three-month supply of cartridges to customers and consumers who may be affected. If the filters are used properly, this requirement should reduce the potential exposure from both partial and full LSLRs. However, the Proposal rests on the assumption that the filters will be properly and uniformly used. That may be true, but we are skeptical, and EPA did not provide evidence to back up that assumption. We anticipate that EPA's variance to Denver Water should provide that type of evidence, but it is not yet available.[17] We are concerned that only providing filters and cartridges will have the additional unintended consequence of aggravating health equity and environmental justice disparities if not uniformly and properly installed.

Additionally, in many ways, the Proposal is likely to result in CWSs adopting programs similar to those Dr. Baehler studied in Washington, DC in which the CWS made full LSLRs significantly easier for

[17] EPA Region 8, In the Matter of Denver Water, Colorado, Variance Under SDWA Section 1415(a)(3), December 16, 2019 at Docket No. EPA-R08-OW-2019-0404-0005.

customers but still continued to require that the customer fully pay to replace the LSL on their property. Therefore, the lessons learned from her study are particularly relevant.

With this context in mind, we applied the framework described in Table 1 to the four LSLR scenarios. For each scenario, we summarized: 1) the change proposed by EPA in the Proposal; 2) the expected impact on the frequency of LSLRs; and 3) the anticipated impact on health equity.

CWS-initiated infrastructure improvements that disturb LSLs:
The Proposal requires CWSs to proactively give 45-days advance notice of infrastructure improvement work, offer to coordinate full LSLR, provide filters, and collect post-replacement samples in 3-6 months. Compared to the current LCR, these provisions should encourage many more customers to pay for full LSLR in order to avoid a partial.

We expect that the Proposal will result in most CWSs adopting a program substantially similar to the CIP program that Washington, DC had in place from 2009 to 2018. Dr. Baehler's study of this program found that it resulted in health equity and environmental justice disparities. Her team found statistically significant impacts by census tract and ward, with lower rates of full replacement in areas with lower mean household incomes, higher percentages of African American / Black residents, and higher deprivation rankings according to the Area Deprivation Index (ADI), which combines 14 social, economic, and demographic factors associated with deprivation and poor health outcomes. While city-wide, property owners paid for full LSLR almost half the time, the rate was 66% in the ward with the highest income and greatest percentage of non-African American / Black residents (Ward 3) compared to 25% weighted average for the two wards (Wards 7 and 8) with the lowest median household income and greatest percentage of African American / Black residents.

Based on this analysis, we expect that the Proposal will increase health inequities in the service area of any CWS that expects property owners to pay to replace the portion of the LSL they own.

Emergency repairs that disturb LSLs:
The Proposal treats emergency repairs in much the same way as CWS-initiated infrastructure improvements except that 24-hour advance notice is allowed instead of 45-days. Therefore, we would expect the impact on the frequency of LSLRs to be similar.

Unlike DC Water's infrastructure improvements, Dr. Baehler's study did not confirm health equity and environmental justice disparities for emergency repairs. We suspect that the lack of confirmation stemmed from three factors: 1) the circumstances of an emergency repair vary widely; 2) the numbers of emergency repairs were much smaller than for CIP (445 v. 1,623); and 3) a smaller percentage of the residents opted for full LSLR under that scenario (20% for emergency repair v. 50% for CIP).

Despite the lack of confirmation, we expect that the Proposal would likely increase health inequities in the service area of any CWS that expects property owners to pay to replace the portion of the LSL they own.

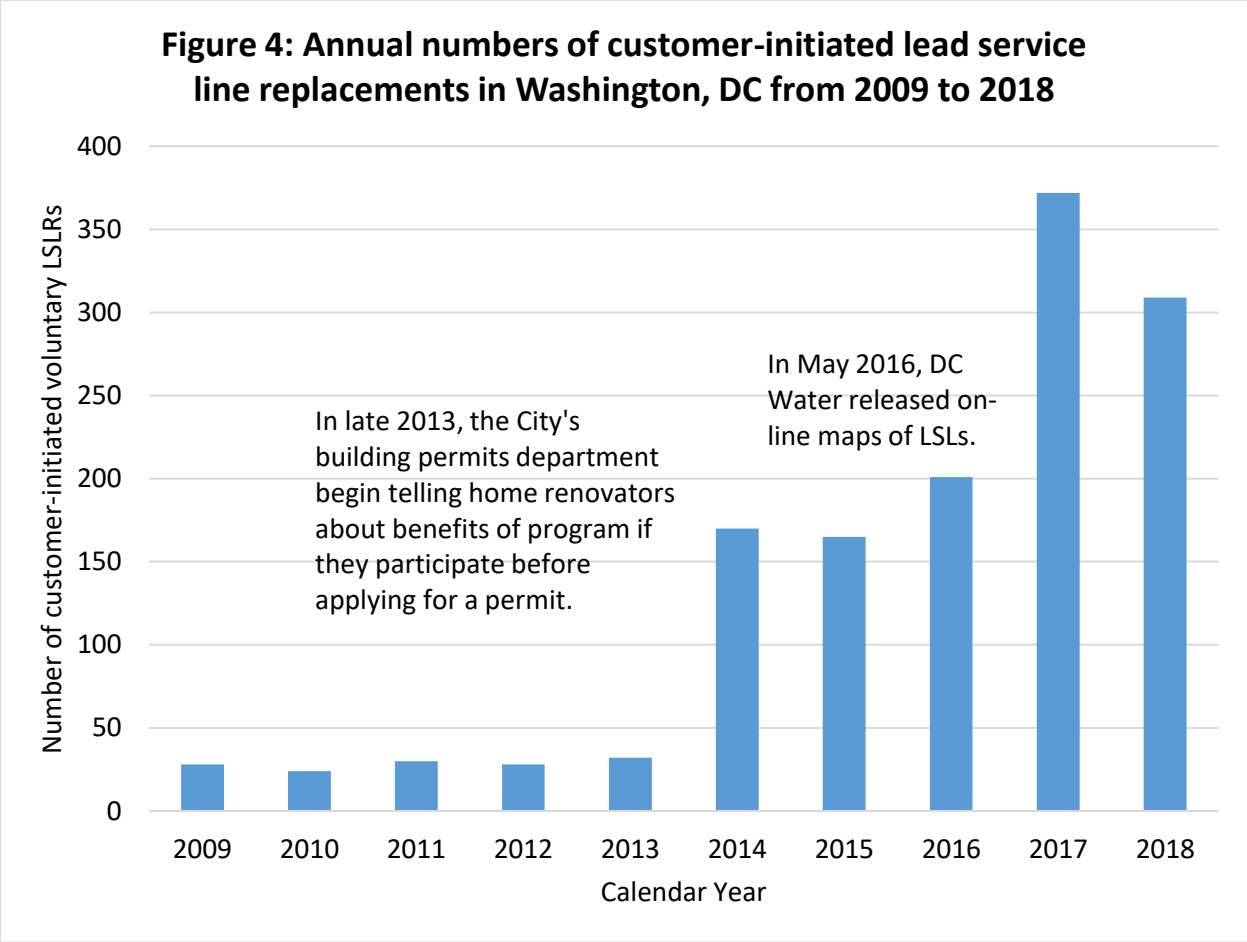
CWS-initiated mandatory LSLR:
The Proposal provides incentives for full LSLR to CWSs that must replace LSLs because of high lead levels found through compliance samples; those water systems will only receive credit for full LSLR. The CWS may still conduct partial LSLRs but will not receive credit for fulfilling its replacement obligations at § 141.84(f) and (g).

We expect the proposed requirement will significantly increase the number of full LSLRs in the affected CWSs. However, as an unintended consequence, CWSs that expect customers to pay to replace the

portion of the LSL they own have a strong incentive to favor projects in wealthier neighborhoods where they are more likely to find willing participants. Therefore, the Proposal, while encouraging full LSLRs, could make health inequities worse.

Customer-initiated LSLR:
The Proposal requires CWSs to replace the portion of the LSL they own if customers provide timely notice that they intend to replace their portion of the service line. The requirement is substantially similar to key elements of the Voluntary LSLR program that Washington, DC had in place from 2009 to 2018 and that Dr. Baehler and her AU Team studied. In that program, DC Water paid to replace the portion of the LSL on public property if the customer proactively agreed to pay to replace the remainder of the line. DC Water also took steps to coordinate the replacement and streamline the contracting costs and arrangements for customers. These steps are consistent with, but go further than, those called for in the Proposal.

Dr. Baehler's study provides critical insight into the likelihood that customers will take advantage of the opportunity for full LSLR as well the importance of various means to promote the program. Figure 4 provides the annual rates of customer-initiated, full LSLR in Washington, DC from 2009 to 2018. The first five years of the program had relatively low participation rates – about 25 replacements per year. From 2014 to 2016, the rate jumped about seven-fold to nearly 175 full LSLRs a year. DC Water told us that the jump most likely resulted from 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. The Proposal, at § 141.84(b), requires all CWSs to make their LSL inventory publicly available and all large water systems – those serving more than 100,000 people – to make the inventory available electronically. However, the provisions do not require specific addresses to be disclosed and do not require interactive maps to be used.

Based on these results, we would expect that customer-initiated full LSLRs would increase dramatically under the Proposal because LSL inventories must be made public and CWSs will be required to annually notify customers and consumers with an LSL that they still have one and should replace it.

However, Dr. Baehler's study found DC Water's Voluntary LSLR program had the unintended consequence of aggravating the disproportionate impacts on low-income and minority populations because wealthy residents were more likely to initiate a full LSLR. The AU Team found statistically significant impacts by census tract and ward, with lower rates of customer-initiated LSLRs in areas with lower mean household incomes, higher percentages of African American / Black residents, and higher deprivation rankings according to the ADI.

The differences between wards were significant. In the two wards (Wards 7 and 8) with the lowest median household income and greatest percentage of African American / Black residents (5% and 6% non-African American / Black, respectively), only 0.1% of all LSLR were customer-initiated. By comparison, 2.3% of LSLR were customer-initiated in Ward 3, a ward with almost three times greater median household incomes and a 94% non-African American / Black population.

We expect customer-initiated LSLR under the Proposal to result in health inequities because wealthier residents concerned about lead in drinking water are more likely to participate based on their ability to pay whereas others may find it difficult to make the issue a priority and commit the resources.

Overall, we find that in each of the four LSLR replacement scenarios, the Proposal will likely make the disproportionate impacts on low-income populations and minorities worse, not better, than the current LCR. For convenience, Table 4 is the portion of Table 1 that applies to EPA's Proposal.

Table 4: Summary of health equity and environmental justice aspects for EPA's proposed revisions to the Lead and Copper Rule.

Situation	CWS-initiated infrastructure improvements that disturb LSLs	Emergency repairs that disturb LSLs	CWS-initiated mandatory LSLRs	Customer-initiated LSLRs
Change proposed by EPA	CWS must proactively provide 45-days advance notice, provide filters, offer to coordinate full LSLR, and conduct post-replacement samples in 3-6 months.	Same as left but only 24-hour notice required.	Same as left, except that no credit given for partial LSLR.	CWS must replace portion it owns if given timely notice.
Impact on frequency of LSLR	Because of advance notice, customers are more likely to fully replace LSLs to avoid increased risk from partial LSLR.		More CWSs likely to have to meet full LSLR milestones.	More customers likely to participate in full LSLR.

Impact on health equity concern.	Increased disparities since wealthier customers are more likely to have full LSLRs because they can afford to pay.	Greater concern because CWS may prioritize wealthier residents to reduce costs of full LSLR and meet milestones.	Potentially increased disparities because wealthier customers more likely to participate.

VII. EPA'S OBLIGATIONS PURSUANT TO E.O. 12898 TO MINIMIZE ENVIRONMENTAL JUSTICE IMPACT

Executive Order 12898, issued by President Clinton in 1994, requires that each federal agency "make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."[18] EPA commissioned the Environmental Justice Analysis for the Proposal to address its obligations under this executive order.[19]

The adequacy of an agency's Analysis "is properly subject to 'arbitrary and capricious' review under the [Administrative Procedure Act]."[20] Under this standard, an agency's "analysis must be 'reasonable and adequately explained,' but the agency's 'choice among reasonable analytical methodologies is entitled to deference.'"[21] A "bare-bones conclusion that [environmental justice communities] would not be disproportionately harmed by" a proposal is insufficient.[22] As the Fourth Circuit recently put it when reviewing compliance with a state environmental justice policy, "environmental justice is not merely a box to be checked."[23]

The Proposal's consideration of its environmental justice impacts is cursory and inadequate. The Environmental Justice Analysis candidly acknowledges that "[h]ousehold-level changes that depend on ability-to-pay will leave low-income households with disproportionately higher health risks."[24] Yet EPA, in the rulemaking preamble, brushes this concern aside with a generic discussion of the Proposal as a whole. It does not address in any way the impact that the Proposal will have on the frequency of partial LSLRs or on a CWS's incentive to replace LSLs for higher income households compared to other households.

To comply with its duty under Executive Order 12898, EPA must specifically analyze in the final rule the environmental justice implications of the portions of the Proposal discussed above. Specifically, the analysis should address in detail the environmental justice implications of the following:

- The Proposal allows CWSs to carry out partial LSLRs during CWS-initiated infrastructure improvements that disturb LSLs and emergency repairs that disturb LSLs.

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[18] Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994).
[19] 84 Fed. Reg. at 61,740.
[20] *Communities Against Runway Expansion, Inc. v. F.A.A.*, 355 F.3d 678, 689 (D.C. Cir. 2004); *accord Coliseum Square Ass'n, Inc. v. Jackson*, 465 F.3d 215, 232 (5th Cir. 2006).
[21] *Sierra Club v. Fed. Energy Regulatory Comm'n*, 867 F.3d 1357, 1368 (D.C. Cir. 2017) (quoting *Communities Against Runway Expansion*, 355 F.3d at 689).
[22] *Standing Rock Sioux Tribe v. U.S. Army Corps of Engineers*, 255 F. Supp. 3d 101, 140 (D.D.C. 2017).
[23] *Friends of Buckingham v. State Air Pollution Control Bd.*, 947 F.3d 68 (4th Cir. 2020).
[24] Abt Associates, *Environmental Justice Analysis for the Proposed Lead and Copper Rule Revisions, October 22, 2019* at Exhibits ES-1 and 4-1.

- When customers initiate LSLR on their privately-owned portion of the line, the Proposal mandates that water systems replace the publicly-owned portion. This approach prioritizes LSLR for wealthy property owners who are able to pay, and could result in disproportionately fewer replacements for low-income communities due to limited water system resources.
- When CWSs must initiate mandatory LSLR due to high levels of lead in drinking water, the Proposal incentivizes full LSLRs where the customer or property owner is willing to pay to replace the privately-owned portion. As with customer-initiated LSLRs, this approach prioritizes wealthy property owners who are able to pay, and could result in fewer replacements for low-income communities due to limited water system resources.

VIII. EPA'S AND CWSS' OBLIGATIONS PURSUANT TO TITLE VI OF THE CIVIL RIGHTS ACT OF 1964 TO PREVENT DISPROPORTIONATE IMPACT ON MINORITIES

Title VI of the Civil Rights Act of 1964 prohibits discrimination "on the ground of race, color, or national origin" in any "program or activity receiving Federal financial assistance."[25] All states with authority to implement the Safe Drinking Water Act and most CWSs receive some form of federal funding through the EPA. Therefore, they must abide by Title VI's requirements.[26]

While private individuals can prevail in a lawsuit against a recipient of federal funding under Title VI only if they prove that the federally-funded program *intentionally* discriminated,[27] EPA has promulgated regulations that prohibit funding recipients from carrying out actions that create a discriminatory *disparate impact*.[28] Affected individuals can file administrative complaints with EPA regarding such impacts.[29] If EPA fails to respond to such a complaint, it can be sued under the APA.[30] If, in response to the complaint, EPA concludes that the funding recipient caused a discriminatory disparate impact, it can withhold federal funds from the funding recipient.[31]

As discussed above, several aspects of the Proposal create incentives for CWSs or otherwise cause a situation in which LSLR programs are likely to cause disparate impacts for minorities. Minority residents are more likely to live in older housing that is more likely to contain LSLs; as a result, they are expected to be exposed to more lead in their drinking water than non-minorities. The Proposal, however, creates incentives for CWSs to replace LSLs more often for wealthy (and on average non-minority) homeowners, thereby exacerbating these pre-existing disparities.

Moreover, the Proposal allows CWSs to replace only the utility-owned portion of an LSL during infrastructure improvements and emergency repairs. Because minority households are, on average, less likely to be able to afford to replace the customer-owned portion of the line, the result is that minority households are more likely to have partial LSLRs, which do not reduce long-term exposure and can make short-term exposure worse. Dr. Baehler's study demonstrated that this disproportionate impact is real.

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[25] 42 U.S.C. § 2000d.
[26] EPA, *Drinking Water Costs and Federal Funding*, https://perma.cc/N4QF-7ZDY.
[27] *Alexander v. Sandoval*, 532 U.S. 275, 280-81 (2001).
[28] 40 C.F.R. § 7.30 ("No person shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving EPA assistance on the basis of race, color, national origin, or on the basis of sex in any program or activity receiving EPA assistance under the Federal Water Pollution Control Act, as amended, including the Environmental Financing Act of 1972.").
[29] 40 C.F.R. § 7.120(a).
[30] *Rosemere Neighborhood Ass'n v. U.S. EPA*, 581 F.3d 1169 (9th Cir. 2009); *Californians for Renewable Energy v. U.S. EPA*, No: C 15-3292 SBA, 2018 WL 1586211 (N.D. Cal. Mar. 30, 2018).
[31] 42 U.S.C. § 2000d-1.

Cumulatively, the LSLR aspects of the Proposal increase the risk that CWSs, when implementing those aspects, will increase the disparity between minorities' and non-minorities' lead exposure through drinking water. EPA should not adopt a regulation whose logical consequence is that CWSs – and in some circumstances states as well –will violate EPA's own Title VI regulations in the normal course of implementation.

IX. OUR RECOMMENDED CHANGES TO THE PROPOSAL IN THE FINAL RULE

For these reasons, we ask EPA to modify its proposed new LSLR planning requirements at 40 CFR § 141.84 to explicitly require CWSs to prevent disproportionate impacts and track performance. EPA should consider its recent variance for Denver Water to track performance regarding health equity and environmental justice.[32] The variance allowed Denver Water to fully replace LSLs instead of implementing ortho-phosphate treatment to reduce corrosion following an exceedance of the lead action level.

For CWS-initiated infrastructure improvements that disturb LSLs and may result in partial LSLRs, EPA should consider requiring full LSLRs. We suggest Michigan's approach[33] of strictly limiting partial LSLRs to situations when emergency repairs are needed or when the resident expressly refuses to participate. The Illinois Department of Public Health is preparing to finalize a rule with a similar approach.[34] This clear and uniform mandate would ensure that all residents are treated equally and simplify state review of the plans. In addition, the programs initiated by communities such as Washington, DC; Cincinnati, OH; and Philadelphia, PA, as well as the Indiana, Missouri, and Pennsylvania subsidiaries of American Water may also serve as useful models.

For mandatory LSLRs, EPA should require states to evaluate replacement plans to confirm that the work will be conducted in a manner that avoids significant disparities. This may mean that CWSs prioritize low-income and minority neighborhoods or offer incentives for property owners in those neighborhoods to participate.

Customer-initiated LSLRs present a more complicated situation because CWSs should encourage participation by all. However, states should ensure that participation is balanced and does not unnecessarily draw limited resources away from full LSLRs for low-income and minority residents.

Finally, because so many of the health equity and environmental justice disparities stem from the fundamental concept that customers pay for the portion of the LSL they own, we recommend that EPA should require that CWSs explicitly address their ability to use ratepayer funds to cover the cost of full LSLR. In a recent white paper, two of the signatories of this comment (EDF and the Emmett Clinic) reviewed the laws of the 13 states with the most LSLs in the country. That review concluded that both publicly-owned and investor-owned CWSs had the authority under state law to use ratepayer funds for this purpose—although in some cases only after receiving approval from a state public utilities commission. EPA should require that CWSs determine their authority to pay for to replace the portion of an LSL on private property. Specifically, EPA should modify the language at 141.84(b)(6) to mandate a

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[32] EPA Region 8, In the Matter of Denver Water, Colorado, Variance Under SDWA Section 1415(a)(3), December 16, 2019 at Docket No. EPA-R08-OW-2019-0404-0005.

[33] Michigan Department of Environment, Great Lakes and Enerry, Supplying Water to the Public Rule, https://dtmb.state.mi.us/ORRDocs/AdminCode/1928_2019-035EQ_AdminCode.pdf.

[34] Illinois Department of Public Health, Second Notice of Revisions to Illinois Plumbing Code, JCAR770890-1824640r01, November 2019, http://www.dph.illinois.gov/sites/default/files/890%20Plumbing_DPH%20Second%20Notice%20Text_112219.pdf. See Section 890.1150(e) page 62-64.

"determination whether the water system has the authority to use funds paid by ratepayer in order to replace LSLs on private property.

By implementing these recommendations, EPA can address the Proposal's shortcomings, thereby fulfilling its responsibilities under Executive Order 12898,[35] reducing health disparities, and helping states and communities that receive federal funding avoid violating Title VI of the Civil Rights Act of 1964.[36]

X. ABOUT THE COMMENTERS

Environmental Defense Fund's mission is to preserve the natural systems on which all life depends. We have more than two million members and a staff of 700 scientists, economists, policy experts, and other professionals around the world. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems. This has drawn us to areas that span the biosphere: climate, oceans, ecosystems and health.

EDF's Health Program seeks to safeguard human health by reducing exposure to toxic chemicals and pollution, including accelerating LSLR to reduce lead in drinking water. We have conducted extensive analysis of the LSLR aspects of the current rule and closely tracked state and local innovations. We also collaborated with the Emmett Environmental Law and Policy Clinic on a report regarding state laws on use of rates paid by customers to support full LSLR.[37] We also supported American University's analysis of LSLR data for Washington, DC between 2009 and 2018. For more information on EDF's lead-related work, see www.edf.org/lead.

Harvard Law School's Emmett Environmental Law and Policy Clinic offers students an opportunity to do real-life and real-time legal and policy work. Clinic offerings include local, national and international projects covering the spectrum of environmental issues. Depending on the project, students may undertake litigation and advocacy work by drafting briefs, preparing testimony, conducting research, developing strategy, and reviewing proposed legislation.

The Emmett Clinic was lead author on a joint report with EDF titled "Rates could fund lead pipe replacement in critical states: Laws in states with the most lead service lines support the practice."[38] The paper reviews the laws of 13 states that collectively account for 2/3 of all LSLs in country, and concludes that there are no explicit barriers to using ratepayer funds to replace LSLs—including the portion on private property.

Shaun Goho, Deputy Director of the Emmett Clinic, and Laurel Petrulionis, a Harvard Law School student, conducted the analysis of EPA's and CWSs' obligations under Executive Order 12898 and Title VI of the Civil Rights Act of 1964.

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[35] Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 59 Fed. Reg. 7629; February 16, 1994. See https://www.epa.gov/laws-regulations/summary-executive-order-12898-federal-actions-address-environmental-justice.

[36] 42 U.S.C. § 2000d et seq. See https://www.justice.gov/crt/fcs/TitleVI-Overview.

[37] Tom Neltner, Laws in states with the most lead service lines support using rates to fund replacement on private property: New analysis, April 2, 2019, http://blogs.edf.org/health/2019/04/02/laws-states-support-rates-fund-replacement-private-property-new-analysis/

[38] Shaun A. Goho & Marcelo Saenz of Emmett Environmental Law & Policy Clinic, Harvard Law School and Tom Neltner of Environmental Defense Fund, Rates could fund lead pipe replacement in critical states: Laws in states with the most lead service lines support the practice, April 2019, https://clinics.law.harvard.edu/environment/files/2019/09/Rates-Fund-LSL-Replacement-States_Harvard_EDF_2019.pdf.

Affairs.

Shaun Goho and Laurel Petrulionis for Emmett Environmental Law and Policy Clinic.

[39] See https://www.american.edu/spa/faculty/baehler.cfm for full biography.

Appendix 1: Details of Dr. Baehler's Study Design and Results

As consensus grows regarding the desirability of encouraging full LSLRs whenever possible in lieu of partial replacements, evidence is needed regarding the effects of various financing arrangements on the relative uses of full vs. partial replacement. Common sense predicts that shared utility-customer funding arrangements like those used in many parts of the U.S., including the District of Columbia prior to October 1, 2019, would lead to more partial replacements of LSLs on properties whose owners have lower incomes and other markers of disadvantage that may pose barriers to participating in an opportunity for full replacement. If true, disadvantaged residents will experience higher probability of lead exposure through drinking water under shared funding arrangements.

The study described here tested that hypothesis using spatial patterns of disadvantage within Washington, D.C.'s census tracts and wards, and comparing these with spatial patterns of LSLR. In the absence of financial support for replacing private side LSLs in DC during the study period, it is reasonable to expect disproportionately higher rates of inferior remediation (in this case, partial rather than full LSLRs) in areas of the city with more markers of disadvantage. Two growing bodies of academic literature—on health equity and environmental justice—support the plausibility of this hypothesis.

American University ("AU") signed a Memorandum of Understanding with DC Water in April 2019 giving the AU research team access to information about service line materials across the utility's customer base of roughly 123,000 addresses, which includes 3,427 LSLRs(fulls and partials) completed during the study period. DC Water's electronic recordkeeping with respect to service line materials improved substantially beginning in 2009. Therefore, the study period 2009 through 2018 was chosen to maximize data quality.

The research was made possible by a grant from Environmental Defense Fund with funding from the Robert Wood Johnson Foundation. An earlier version of results was presented at the Association of Public Policy and Management's 41st Annual Fall Research Conference in Denver, Colorado in November 2019.

Outcome Variables for Full LSLR

Our main outcome variable is the percentage of total LSLRs in each ward or census tract that consisted of full replacements over the study period 2009-2018. Higher values for that variable represent more desirable policy outcomes because full replacements are preferred over partial replacements for the reasons stated earlier in this comment. We calculated these outcome values for each ward and census tract from the DC Water data, all years combined, with separate values for LSLR associated with utility-initiated, block-by-block capital improvement projects (CIPs) vs. emergency repairs.

For purposes of analyzing Voluntary, customer-initiated replacements, a different outcome variable was needed because Voluntary LSLRs are, almost by definition, all fulls, making it impossible to calculate Voluntary fulls as a percentage of total LSLRs (fulls plus partials).[40] Therefore, we used Voluntary replacements as a percentage of all service lines within each ward as the alternative outcome variable for those analyses. We did not study Voluntary replacements at the census tract level.

Income, Race, and Deprivation

Income and race data was obtained from the American Community Survey's 5-year estimates published by the U.S. Census Bureau. The Census Bureau recommends use of 5-year averages at the census tract

[40] Two anomalous partial LSLRs occurred in DC's Voluntary Program during the study period.

level to ensure adequate sample sizes. We averaged ACS estimates from 2013 (incorporating annual survey results from 2009-2012) and 2018 (incorporating annual survey results from 2013-18) to cover all relevant years and avoid double counting of overlapping years.

Specifically, we focused on three markers of disadvantage that vary significantly by area:

- Median Household Income: a direct measure of capacity to pay for full replacements in systems where customers are expected to pay for replacements on private property;
- Percent African-American / Black Residents: an alarmingly reliable predictor of poor health and environmental outcomes in many studies of health equity and environmental justice; and
- Area Deprivation Index (ADI): a rank-order index based on a cluster of social background variables (including race and income) often associated with poor health and education outcomes. ADI was developed at the University of Wisconsin Medical School and is available online through the Neighborhood Atlas.[41] Higher index numbers indicate greater levels of deprivation. See Figure 5 for elements of the ADI.

We expected median income to be positively correlated with our outcome variables. We expected percent African-American and ADI to be negatively correlated with our outcome variables. Similar results were expected for both outcome variables: (1) percentage of total replacements that are full (for LSLRs associated with CIPs and Emergency Repairs) and (2) Voluntary replacements as a share of all service lines in an area.

Results

As summarized above, our bivariate correlation tests showed statistically significant relationships in the expected direction between the outcome variables and all three measures of potential disadvantage for customer-initiated, voluntary replacements and utility-initiated replacements associated with CIPs, but not for replacements associated with emergency repairs. Pearson's R values for the CIP and Voluntary correlations indicate consistently strong relationships between spatial disparities in LSLR activity and spatial disparities in income, race, and deprivation. It should be noted that ward-level analyses involve a very small n of 8 (6 degrees of freedom), which sets the threshold for statistical significance very high (95% confidence requires R >0.707 or <-0.707). All ward-level analyses were able to meet that demanding test of significance.

In addition to the results reported above at ward level, we also calculated bivariate correlations at the ward-year level, which involves an n of 80 (8 wards x 10 years). Thus, we calculated the outcome variable for each year in each ward and correlated these values with the ACS 5-year estimate for each year 2009-2018 separately. These calculations also produced statistically significant results. Pearson's R for percent African-American / Black correlated with percent full LSLRs across all three types of replacements (CIP, Emergency, and Voluntary) was -0.503, and the correlation with household median

[41] The ADI is available at block-group level at https://www.neighborhoodatlas.medicine.wisc.edu. The 17 components of the index are described in Figure 5 and are as follows: % of population aged >= 25 years with < 9 years of education; % of population aged >= 25 years with < a high school diploma; % of employed persons >=16 years of age in white-collar occupations; median family income; income disparity (log of 100 * ratio of the number of households with <$10,000 in income to the number of households with $50,000 or more in income; median home value; median gross rent; median monthly mortgage; percent owner-occupied housing units (home ownership rate); % of civilian labor force population >= 16 years of age unemployed (unemployment rate); % of families below the poverty level; % of population below 150% of the poverty threshold; % single-parent households with children < 18 years of age; % of households without a motor vehicle; % of households without a telephone; % of occupied housing units without complete plumbing; % of households with more than one person per room (crowding).

income was 0.586. Both results meet and exceed the threshold for critical R / statistical significance with an n of 80: 95% confidence requires R >0.232 or <-0.232.

Finally, we conducted regression analyses at the census-tract level using our first outcome variable (full LSLRs as percent of all LSLRs in each tract) for all types of LSLRs combined and for CIPs only. Simple regression using one independent variable at a time generated statistically significant results for race, income, and deprivation for all LSLRs combined and for CIPs only (with p values well below 0.01 in each case, providing greater than 99% confidence that the null hypothesis could be rejected).

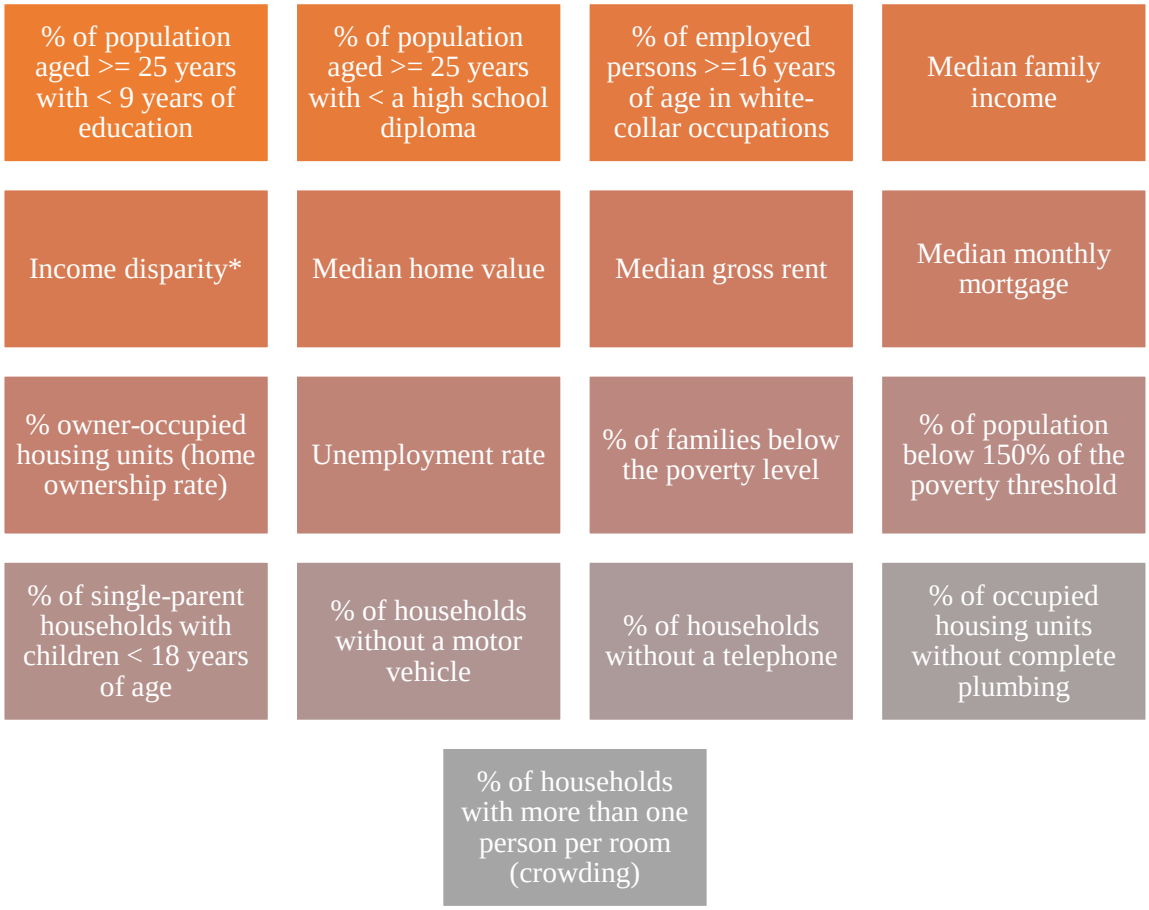
Simple regression using the deprivation index produced a notable result: a regression coefficient of -4.52 with $p < 0.0000$ for all LSLRs combined and regression coefficient of -4.19 with p of 0.0021 for CIPs. This indicates that a one decile increase in ADI in a census tract would predict either a 4.52 or 4.19 decrease in the percent of LSLRs that are fulls.

Using both race and income as independent variables in a multivariate regression revealed race to be the more powerful explanatory factor, with a regression coefficient of -0.31 and p value of 0.0034 (highly significant). Income was not statistically significant in the multivariate model. It should be noted that race and income are highly correlated with each other in DC at the census tract and ward level (collinear), which makes the deprivation score measure more meaningful than a multivariate regression model with multiple, overlapping markers of disadvantage.

Study Limitations

Ideally, our analysis would be run at the address level as well as the census-tract and ward levels, but the timeframe was too short to apply for access to household-level demographic data from the 2010 decennial Census—a process that takes 6-9 months. We intend to extend our analysis using address-level data from DC Water and the 2010 decennial Census, and with possible additional variables from publicly available, address-level records provided by the DC government.

Figure 5: Factors considered in Area Deprivation Index



*log of 100 x ratio of # of households with <$10,000 income to # of households with $50,000 or more in income