



Chicago Fed Insights, June 2024

Identifying Information Gaps to Help Communities Navigate Lead Service Line Replacement

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Lead Service Line Replacement Community Development Regional Economy Public Economics

In response to state and federal policy changes, communities across the United States have been developing strategies to undertake the large-scale and complex process of replacing millions of lead service lines (LSLs). These lead pipes supply drinking water to homes and risk exposing households to lead, which can have long-term repercussions for a child's development and cause chronic health issues in an adult. The challenge of replacing LSLs is felt acutely in the heart of the Midwest—home to the Federal Reserve Bank of Chicago's Seventh District, which comprises all of Iowa and most of Illinois, Indiana, Michigan, and Wisconsin. According to estimates from a September 2023 report by the U.S. Environmental Protection Agency (EPA), Illinois and Wisconsin rank among the top ten states with the most lead pipes, Michigan and Indiana among the top 15, and Iowa among the top 25 (see the report's exhibit 2.8).



During a trip to Wisconsin, President Austan Goolsbee visited with Green Bay Water to learn about the city's completed lead service line replacements. (Chicago Fed staff photo/Ping Homeric)

The Joyce Foundation and the Federal Reserve Bank of Chicago jointly convened 25 regional and national leaders in lead service line replacement (LSLR) in January 2024 to identify key information and research needs that, if met, could help communities overcome economic and financial challenges to implementing LSLR projects. The individuals gathered were experts in municipal water system management, public finance, and private capital.

Two primary issues permeated the discussion at the convening:

- The unique complexity of LSLR stemming from the split ownership of LSLs (typically between the public water system and the private residential property owner)
- How to address common equity issues when developing LSLR strategies for a community

The discussion also highlighted the need for a low-cost way to learn and share both quantitative and qualitative information on LSLR, possibly through an LSLR playbook. In addition, participants arrived at a broad consensus about the need for more information and research on three key LSLR topics:

1. LSLR cost drivers
2. Financing needs and the cost of different financing sources
3. Funding and financing from Drinking Water State Revolving Funds (SRFs)

The convening was held under the Chatham House Rule, meaning that participants are free to identify themselves and use information shared during the meeting but were asked to refrain from attributing any specific comments to other individuals or organizations. In what follows, we include links to articles by some of the participants, which offer additional perspective on topics discussed during the convening. The opinions expressed in these linked articles are those of the author(s) and do not necessarily reflect the views of the Joyce Foundation, the Federal Reserve Bank of Chicago, or the Federal Reserve System. Consistent with the Chatham House Rule, the authors of these articles do not attribute any remarks at the convening to any other participants or organizations. A full list of participants is available in a [companion *Chicago Fed Insights* article](#).

In this article, we first give some more background on the LSLR policy environment. Then, we describe what we heard from the experts who attended the convening by delving into the two primary issues that permeated the discussion. Next, we go over the types of quantitative and qualitative information that participants agreed would be useful for communities embarking on LSLR projects, plus the value of a playbook as one low-cost way to learn and share such information. After this, we discuss the three key LSLR information and research needs that the participants identified and reached a consensus on. By summarizing the convening like this, we aim to help people in the research, policy, and funder circles shape their own future work.

Further background

This is a key moment to identify LSLR information gaps and research needs, given that new federal funding and recent and proposed changes to federal and state laws encourage and, in some cases, require water systems to accelerate LSLR.

Recent changes in federal laws include an [October 16, 2024, deadline](#) for water systems to prepare and maintain a service line inventory and notify households served by a known or potential LSL. On November 30, 2023, the [EPA proposed lead and copper rule improvements](#) (LCRI), which, if finalized, would require most water systems to replace all LSLs within ten years. At the state level, [Michigan and Illinois have recently mandated](#) the replacement of all LSLs. So, in the current policy environment, most communities will have to quickly develop plans to finance and implement a major infrastructure project that involves significant levels of coordination among public and private partners.

Congress has provided SRFs with [\\$15 billion in dedicated funding for LSLR](#)—which the SRFs distribute to water systems on a competitive basis through grants and low-interest loans. Many communities face challenges to access these funds. Further, this federal money is only an initial down payment; most communities will have to pay for much of the LSLR cost themselves.

To help communities tackle the problem of LSLR, Chicago Fed staff started the [Lead Service Line Replacement project](#) in 2022. This initiative has leveraged the Chicago Fed staff's expertise in public policy, finance, and community economic development under the Federal Reserve's broader mission to foster a strong and inclusive economy and promote an efficient financial system. Over the coming months we plan to conduct original research that addresses some of the information gaps identified during this convening—including analyses on the financing that communities in our District need to execute LSLR projects.

Understanding the unique complexity and equity considerations of LSLR

Participants at the convening described LSLR as a major infrastructure project with unique complexities that presents a common set of equity issues. They also observed that LSLR requires expertise in public and private financing, workforce development, community outreach, and project management and implementation.

Unique complexity of LSLR stems from the split ownership of LSLs

The ownership of lead service lines is nearly universally split between public and private parties: The public water utility owns the pipe section connected to the water main, and the private residential property owner (e.g., the homeowner or landlord) owns the pipe section that connects this public section to the home. This public–private split in the ownership of LSLs presents complexities for a major infrastructure project. Because replacing only one side (public or private) can temporarily increase lead exposure risk—either from damage to the remaining side during construction or from a corrosive reaction when a new copper pipe is combined with an old lead pipe—both sides should be replaced at the same time, according to the [EPA Science Advisory Board’s evaluation of partial replacements of LSLs](#).

The complexities stemming from split ownership are as follows:

- Private-side LSLR requires the consent of the property owner, which can require intensive and targeted engagement with the community and property owners. This engagement differs from the outreach that water and utility systems typically conduct for infrastructure projects.

Participant Caroline Pakenham, director of water programs at Elevate, provides perspective on this point in her article titled “[Getting to yes: How effective engagement with residents can ease lead service line replacement challenges](#).”

- Private-side LSLR creates challenges unfamiliar to many water and utility systems because it can involve the use of public money (including water rate revenue) to pay for the replacement of private property. Water systems sometimes state that legal and accounting rules prevent them from using public money for this purpose.
- Private-side LSLR can create complexities with the contracting process when water systems do not allow public employees to replace private property. In these cases, water and utility systems may need to coordinate with private contractors to replace private-side LSLs.
- Many communities lack reliable and comprehensive information about the number and location of LSLs, and it can be expensive and time-intensive to verify locations and complete an inventory.
- Effective project design and ongoing communication with many individual residents during and after LSLR are necessary to minimize significant public health risks.
- Replacing LSLs at scale is new for many communities, so they are unfamiliar with best practices, typical cost ranges, and common contract provisions, as well as how these may vary depending on local conditions.

LSLR presents a common set of equity issues

When developing LSLR strategies, communities seeking an equitable implementation of LSLR need to think about how the set of common equity issues presented in the bulleted points of this subsection may impact their population.

- Black, Latino, and low- and moderate-income (LMI) households appear to be disproportionately exposed to the risks of LSLs because these populations tend to live in older housing where LSLs are more common.
- The public health and economic impacts of an LSLR project may differ by race, ethnicity, income, and age.
- The relative economic burden of LSLR costs on some households, particularly on LMI households, may be higher.
- Using the significant financial investment involved with LSLR projects to create economic co-benefits for residents—for instance, by advancing workforce development goals or by driving work to minority and underrepresented business owners—may be difficult.
- Getting consent through outreach to replace private-side LSLs, especially in rental buildings and in minority and low-income communities, may be difficult.

The risk of lead exposure in rental buildings is borne primarily by tenants, while it is the landlord who can consent to LSLR. Reaching landlords can be challenging and getting consent for LSLR is even more so when communities require that landlords pay for the private-side replacement. Further, landlords may increase rents to cover LSLR costs, which can reduce

affordability for tenants.

Participant Tom Neltner, executive director of Unleaded Kids, shares his perspective on reaching landlords and renters in an article titled “[Engaging landlords and tenants in LSL replacement](#),” cowritten with Lindsay McCormick and Roya Alkafaji, both of the Environmental Defense Fund.

- Some communities must overcome significant levels of distrust rooted in historical and systemic discrimination, as well as experiences with a lack of transparency and communication from public officials.
- Residents with low incomes are less likely to have the time and resources to participate in public outreach activities, so they may not receive the information they need to make an educated decision about LSLR.

To build trust and encourage take-up of LSLR, public leaders and officials within a community must tailor outreach strategies and messaging to directly address the needs of specific neighborhoods or demographic groups that have not always been well served by traditional utility outreach efforts. Additionally, these leaders and officials must consider the fact that many households have limited financial resources to pay for private-side replacement or to afford increases in water rates.

Participant Christine Spitzley, a principal of OHM Advisors, shares her perspective on community outreach in her article titled “[Stories from Michigan: Lead service line lessons in collaboration, communication and community](#).”

Later on in this article, as we go over the three main LSLR topics for which more information and research are needed, we point out specific equity considerations relevant for each topic.

A low-cost way to learn and share three types of information on LSLR

While LSLR requires a lot of upfront decisions with long-term implications, a brittle information-sharing infrastructure impedes access to timely resources, which could potentially inform those decisions. As a result, many communities start their LSLR efforts without a clear blueprint and then must manage many surprises as they implement LSLR. In this section, we go over the quantitative and qualitative information that participants at the convening agreed would be helpful to communities beginning LSLR projects and how a playbook is one way for them to learn and share this information.

Three broad types of information

As noted by participants at the convening, the three broad types of information and resources that would be useful to communities starting LSLR work—and even those with more experience—are as follows:

- Straightforward numerical and accounting data on LSLR efforts, covering topics such as the average costs of LSLR, the number of pipes replaced in a year, which and how many communities have completed or have active LSLR efforts, and the water rates utilities charge before and after LSLR
- Data analyses that communities and policymakers can use to help them answer questions such as whether a more robust outreach program is expected to save more money than it costs, what are the key drivers of differences in average LSLR costs across communities, how to compare the costs of different public and private financing sources, what economic burdens do different sources of funding and financing impose on LMI residents, and whether the awarding of funding and financing by a state’s SRF helped advance LSLR in disadvantaged communities
- Qualitative information, including materials and case studies that communities can use to learn about topics such as the equitable replacement of LSLs; important contractual terms to negotiate with engineering firms; how legal, accounting, and tax rules can affect LSLR financing; and outreach programs created by water systems to advance LSLR—along with lists of primary noncapital (“soft”) costs for LSLR, such as the costs for outreach, research, and permitting

Participants shared how they discover these types of information. Their information-finding strategies included searching the internet for resources (e.g., research, data analyses, case studies, and manuals), seeking out peer mentoring from experienced communities, requesting technical assistance from state agency staff or the [EPA’s Environmental Finance Centers](#), and securing advice from consultants and engineering firms.

Websites and other resources noted during the convening are provided in the [companion Chicago Fed Insights article](#).

A playbook as a low-cost way to navigate LSLR challenges

Gathering information and putting it in a digestible form like a playbook would help communities navigate the unique complexities and equity considerations involved in LSLR. At the convening, the participants expressed that a playbook would especially benefit small- and medium-sized communities and low-income communities that need guidance and resources to start LSLR, including how to design pilot programs to help estimate project costs and craft long-term strategies.

Participant Cathy Bailey, executive director of Greater Cincinnati Water Works, provides perspective on the need for a community LSLR playbook in her article titled [“The case for a lead service line replacement playbook—and some key plays.”](#)

Any playbook should include guidance on the following questions to help communities navigate LSLR:

- What are the best practices for community outreach and education?
- Can partnerships with community-based organizations improve outreach effectiveness and reduce costs?
- How can utilities combine LSLR financing and water affordability programs to ensure water services remain affordable to all residents?
- What are examples of plans that improve equitable implementation of LSLR programs?
- What are best practices for replacing LSLs connected to rental buildings?
- What are best practices for using LSLR to create economic co-benefits for residents (e.g., resident participation in the workforce)?

The three key LSLR topics

In this section, we review the three key topics for which more research and information are needed, according to a broad consensus among the LSLR experts who convened in January 2024.

Key topic no. 1: LSLR cost drivers

Information on LSLR cost drivers would help communities estimate total project costs. Communities need concrete examples of decisions they will have to make at each stage of the LSLR project, along with the data to quantify how these decisions affect short-run and longer-run expected costs.

It would be valuable to know how factors such as community population, local ordinances requiring LSLR, and urban versus rural location affect LSLR cost drivers. Understanding how these and related factors affect LSLR cost drivers can help communities make decisions about how to plan for and implement their LSLR projects. Examples of decisions that can affect costs are as follows:

- **Deciding to use a block-by-block LSLR approach:** Coordinating work and permitting to replace all LSLs on a single block, one block at a time and one neighborhood at a time, is less expensive and quicker than hopscotching across different blocks in a community. However, getting an entire block or neighborhood of property owners to consent to LSLR at the same time often requires extensive person-to-person outreach that can slow down overall replacement and increase short-run costs.
- **Deciding on a prioritization approach for LSLR:** Developing prioritization plans can help communities conduct LSLR efficiently. Communities may consider prioritization factors such as targeting where LSLs are most concentrated and where household incomes are lowest. Information and data can help decision-makers understand how their prioritization decisions affect costs and the timeline for overall replacement.
- **Deciding on who pays for the costs of replacing private-side LSLs:** If public utilities find ways to pay for private-side LSLR, they can increase take-up rates. In LSLR projects that required private residential property owners to pay for some or all private-side replacement costs, take-up was greater and happened first in communities with higher-income residents. It would be valuable to have an analysis of the cost differential when a utility or municipality pays for private-side replacement versus when property owners pay the cost.

- **Deciding on regional LSLR strategies:** Small communities could regionalize LSLR by financing it jointly, applying for federal and state funding jointly, or hiring consultants and workforce jointly. However, there are few, if any, concrete examples of how much money and time communities might save by cooperating to regionalize LSLR.

Participant Shawn Kerachsky, CEO and president of Community Infrastructure Partners, provides perspective on regional partnerships and other strategies for communities to reduce costs in his article titled “Maximizing the impact of Bipartisan Infrastructure Law funding: Operating principles for establishing an efficient and effective lead service line replacement program.”

Equity considerations related to decision-making surrounding LSLR include the following:

- Low-income communities are more likely to have immediate infrastructure needs that may take priority over LSLR.
- Small and low-income communities are less likely to have staff capacity to access information about best practice LSLR programs or the time to design and develop their own.
- Small communities may be at a competitive disadvantage in retaining high-quality contractors for LSLR projects.

Key topic no. 2: Financing needs and the cost of different financing sources

It is expected that most communities will end up paying for the majority of LSLR costs themselves, likely using financing to pay LSLR costs over time. Communities looking to finance LSLR costs will have access to several different financing sources through federal and state agencies as well as the private market. Communities would benefit from a financial analysis that shows the estimated need for financing and compares different financing sources. Any such analysis should be tailored to different community types because differences in population, ability to pay, existing debt, and credit rating may create different financing needs and costs.

Participant Justin Williams, senior manager at Metropolitan Planning Council, provides his perspective on the need for holistic analysis of financing options in his article titled “An ecosystem approach to LSLR affordability.”

Financing sources: Analysis of the following financing sources would be helpful: municipal bonds (such as revenue bonds and general obligation bonds), low-interest Water Infrastructure Finance and Innovation Act (WIFIA) loans from the EPA, and SRF loans. The analysis should include discussions of 1) the expected cost of capital, 2) expected costs of compliance with any covenants, 3) expected sources of repayment, length of repayment, and the distribution of the repayment burden on households, and 4) explanations of why these differ across the options.

Participant Rebecca Morley, a consultant to the Robert Wood Johnson Foundation, and her colleagues Pamela Russo, Kimberlee Cornett, and Radhika Fox provide more perspective on this issue in their article titled “Reimagining water infrastructure for justice and health equity.”

Repayment sources: There is a need for analyses of funding sources to repay loans that go beyond traditional water rate increases. Alternative revenue sources for this purpose include wholesale water sales and municipal tax revenues (e.g., property taxes). There is also a need for analyses of how LSLR has affected water rates and housing and rental affordability in communities that have used revenue bonds to finance LSLR (e.g., Newark and Denver).

Equity considerations related to financing sources include the following:

- Low-income communities are more likely to have existing municipal debt that limits financing options.
- Small and low-income communities have less capacity to take on debt or increase water rates or other revenue sources to cover LSLR costs.
- Small and low-income communities are less likely to have staff capacity to apply for grants, develop applications for SRF or WIFIA loans, or evaluate the pros and cons of different financing options.

Key topic no. 3: Funding and financing from Drinking Water State Revolving Funds

Information on SRFs should be shared with two goals. The first goal is to make the application process more accessible to communities with fewer staff and to reduce the uncertainty that communities face regarding SRF funding terms. The second goal is to provide policymakers with data that better allow for evaluations of SRF policies.

Applying to SRFs: To make the SRF application process more accessible, SRFs should share information that helps water systems navigate the application process efficiently and clarifies financing terms. The following would aid the application process:

- Application guidebooks that outline the SRF application process: Applying for SRF financing is a time- and resource-intensive process. Small water systems are not certain whether applying for SRF financing is worth the effort.
- Examples of leveraging SRF financing for LSLR projects: Some communities are hesitant to take on debt through an SRF or to use this debt to pay for private-side replacement. More examples of communities using SRF financing for LSLR, especially communities of different population sizes, would be helpful.
- Clarity on whether state SRF programs pay out on an invoice or reimbursement basis: For many small and low-income communities, it would be untenable to receive SRF funding or financing that can only be accessed to reimburse expenses rather than pay invoices.
- Clarity on whether and how small systems can submit applications jointly: Small systems want to pool resources together to apply for SRF financing to benefit from cost efficiencies.

Evaluating SRFs: To improve SRF policy evaluation, SRFs can share the following information to help promote analysis of SRF program design and criteria:

- Broader and more accessible data on awards, including the financial and other contractual terms and the borrower's identity, in a format suitable for data analysis
- Data on unsuccessful applications in a format suitable for data analysis

An equity consideration relevant to SRFs is as follows:

- Small and low-income communities are less likely to have the staff capacity to take on the costs of planning and project development required to apply for and submit an SRF application.

Conclusion

Participants at the convening identified key information and research needs that people in the economic and water sector research circles can pursue to support communities' LSLR efforts. The participants who joined the convening made the case for specific, accessible, and actionable information to allow municipal and utility leaders to develop LSLR programs that work for their communities. The Joyce Foundation and the Federal Reserve Bank of Chicago are grateful for their input. We look forward to exploring how we might support this effort further in the months and years ahead.

Details for Nathan Anderson, Maria Castro, Karen Cuenca, and Suchi Saxena are available on their Chicago Fed online profiles (accessed by clicking their names in the byline). Elizabeth Cisar is the director of the Environment Program at The Joyce Foundation.

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