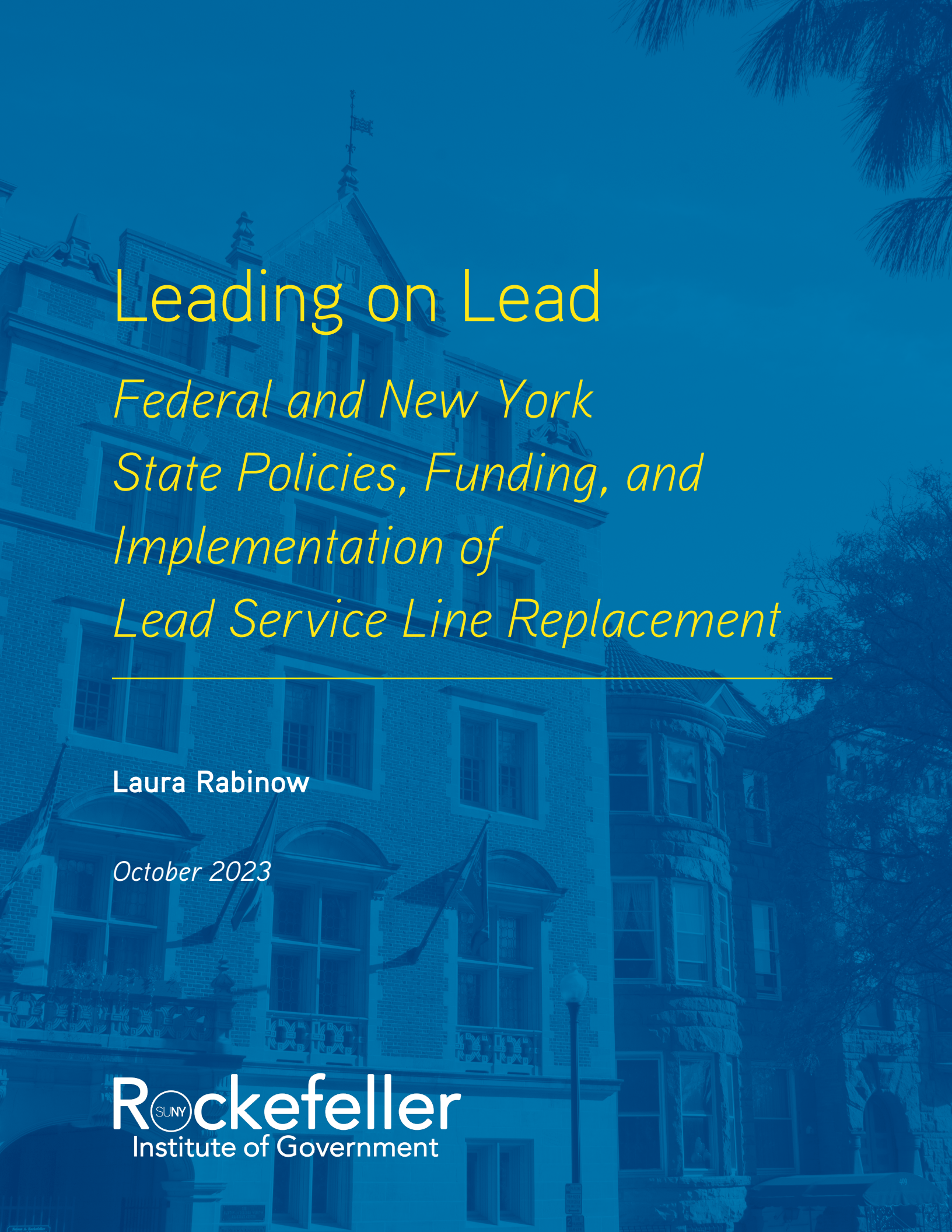


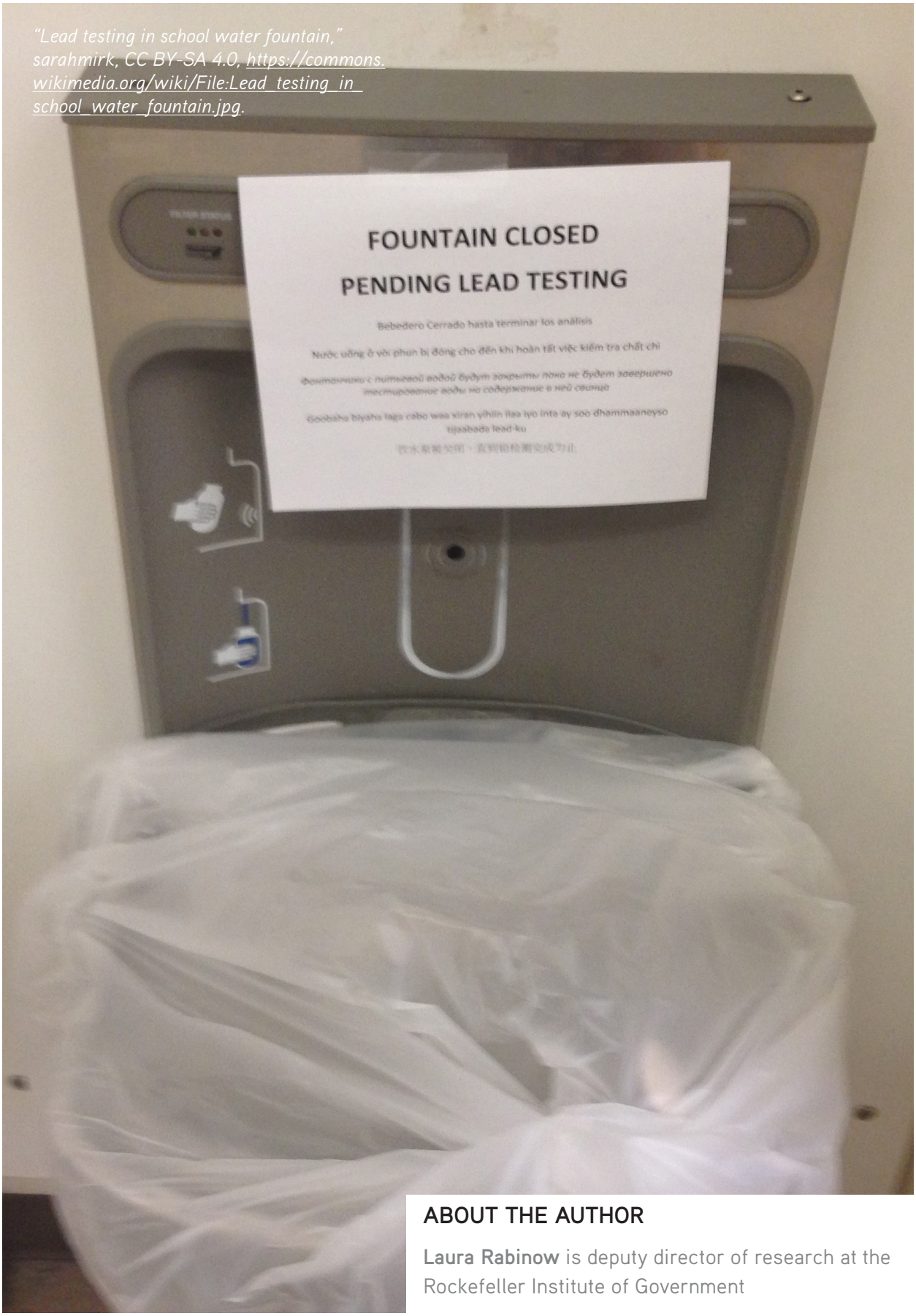
# Leading on Lead

## *Federal and New York State Policies, Funding, and Implementation of Lead Service Line Replacement*

**Laura Rabinow**

*October 2023*

Rockefeller SUNY Institute of Government




*"Lead testing in school water fountain," sarahmirk, CC BY-SA 4.0, https://commons.wikimedia.org/wiki/File:Lead_testing_in_school_water_fountain.jpg.*

## ABOUT THE AUTHOR

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# Leading on Lead

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## Introduction

Service lines—pipes that connect homes and buildings to municipal water systems—made of lead are known to be a common source of exposure when they corrode and lead enters the drinking water supply.[1] The harms of lead exposure, particularly for children, have been well-documented for many decades, including at very low levels. So much so, that the federal health-based goal for lead in drinking water is 0 µg/dL—none. Yet, an estimated 9.2 million lead service lines (LSLs) remain in use in communities across the United States, including nearly 500,000 in New York State.[2] Recent news coverage and reports by environmental advocates have addressed the potentially significant number of remaining LSLs in New York City,[3] as well as multiple cases of municipalities in upstate New York where children have had elevated levels of lead in their blood connected to exposures from LSLs.[4, 5]

Addressing the potential impacts of LSLs and attempting to replace them is a challenge on multiple fronts. For starters, although experts have generated estimates for how many LSLs remain in use, details of the homes and buildings they are connected to—including those that house, educate, or care for young children—are unknown. The location and material of many service lines were not initially recorded when installed or were recorded on older localized systems (including paper ones) that have not been updated and centralized. Until recently, the inventory of service lines and their materials has not been required by most states or the federal government. In addition, as will be discussed below, there have been legal questions raised by municipalities in New York about the use of certain types of public funding for LSL replacements, due to a state constitutional provision that restricts the use of public resources for private benefit.

Over the last few years, however, there have been a number of federal policy changes and proposals related to lead service lines. In 2021, the Biden-Harris administration initiated the "Get the Lead Out Partnership" with localities and states, in which the EPA committed to advancing "non-regulatory actions to support the replacement of 100 percent of lead pipes" with the goal of doing so in the next decade.[6] The federal government has also allocated funding towards that end.[7] In particular, the Infrastructure Investment and Jobs Act of 2021 (IIJA) allocated $15 billion in direct funding for lead service line replacement.[8, 9] The state of New York anticipates roughly $115 million annually over five years from this funding for the inventory and replacement of lead service lines.[10] In addition, in 2021 the Environmental Protection Agency (EPA) published revisions to the 1991 Lead and Copper Rule and subsequently published guidance in 2022 that directed water systems to create lead service line material inventories and directed them to complete those inventories by October 16, 2024—by which time further regulatory actions are anticipated.[11]

An estimated 9.2 million lead service lines (LSLs) remain in use in communities across the United States, including nearly 500,000 in New York State.

As local water systems in New York and across the country move towards the inventory deadline and await the further federal regulatory action in 2024 and as the first rounds of federal IIJA funding are being spent,[12] this policy brief will examine the broader policy history, funding, and challenges to realizing the potential replacement of all lead service lines. In doing so, it will discuss the history of lead service lines, what we know about lead exposure and its impacts, and the longer development of public policies and funding to address associated water contamination, while considering how other states and localities have structured their policy responses to the challenges of identifying and replacing LSLs. It also outlines existing efforts, programs, policies, and funding available in New York State for water systems and localities, and highlights further research and policy recommendations.

## Background

The history of lead in water infrastructure dates back so far that the etymology of "plumbing" is derived from the Latin word for lead, plumbum, from which the symbol for lead on the periodic table (Pb) is also derived.[13] In the United States service lines, which connect individual homes and buildings to municipal water systems, were commonly made of lead beginning in the mid-late 19th century. A list from 1900 of the primary materials used for service lines in the country's largest cities reflects the widespread and dominant use of lead pipes at that time. This list included several larger cities in New York State, all of which had lead service lines (LSLs)—Albany, Buffalo, New York City, Rochester, and Syracuse.[14] But, by the 1920s, many localities were beginning to restrict or prohibit their use.[15]

Although the broader regulation of lead and lead in drinking water has only occurred since the 1970s in the US, concerns about the impacts of lead exposure have existed for hundreds of years, and concerns related to exposures from LSLs have been documented dating back to the mid-1800s.[16] Reflecting on this long gap between concern and action, renowned medical researcher Dr. Herbert Needleman[17] began his seminal 1991 book *Human Lead Exposure* by quoting a 1786 letter[18] from Benjamin Franklin:

> This, my dear friend, is all I can at present recollect on the subject. You will see by it, that the opinion of this mischievous effect from lead, is at least above sixty years old; and you will observe with Concern how long a useful Truth may be known, and exist, before it is generally receiv'd and practis'd on.[19]

Lead service lines are a common source of exposure to lead in drinking water. Exposure occurs when the lines corrode and lead enters the drinking water supply for a building.[20] Because lead isn't seen, tasted, or smelled in water, its presence is typically only detected through examination of the plumbing for lead or testing the water. The characteristics of the water (its acidity/alkalinity, mineral content, temperature, and any treatment or lack thereof), the lead pipe (its degree of wear, protective coatings), and their interaction (how long the water stays in the lead pipe, how much lead the water is in contact with) can all effect whether or not and how much lead gets into a drinking water supply.[21]

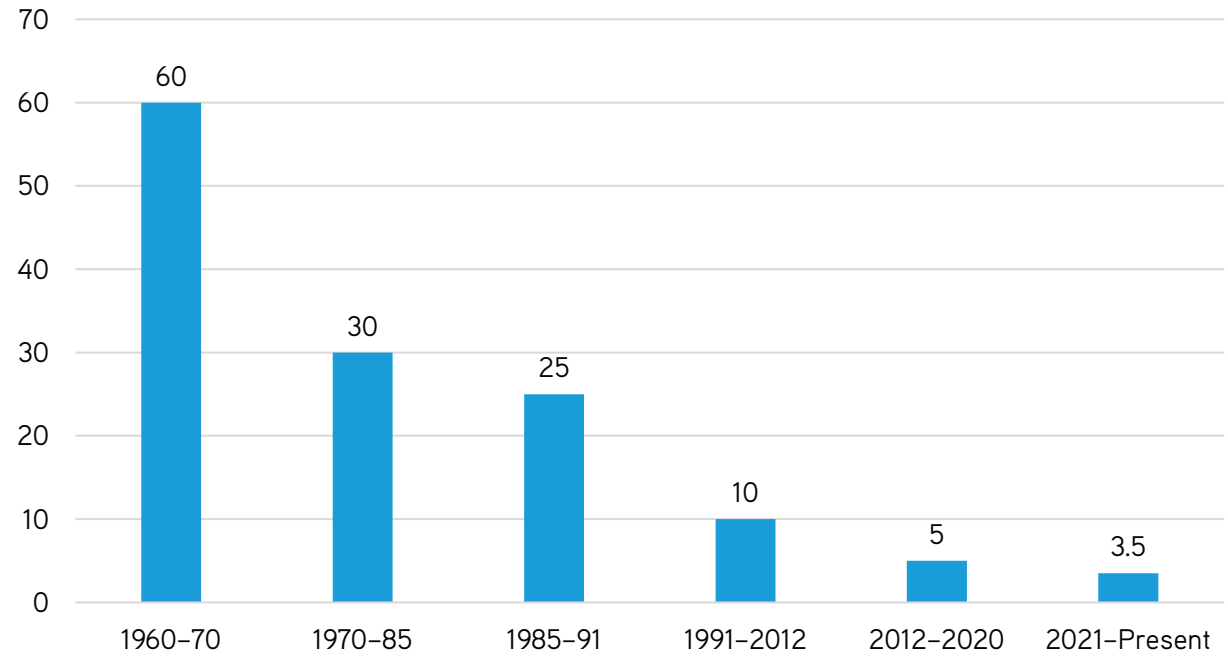
The most prominent recent case of lead contamination is the drinking water crisis in Flint, Michigan, that came to light in 2014. The contamination most directly stemmed from the decision of officials to switch the water supply to a source that wasn't properly treated. This lack of proper water treatment resulted in harmful contaminants entering the water supply, which negatively interacted with the city's existing infrastructure.[22] These contaminants lead to the corrosion of thousands of LSLs in the city, high lead levels in drinking water, and a spike in childhood blood lead levels.[23]

## Health Impacts and Childhood Exposures

The US Centers for Disease Control and Prevention (CDC) has affirmed that childhood exposures from lead service lines can and should be prevented. There is a wealth of research on the detrimental impacts of lead exposure, particularly on young children. The impacts of childhood lead exposure include: damage to the brain and nervous system, slowed growth and development, learning and behavioral issues, as well as hearing and speech issues.[24, 25, 26, 27, 28, 29, 30] For both children and adults, very high levels of lead exposure can even be fatal. Lead exposure in children is made all the more worrisome with respect to LSLs, as the New York State Department of Health (DOH) has cited, because "infants who consume mostly mixed formula can receive 40 percent to 60 percent of their total exposure to lead from drinking water."[31] For adults, drinking water is generally considered to be 20 percent of their potential exposure.[32] Nonetheless, adult exposures to lead at nonfatal doses are also associated with harmful health impacts, including high blood pressure, headaches, joint and muscle pain, and reproductive health issues such as low sperm count and miscarriage.[33, 34]

Testing for blood lead levels in children has been more broadly conducted since the 1970s.[35] In 1970, screening was only recommended for those children living in or visiting homes built prior to World War II, which were more likely to have lead paint, and therein dust, as well as LSLs. By 1991, it was strongly recommended for nearly all children under six years old, including at least one test for children under two years old. As a result of a nationwide class action lawsuit in 1993, the Centers for Medicare and Medicaid Services (CMS) adopted these screening requirements and later required all Medicaid-enrolled children be tested at one and two years old. At that time, New York State also began requiring by law that all children be screened for lead poisoning at one and two years old and be assessed for the need for screening between ages six months to six years.[36, 37, 38]

*FIGURE 1.* **What's Considered Elevated for Blood Lead Levels in Children and Adults Over Time**




*NOTE:* In 1971, a US Surgeon General's report defined 40 µg/dL as suggestive of "undue absorption of lead, either past or present" and 80 µg/dL or higher (as confirmed on two successive tests) as "lead poisoning."

*SOURCE:* "What Are U.S. Standards for Lead Levels?" Centers for Disease Control and Prevention, updated May 24, 2023, https://www.atsdr.cdc.gov/csem/leadtoxicity/safety_standards.html.

Although lead service lines are a known and not uncommon route of lead exposure, it is important to note that they are not the only or even most frequently cited route of exposure for children with elevated blood lead levels—generally breathing in dust from or the ingestion of lead paint is, along with contaminated soil.[39] Thus, data on blood lead levels reflects exposures that include, but are not solely due to, lead service lines or drinking water-related exposures.

Thresholds for blood lead levels (BLLs), and the terms to identify them, have changed several times since the 1970s. According to the CDC, "as parameters that are more sensitive are developed, BLLs previously thought to be 'safe' have been demonstrated

to cause adverse health outcomes," including hypertension, neurological, and reproductive effects.[40] Prior to the 1970s, lead levels associated with adverse health impacts were clinically defined as 60 µg/dL(micrograms per deciliter) or higher. In 1971, a US Surgeon General's report defined 40 µg/dL as suggestive of "undue absorption of lead, either past or present" and 80 µg/dL or higher (as confirmed on two successive tests) as "lead poisoning."[41] In 1975, CDC defined lead poisoning in children as 30 µg/dL or more.[42] In 1978, the same year lead paint was banned, the term "elevated blood lead levels" was introduced to describe levels at or above a defined value. The term lead poisoning was also at times used interchangeably by the CDC with lead toxicity. In 1985, the CDC guidelines used both these terms to refer to BLLs at or above 25 µg/dL.[43] And, in 1991, the CDC identified the blood lead "level of concern" in children as 10 µg/dL or higher.

In 2012, the CDC replaced "level of concern" with blood lead "reference value"[44] (BLRV) or the 97.5th percentile of blood lead distribution for children under six years old (derived from the National Health and Nutrition Examination Survey or NHANES). Based on the most recent data at that time, the reference value for children was then revised down to 5 µg/dL.[45, 46] New York State adopted that lower screening level in 2019.

More recently, in 2021, based on newer data, the CDC updated the BLRV again to 3.5 µg/dL. According to a January 2023 announcement by the Biden-Harris administration, "over the past year, 21 states have changed their laws or policies to provide case management or other services to children with blood lead levels higher than the updated BLRV of 3.5 micrograms per deciliter."[47] New York State's Department of Health has not adopted this lower level in its guidance or as of yet announced its intention to do so,[48] though the New York City Department of Health has adopted it.[49, 50]

## Ongoing Challenges and Disparities

Following significant public health policy changes beginning in the 1970s (see Appendix) blood lead levels in children under six years old decreased significantly. According to the EPA and based on data from the National Center for Health Statistics' National Health and Nutrition Examination Surveys (NHANES), "the median concentration of lead in the blood of children between the ages of 1 and 5 years dropped from 15 µg/dL in 1976–1980 to 0.6 µg/dL in 2017–2018, a decrease of 96%."[51] Despite these significant gains, early childhood lead exposure still persists. In 2018, the most recent year available for CDC data,[52] of the 17.6 percent of the population under six years old tested, 2.6 percent or 86,371 children had blood lead level results of 5 µg/dL or greater.[53] As noted above, the CDC more recently lowered the reference value level from 5 to 3.5 µg/dL, and estimates that "approximately 500,000 U.S. children between ages one and five have blood lead levels at or above this new reference value."[54]

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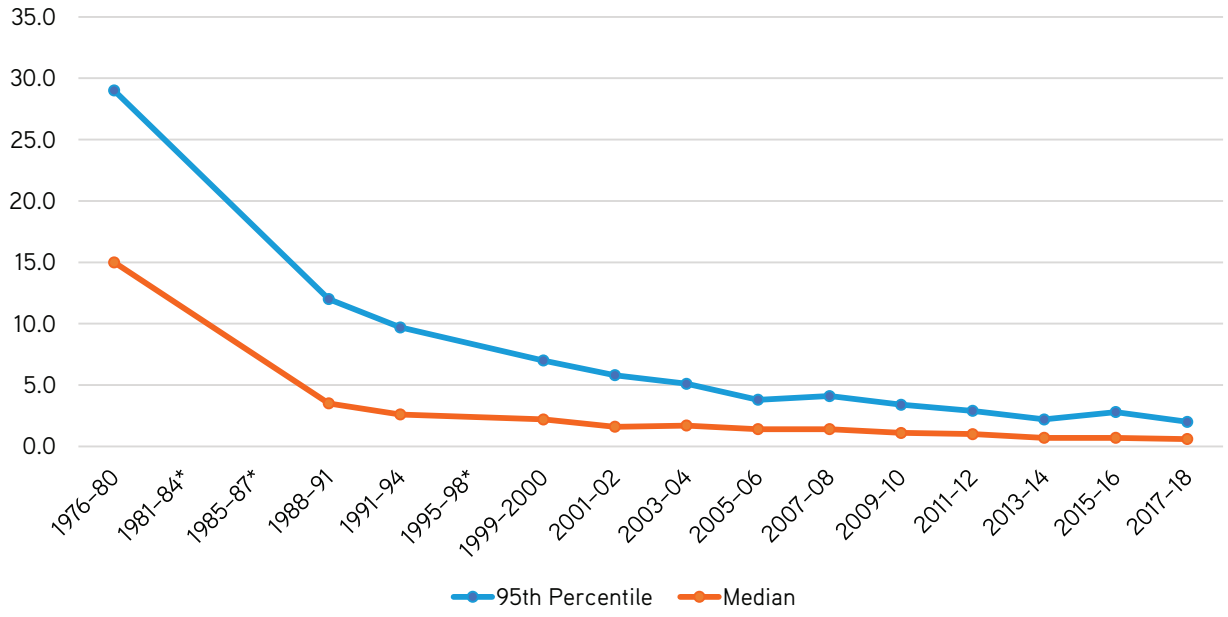
*FIGURE 2.* **Blood Lead Levels of Children in th US, 1976–2018**




*SOURCE:* "Biomonitoring – Lead," US Environmental Protection Agency, updated June 15, 2023, https://www.epa.gov/americaschildrenenvironment/biomonitoring-lead.

Younger children tend to be disproportionately impacted by lead exposure and have higher blood lead levels. While 16- and 17-year-olds that were tested in 2017–18 had a 95th percentile level of 1.3 µg/dL, one- and two-year-olds had levels of 2.8 and 2.5 µg/dL respectively.[55] In New York State, 9,717 or 4.7 percent of the children under six years old that were tested in 2018 had levels equal to or above 5 µg/dL in counties outside of New York City.[56] The children tested in those counties represented 15.2 percent of children in that age range. Data specific to New York City reflects that the same year, 4,060 children under six years old had levels over 5 µg/dL, representing 1.4 percent of those tested.[57, 58] Overall, the number of children that tested above 5 µg/dL represent approximately 2.78 percent of those children under six years old tested across New York State in 2018, somewhat higher than the national rate of 2.6 percent. Without knowing more about how representative those tested versus those not tested in that age group are, or how many children tested had levels between the new reference value of 3.5 µg/dL and the measured 5 µg/dL, it is difficult to determine what the estimated total number of children with elevated blood lead levels may be for the entire state, though further work by public health experts could attempt to address that question.

Overall, the number of children that tested above 5 µg/dL represent approximately 2.78 percent of those children under 6 years old tested across New York State in 2018, somewhat higher than the national rate of 2.6 percent.

Elevated blood levels in children are not only a public health concern but an environmental and social justice issue, as they are distributed unevenly across race, ethnicity, and income. Black children and children of low-income families have higher median blood lead levels. While the median BLL across race, ethnicity, and income for children aged one to five years old was 0.7 µg/dL between 2015–18, the median BLL for low-income children across race or ethnicity is 0.8 ug/L. For Black children aged one to five years old of all incomes, the median is 0.8 µg/dL and for Black children of low-income families it is 1.0 ug/L.[59]

*TABLE 1.* **Lead In Children Ages 1 to 17 Years: Blood Lead Concentration by Age Group, 2017–18**

*(Blood lead concentration (µg/dL)*

| Percentile | All Ages | Age 1 Year | Age 2 Years | Ages 3 to 5 Years | Ages 6 to 10 Years | Ages 11 to 15 Years | Ages 16 to 17 Years |
|---|---|---|---|---|---|---|---|
| Median | 0.5 | 0.7 | 0.8 | 0.6 | 0.5 | 0.4 | 0.4 |
| 95th Percentile | 1.4 | 2.8 | 2.5 | 1.7 | 1.2 | 1.1 | 1.3 |

*SOURCE:* "Data Tables – Biomonitoring – Lead," US Environmental Protection Agency, updated May 4, 2023, https://www.epa.gov/americaschildrenenvironment/data-tables-biomonitoring-lead.

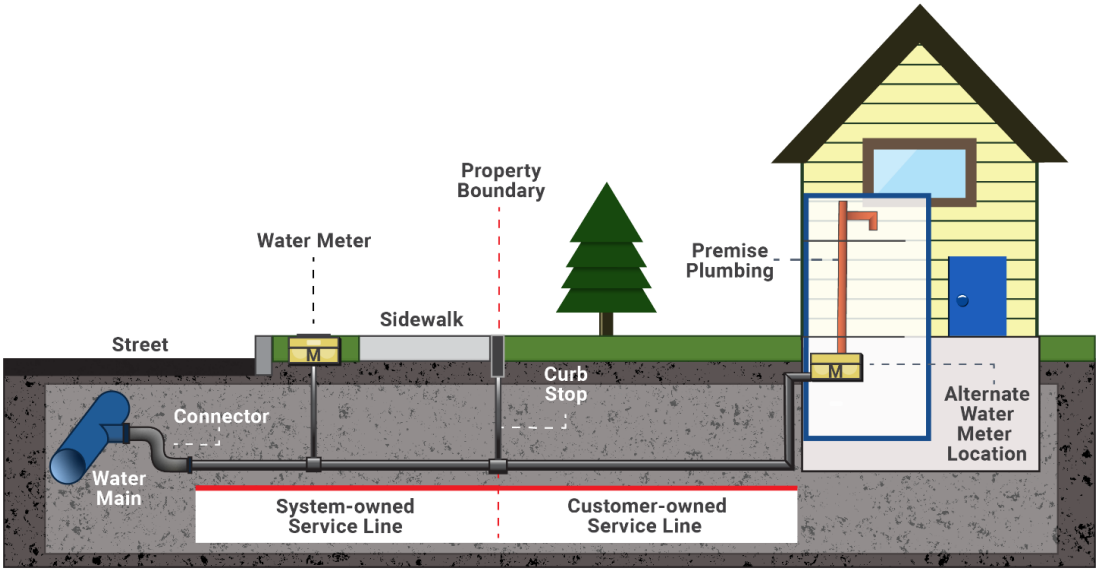
In New York State, and elsewhere, childhood lead exposure is not only experienced unevenly across race, ethnicity, and income, but at the intersection of geography.[60]

County level data from 2017 (the most recent year is available through the CDC) of childhood blood lead levels in the state reflect significant differences in terms of the number and percent of children impacted across the state. For counties outside of New York City, the percent of children tested with BLLs of 5 µg/dL or greater ranged from 0.5 percent in Clinton County (which tested 26.5 percent of the population in that age group) to 13.4 percent in Fulton County (which tested 29.1 percent of the population in that age group). Erie County, which has the largest population of children under six years old outside of New York City, had 1,130 children of that age with BLLs of 5 µg/dL or greater, 5.6 percent of those tested—this number reflects the outcomes of testing for 33 percent of the county's population of that age group.[61]

## Partially Replacing LSLs

As research has further considered the relationship between lead service lines and exposures, it has demonstrated links between partial replacements—that only replace the system-owned portion of the service line that is owned and maintained by the municipal water system and not the customer-owned portion—and continued or increased incidence of high blood lead levels in children. Partial replacements disturb the lead in the service line and can increase opportunities for it to enter drinking water. And when partial replacements of LSLs are done with other metals, they may result in galvanic corrosion, caused by the contact of different metals, that increases the amount of lead that enters drinking water from the service line.[62]

*FIGURE 3.* **Diagram of Lead Service Line Ownership**




*SOURCE: Guidance for Developing and Maintaining a Service Line Inventory* (Washington, DC: Office of Water, US Environmental Protection Agency, August 2022), https://www.epa.gov/system/files/documents/2022-08/Inventory%20Guidance_August%202022_508%20compliant.pdf.

While there was early evidence of this, in 2011 the EPA's Science Advisory Board concluded that although "the available information is broadly suggestive that PLSLR [partial lead service line replacement] may pose a risk to the population" there was a "lack of data available to fully evaluate the effectiveness."[63] It is important to note that partial replacements with metals, including copper, may result in increased risks of lead exposure. Environmental advocates in New York and researchers have highlighted that full replacement of copper pipes, or more specifically recycled copper pipes, is preferable in order to avoid regrettable substitutions with plastic pipes such as those made of polyvinyl chloride (PVC) or high-density polyethylene (HDPE).[64] A recent report issued by environmental health advocates in New York highlighted concerns with respect to the potential upstream and downstream impacts of using PVC and chlorinated PVC (CPVC) replacement pipes, and the lack of independent testing or standards for these pipe materials, particularly with respect to chemical components leaching into drinking water.

The literature on partial replacements and the data related to it has continued to expand since 2011 and has further demonstrated the increased potential exposure to lead from partial replacements. So much so that in 2017 the American Water Works Association, which previously took the EPA to court to allow for partial replacements, published a new standard for its members that "every effort shall be made to avoid partial replacements."[65]

# Estimates, Costs/Benefits, and Funding to Replace LSLs

## Quantity

Estimates of the number of lead service lines across the country have varied. The EPA's initial projections in the 1991 Final Regulatory Impact Analysis of National Primary Drinking Water Regulations for Lead and Copper estimated that 10.2 million LSLs were in place across the country, while more recent estimates by the EPA have put the number of lead service lines at roughly 9.3 million in 2019 and 9.2 million in 2023.[66] The EPA's estimates fall between other commonly cited lower- and higher-range estimates. A 2016 report in the *Journal AWWA* estimated the number of LSLs between 5.5 million and 7.1 million,[67] and the Association has generally cited the figure of 6.1 million based on those estimates.[68] A 2021 estimate by the Natural Resources Defense Council (NRDC) placed the number between 9.7 million and 12.8 million.[69] As NRDC noted of the larger estimate range, while "there are 6.2 million known lead pipes," there are additional service lines for which we don't have information "since most states have not identified how many service lines are lead, the total number of lead pipes identified nationwide will increase as additional detailed inventories proceed."[70]

The most recent estimates from the Environmental Protection Agency (EPA) in April 2023, of an estimated 9.2 million LSLs,[71] include an estimated 494,007 LSLs in New York—the 6th highest of any state, representing 5.38 percent of LSLs nationally.[72] Lower range estimates of the number of lead service lines in New York State have stood at roughly 360,000, with New York City's Department of Environmental Protection estimating up to 130,000 LSLs in the city alone.[73]

## Distribution

While larger municipalities and water systems may serve significant portions of the population, the plurality of the LSLs across the country are in small to midsized localities of 50,000 people or less.[74] Notably, in recent years, small to midsized New York municipalities including Ilion,[75] Amsterdam,[76] Newburgh,[77] and Troy[78] have all had exceedances of the EPA's lead action level. These service lines are located across an estimated 14,131 water systems nationally—some of which serve very large populations, but over 96 percent of which serve populations of 50,000 or less, and 86 percent of which serve populations of 10,000 or less.[79] In New York, most residents—18,344,737—are served by one of 2,812 public community water systems across the state—this includes systems run by local governments, private water companies, and nonprofits that tend to run smaller systems (for places like mobile home parks, apartment

### Community Water Systems

Community water systems are a public water system that (a) serves at least 15 service connections used by year-round residents of the area served by the system; or (b) regularly serves at least 25 year-round residents.

buildings or complexes, or homeowners associations).[80] There are 939 localities that have water departments or districts and 27 public authorities, including New York City, that operate water systems.[81] Of these, just 54 serve cities, while 371 serve villages, and 484 towns are served by at least one water district. In addition, there are roughly 230 private water companies in New York State that serve approximately 830,000 people.[82] The majority of these companies serve less than 100 people, though a few serve very large populations, and around 118 of them are run by homeowners associations.[83]

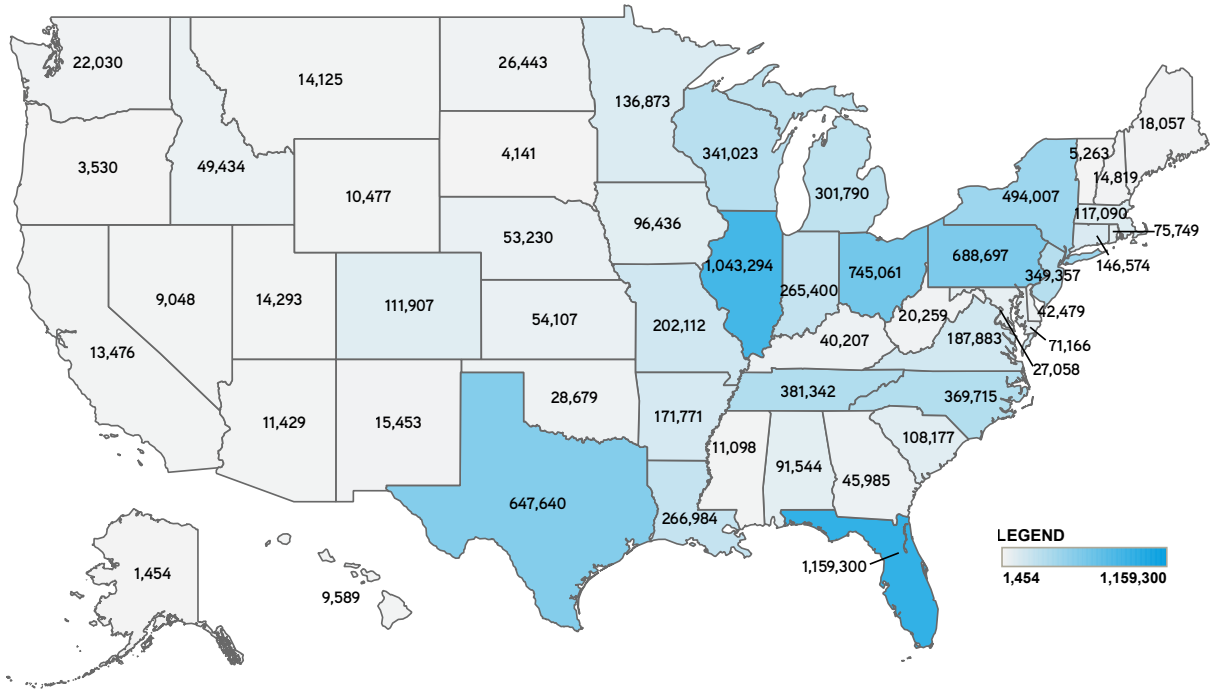
According to a statistical analysis by the US Government Accountability Office (GAO) in 2020 of water systems in four cities (including Rochester, New York) and their review of data from the US Census' American Community Survey, "older homes and poverty as well as other indicators of social vulnerability are common characteristics of neighborhoods that have higher concentrations of lead service lines."[84] These other indicators refer to "demographic indicators of higher percentages of families in poverty, such as racial and ethnic minorities."[85] A recent study released by Columbia University's Mailman School of Public Health reflects these findings with respect to their analysis of LSLs in New York City. That August 2023 study found that over 40 percent of service lines in the city may contain lead and found that "communities with higher proportions of Hispanic/Latino residents had a higher prevalence of service lines that could contain lead" and that potential LSLs were more likely in areas with higher exposures to lead from all sources.[86]

*TABLE 2*. **Local Government Water Provision**

| | | Town | | | | | |
|---|---|---|---|---|---|---|---|
| County | City | Town-Wide Only | Water Districts Only | Town-Wide and Water Districts | Village | Joint Activity | Total |
| 9 | 54 | 20 | 464 | 20 | 371 | 1 | 939 |

*SOURCE*: *Drinking Water Systems in New York: The Challenges of Aging Infrastructure* (Albany: Office of the New York State Comptroller (OSC), February 2017), https://www.osc.state.ny.us/files/local-government/publications/pdf/drinkingwatersystems.pdf.

*FIGURE 4.* **EPA Projected Lead Services Lines by State, 2023**




| State | Number | Total | State | Number | Total | State | Number | Total |
|---|---|---|---|---|---|---|---|---|
| Florida | 1,159,300 | 12.62% | Massachusetts | 117,090 | 1.27% | Washington | 22,030 | 0.24% |
| Illinois | 1,043,294 | 11.35% | Colorado | 111,907 | 1.22% | West Virginia | 20,259 | 0.22% |
| Ohio | 745,061 | 8.11% | South Carolina | 108,177 | 1.18% | Maine | 18,057 | 0.20% |
| Pennsylvania | 688,697 | 7.50% | Iowa | 96,436 | 1.05% | New Mexico | 15,453 | 0.17% |
| Texas | 647,640 | 7.05% | Alabama | 91,544 | 1.00% | New Hampshire | 14,819 | 0.16% |
| New York | 494,007 | 5.38% | Rhode Island | 75,749 | 0.82% | Utah | 14,293 | 0.16% |
| Tennessee | 381,342 | 4.15% | Maryland | 71,166 | 0.77% | Montana | 14,125 | 0.15% |
| North Carolina | 369,715 | 4.02% | Kansas | 54,107 | 0.59% | California | 13,476 | 0.15% |
| New Jersey | 349,357 | 3.80% | Nebraska | 53,230 | 0.58% | Arizona | 11,429 | 0.12% |
| Wisconsin | 341,023 | 3.71% | Puerto Rico | 51,490 | 0.56% | Mississippi | 11,098 | 0.12% |
| Michigan | 301,790 | 3.28% | Idaho | 49,434 | 0.54% | Wyoming | 10,477 | 0.11% |
| Louisiana | 266,984 | 2.91% | Georgia | 45,985 | 0.50% | Hawaii | 9,589 | 0.10% |
| Missouri | 202,112 | 2.20% | Delaware | 42,479 | 0.46% | Nevada | 9,048 | 0.10% |
| Virginia | 187,883 | 2.04% | Kentucky | 40,207 | 0.44% | South Dakota | 4,141 | 0.05% |
| Arkansas | 171,771 | 1.87% | Oklahoma | 28,679 | 0.31% | Oregon | 3,530 | 0.04% |
| Connecticut | 146,574 | 1.60% | District of Columbia | 27,058 | 0.29% | Alaska | 1,454 | 0.02% |
| Minnesota | 136,873 | 1.49% | North Dakota | 26,443 | 0.29% | | | |
| Total: 9,188,545 | | | | | | | | |

*SOURCE: Drinking Water Systems in New York: The Challenges of Aging Infrastructure* (Albany: Office of the New York State Comptroller (OSC), February 2017), https://www.osc.state.ny.us/files/local-government/publications/pdf/drinkingwatersystems.pdf.

## Costs

In 2018, the Drinking Water Infrastructure Needs Survey and Assessment Sixth Report to Congress estimated that the cost of replacing each lead service line would be $3,777.[87] More recent projections by advocates in New York State have roughly estimated $5,000 for each LSL.[88] The New York State Department of Health's Lead Service Line Replacement Program has estimated that costs for full replacements range from $5,000 to $10,000—largely depending on whether or not outside contractors are required. For full replacements done by municipal employees, the department estimates $2,000 to $4,000, and for those done by outside contractors $9,000 to $11,000.[89]

Given the more recent EPA estimates of the number of LSLs in the state at 494,007 and assuming the same cost per LSL, the total cost for New York State to conduct full replacements for 100 percent of LSLs would be an estimated $3.7 billion; $1 billion more than previously estimated in 2019.

Based on this and the EPA's most recent estimate of the total number of LSLs in need of replacement, the total cost for replacements nationwide would be in the range of $35.0 billion at $3,777/LSL—to $46.3 billion at $5,000/LSL—to $96.3 billion at $10,000/LSL. For New York State, based on the estimate of 494,007 LSLs, the cost would be in the range of $1.9 billion at $3,777/LSL on the lower end—to $2.5 billion at $5,000/LSL in the middle range—to $4.9 billion at $10,000/LSL on the higher end. In 2019, based on existing lower-range estimates of the number of LSLs at 360,000 in New York State, and an estimated $7,500 per full LSL replacement (falling between their range of $5–10,000), the Department of Health estimated the costs of full replacements for the entire state at $2.7 billion. Given the more recent EPA estimates of the number of LSLs in the state at 494,007 and assuming the same cost per LSL, the total cost for New York State to conduct full replacements for 100 percent of LSLs would be an estimated $3.7 billion; $1 billion more than previously estimated in 2019.

These estimates are with respect to reaching the goal of 100 percent replacement. Compliance with the current Lead and Copper Rule Revisions (LCRR) is not as costly as it does not require that. Under the LCRR, "if a water system serving more than 10,000 persons exceeds the action level, the system is required to replace 3 percent of the LSLs annually based on a two-year rolling average until the action level is not exceeded for four consecutive six-month monitoring periods."[90] The EPA's 2019 estimates for the then-proposed LCRR over a 35-year cost scenario for a single year between $211 million and $761 million.[91]

While the potential costs associated with full replacement of all LSLs in New York State are significant, these costs should be considered alongside the costs associated with non-replacement—that is with the averted or mitigated human health impacts and the economic benefits associated with those that would otherwise occur if LSLs were not replaced. While it's not clear that such an estimate of potential benefits exists specific to New York State, other examples exist. Following state legislative action, Minnesota's

Department of Health in conjunction with the University of Minnesota issued a report estimating the costs of both replacing LSLs throughout the state and the quantifiable public health and economic benefits of doing so. The 2019 report found that the costs of replacing LSLs ranged between $1.52 billion and $4.12 billion, while the potential benefits were estimated at between $4.24 billion and $8.47 billion.[92] In 2020, the environmental advocacy organization Environmental Defense Fund has likewise estimated the benefits of fully replacing LSLs based only on the decrease in cardiovascular disease deaths over 35 years old (and not including childhood brain development) to be $22,000 per LSL or $205 billion nationally based on existing EPA data at the time.[93] The United Association of Union Plumbers & Pipefitters in collaboration with the business and environmental organization Environmental Entrepreneurs (E2) have also estimated the employment and economic impacts of implementing the Biden-Harris administration's Get the Lead Out plan. They found that $45 billion spent on LSL replacement would "create and support 56,080 jobs annually for 10 years, or a total of 560,800 job-years," this includes 26,900 direct jobs.[94]

## Recent Funding and Regulatory Changes—New York State

According to a 2017 report by the New York State Comptroller, municipal water revenues are derived largely from water sales and charges, which make up 79 percent of that revenue, while property taxes and PILOTs or assessments account for 15 percent, and other revenues such as state and federal grants make up just 6 percent.[95] As noted in the report, "municipalities spend most of this revenue on the day-to-day operation of the water systems, including routine maintenance." Likewise, public water authorities' expenses between 2008 and 2015 were close to their total revenue.[96]

In addition to the day-to-day operations of water systems in New York, many localities and systems have to contend with significant costs related to the state's aging drinking water infrastructure. A widely cited 2008 report by the state Department of Health gave a "conservative cost estimated estimate of repairing, replacing, and updating New York's drinking water infrastructure is $38.7 billion over the next 20 years."[97] It further noted, at that time, that despite significant state investment, 95 percent of projects submitted for Drinking Water State Revolving Loan Funds remained unfunded due to the level of funding available with respect to the comparative need. More recently, in 2023, the EPA's 7th Drinking Water Infrastructure Needs Survey and Assessment estimated that New York will need $35.147 billion (in 2021 dollars) over 20 years for drinking water infrastructure.[98] As will be discussed below, since that time and in particular, over the last five years, the state has committed more substantial levels of funding to drinking water infrastructure as a whole. However, direct funding for lead service line replacement has remained low.

In 2015, the New York State Legislature and former Governor Cuomo enacted the Water Infrastructure Improvement Act (WIIA). WIIA, passed as part of the state budget, came with an initial appropriation of $200 million to assist municipalities with wastewater and drinking water projects. WIIA received an additional $200 million appropriation

in 2016, and has continued to be funded through the Clean Water Infrastructure Act, described below, since 2017. WIIA has made awards each year, except in 2020, and has distributed over $2 billion in grants across the state, including over $880 million in 2022. However, few entities—including the Water Board of Niagara Falls and the city of Rochester—have applied for and received awards for LSL replacement projects.

In 2016, New York State enacted a new first-in-the-nation law requiring all roughly 4,700 public schools and BOCES (Boards of Cooperative Educational Services) in the state to test for lead contamination in potable water systems outlets (such as a water fountain or sink).[99] In 2017, the first biennial report to the governor and the legislature of these testing results was published. At that time, 14 percent of the 236,600 outlets that had been tested at schools outside of New York City exceeded the EPA's action level of 15 ppb, while 9 percent of the 46,654 outlets tested in schools in New York City were above the action level.[100] By the 2019 biennial report, of the 392,370 outlets for which data had been reported by schools in New York State, 6 percent were over the EPA's action level.[101] Those outlets that exceeded the action level are required to be taken offline and remediated. The testing for schools (up through 2020 at the time of this publication) is accessible online in a state database.[102] However, as that interface reflects, lead levels for outlets in schools are only reported as either under or over the federal action level of 15 µg/dL. As such, it is unclear from the publically available data if a school outlet that has tested below the action level tested at 0 µg/dL or 14.9 µg/dL, and likewise, it's unclear how high it has tested if it is over the action level.

In 2017, New York State enacted the $2.5 billion Clean Water Infrastructure Act (CWIA) as part of the state budget.[103] Each year, since 2019, state leaders have invested $500 million in the CWIA, bringing the total appropriation to $5 billion to date. The original 2017 CWIA appropriation included $20 million for a new Lead Service Line Replacement Program (LSLRP), to be operated by the New York State Department of Health.[104] Municipalities across the state that had at least a .5 percent rate of children under six years old with elevated blood lead levels (5.0 µg/L or higher) could potentially receive funding from DOH.

In 2017, 26 municipalities received an LSLRP grant, averaging about $500,000 per grant, and in 2019 an additional $10 million from the CWIA was made available to provide 18 more municipalities an LSLRP grant. According to the department's report on the program, the LSLRP funds could be used "to replace the entire length of residential LSLs, from the municipal water main to the residence," further clarifying that while "in most cases the portion of the service line from the water main to the shut-off valve is owned by the municipality while the portion from the shut-off valve to the residence is owned by the property owner. Regardless of ownership, replacement of both portions is eligible under the LSLRP." However, no new grants have been made since 2019 and the $30 million of direct funds made available to date reflects a very small fraction of New York's total need.[105]

## Municipalities That Received CWIA Funding

### 2017

Albany, Auburn, Binghamton, Buffalo, Elmira, Geneva, Gloversville, Gouverneur, Hempstead, Jamestown, Kingston, Long Beach, Lyons, New York, Newburgh, Niagara Falls, North Hempstead, Poughkeepsie, Rochester, Schenectady, Southold, Syracuse, Troy, Utica, Watertown

### 2019

Amsterdam, Batavia, Cortland, Dunkirk, Ellicott, Glen Cove, Hornell, Hudson, Johnstown, Norwich, Oswego, Perry, Plattsburgh, Port Jervis, Riverhead, Watervliet, Yonkers

In 2022, the state legislature and governor included in the state budget and residents of New York then enacted through public referendum the $4.2 billion Environmental Bond Act.[106] The act allocated $650 million towards "water quality improvement and resilient infrastructure," including lead service line replacement. The broader funding requirements of the Bond Act also stipulate that 35 percent of the total money allocated must be directed to disadvantaged communities. And in 2023, the state budget proposals included a $50 million carve-out of Clean Water Infrastructure funds for lead service line replacement, and a provision allowing localities to issue bonds to fund lead service line replacement programs (Part UU in the Transportation, Environment, and Economic Development Article VII bill). That funding carve-out was not included in the final enacted budget. However, it would have amended Local Finance Law to clarify the ability of localities to take on debt in order to finance lead service line replacement programs, "including, but not limited to programs that inventory, design and replace publicly owned and privately owned lead service lines within an established water system."[107, 108] The impetus for this proposal will be further discussed below (see Potential Legal Challenges and Solutions).

In addition to the state budget proposals, a new bill was introduced in the state Senate and Assembly in 2023 entitled the "Lead Pipe Right to Know Act." This act would require water systems to provide electronic records of their service line inventories to the state Department of Health, including the location and material composition, which DOH would then publish on its web site. It would further require the department to make searchable maps of all inventories for systems serving over 10,000 people that are updated annually. This bill was passed by both the state Senate and Assembly in the spring of 2023 but has till the end of the year to be acted on by the governor.[109]

## Recent Funding and Regulatory Changes—Federal

Federal funding has also changed and expanded in recent years. In 2019, the Water Infrastructure Fund Transfer Act allowed states a one-time transfer of funds from Clean Water State Revolving Fund to the Drinking Water State Revolving Fund for lead-related projects.[110] Under the American Rescue Plan Act of 2021 (ARPA), local state and tribal governments were allowed to use funding for lead service line replacement projects. In January 2022, the US Treasury Department issued a final rule on the use of the funds that included further related eligible expenses and confirmed the ability of recipients to use the $345 million of ARPA funds they had budgeted for lead remediation. This funding included $21.5 million for the replacement of lead service lines in Rochester, New York.[111]

The federal Infrastructure Investment and Jobs Act, signed into law in late 2021, allocated a further $50 billion towards broader drinking and wastewater systems. This included $15 billion in the Drinking Water State Revolving Fund's lead service line replacement funding and mandated that 49 percent of those funds be provided to disadvantaged communities as grants and forgivable loans.[112] It further stipulated that grants provided through that funding "shall, in the case of a low-income homeowner, and may, for other homeowners offer to replace the privately owned portion of the lead service line at no cost to the homeowner."

Alongside this funding, in 2021, the White House announced the Get the Lead Out Partnership to address lead paint and water contamination—in which among other things the EPA committed to supporting the replacement of 100 percent of lead pipes. The Partnership included a collaboration between the EPA, the US Department of Labor, and four states to establish "Lead Service Line Replacement Accelerators" to support the replacement of lead service lines in 40 communities across Connecticut, New Jersey, Pennsylvania, and Wisconsin.[113] These Accelerators provide technical assistance and support for developing and implementing service line inventories and replacement plans. While not a direct beneficiary, the lessons learned in New York's neighboring states could help inform state and local leaders as they develop similar programs.

And, as has been referenced prior, that same year, the EPA published a final rule for the Lead and Copper Rule Revisions (LCRR). These revisions (and to a greater extent their earlier version as a proposal in 2019) mirrored some, though certainly not all, of the changes Michigan put in place in 2018 as part of its broader response to the crisis in Flint. At that time, the state of Michigan revised its own Lead and Copper Rule to include a ban on partial replacements, lower the action level for the state from 15 ppb to 12 ppb, require a preliminary inventory of all LSLs by water systems by 2020, and require systems to begin replacing LSLs by 2021 at an average of 5 percent a year for 20 years—which was to be funded by utilities and therein ratepayers.[114] The LCRR,[115] among other provisions that are outlined in the appendix, most immediately directed water systems to develop and annually or triennially update a service line materials inventory beginning October 16, 2024. While further federal regulatory action is anticipated by that time, which may impact other provisions in the LCRR, the materials inventory requirement is not expected to change.

In total, the federal government has appropriated $3 billion nationally for FY2023 in direct funding to lead service line replacement. Carried over the anticipated five-year funding cycle, this would amount to $15 billion, a significant investment. At the midrange of estimated costs for full replacements of $5,000 per LSL for 100 percent of LSLs, this amounts to 33.3 percent of the total funding needed.

The state of New York anticipated $115 million annually over five years for the inventory and replacement of lead service lines from the IIJA—which the state's governor included in her recent state budget proposal.[116] The most recent appropriation summary for FY2023 from the EPA, in April 2023, closely aligns with New York's estimate at $113,656,000 in federal dollars for the state's Lead Service Line Replacement Program, with 49 percent or $55,691,440 designated for disadvantaged communities.[117]

If New York State receives, as it expects, the same appropriation over each year of the planned five-year funding cycle, the total would be $568,280,000. Based on the midrange estimates of full replacements for 100 percent of LSLs at $5,000 per LSL, it is 23 percent of the total need. At this level of federal funding and estimated cost, it would take roughly 22 years to reach 100 percent replacement without further state or local funding. Based on the Department of Health's cost estimate per LSL of $7,500, it would be 15 percent of the total need and would take roughly 33 years to reach 100 percent replacement.

## Potential Legal Challenges and Solutions

In January 2023, a case of lead service line related water contamination in Troy, New York, came to light. A local resident whose toddler had tested for elevated blood lead levels, for which the cause was determined to be a lead service line, brought forward concerns with other residents about the need for LSL replacements. In doing so they found that the city had received but not yet utilized roughly $500,000 in state funding to replace LSLs allocated under DOH's Lead Service Line Replacement Program roughly five years earlier.[118] The resulting public outcry convinced the city to propose a first-in-the-state plan to replace all LSLs utilizing both grant funding and rate hikes such that owners would not directly pay for replacements over a period of 15 years. However, water department officials at that time noted a "wrinkle"—that the use of such rate-generated funds may not be allowed under the state constitution for the private portions of the LSL replacements.[119] As such, the city decided to allocate further funding from ARPA and from its water fund reserves but noted that only the original state funds and ARPA money could be used to conduct replacements for the privately-owned portions of LSLs—and not the local reserves—as a consequence of the potential constitutional issue.[120]

As reflected in the case of Troy, New York, a broader challenge to achieving the federal goal of 100 percent replacement of lead pipes is the legal restriction on directing public funds to private persons or entities—in this case for the replacement of the privately-owned portion of LSLs. In New York State, as in other states, Article VIII, Section 1 of the state constitution prohibits counties, localities, and school districts from making a gift or loan to an individual or private corporation or association. Referred to as the

"Gift and Loan Clause," this provision has the well-intended purpose of curbing the use of public resources for private benefit. Enacted in 1874, the clause was largely a response to the "prior practices of subsidizing private railroad and canal companies" through the issuance of state and municipal debt, which resulted in a fiscal crisis when those companies failed, leaving the state or localities to shoulder the debt burden.[121, 122]

### Article VIII, Section 1

> No county, city, town, village or school district shall give or loan any money or property to or in aid of any individual, or private corporation or association, or private undertaking, or become directly or indirectly the owner of stock in, or bonds of, any private corporation or association; nor shall any county, city, town, village or school district give or loan its credit to or in aid of any individual, or public or private corporation or association, or private undertaking.[123]

This constitutional provision does not, however, preclude any and all such public resources from going to a private individual or entity. The state courts,[124] as well as opinions by the state attorney general[125] and state comptroller,[126, 127] have at various times addressed cases and questions of when public resources may be expended to the benefit of private individuals or entities. While none of these cases or opinions specifically pertain to lead service line replacements, there are some key threads that relate to our understanding how public funds may be able to be used with respect to LSLs.

## *Murphy v. Erie County* (1971)

Erie County entered into a contract with a private company for the construction and management of a publicly-owned stadium for either 20 or 40 years. A taxpayer challenged the agreement, contending that it was a loan or gift in violation of the state constitution under Article VIII, Section 1. The decision in this case found that the use of public funds towards a private entity did not violate the state constitution as "the private benefit is 'incidental' to the conceded public purpose."[128] This was found to be the case despite the fact that the county did not retain any right to use the facility during the course of the contract, as the public maintained ownership over the improvements during that time and as county residents retained the "full benefit for which the stadium is intended" by being able to attend (if for a fee) events held there.

## *Kradjian v. City of Binghamton* (1984)

The city of Binghamton participated in a federal loan program in order to assist in financing the construction of a Marriott Hotel in the city's downtown. The owners of an existing Holiday Inn hotel in the city (Kradjian) brought this case to challenge the city's use of those funds under Article VIII, Section 1 of the state constitution, as well as with respect to potential violations of Open Meetings Law. The court decided in this case that there was no violation of the state constitution, because:

> [T]he city is participating in a Federal program, created by Federal statute, administered by a Federal agency and funded by Federal sources. The city's participation, authorized by State statute (General Municipal Law, § 99–h, subd. 2), is intended to promote urban expansion and growth so as to attract investments and create permanent job opportunities for low and moderate income persons. Under these circumstances, we see no gift or loan of municipal funds in violation of section 1 of article VIII of the State Constitution.

That is, under the state's General Municipal Law (GMU § 99–h, subd. 2),[129] federal funds could be used in a way that (citing *Murphy v. Erie County*) conferred a private benefit that was incidental to a public purpose, provided the city was authorized to do so by law.

## *Schulz v. Warren Supervisors* (1992)

A handful of taxpayers in Warren County (including Robert Schulz, director of the Tri-County Taxpayers Association) petitioned the court seeking to void a contract between Warren County (Warren County Board of Supervisors) and the Lake George-Warren County Convention Bureau Inc. The contract, for $120,000 annually, was for the marketing of the county as a convention destination. As in the other cases presented here, the petitioners argued this agreement was counter to Article VIII, Section 1 of the state constitution.

The court found, citing an 1897 decision[130] related to municipal bonding for the construction of railroads in New York City, that a public purpose is something "necessary for the common good and general welfare of the people of the municipality, sanctioned by its citizens, public in character and authorized by the legislature."[131] Based on this definition, the court concluded that the "goal of convention development is in our estimation a valid public purpose because it serves the dual function of publicizing the advantages and promoting the general commercial welfare of the County."

## *Bordeleau v. State*, 18 N.Y.3d 305 (2011)

A group of 50 taxpayers sought declaratory relief challenging the constitutionality of various "loans and grants issued by public defendants to private entity defendants and other private companies in order to stimulate economic development."[132] Most of these were appropriations to the Urban Development Corporation (UDC) through the Empire State Development Corporation (ESD) that funded the expansion of semiconductor manufacturing at the University at Albany's Nanotech Complex and Globalfoundries's plant in Malta, New York. A second set of appropriations concerned funds allocated to the Department of Agriculture and Markets to support agreements with nonprofits (New York State Apple Growers Association, New York Wine and Grape Foundation, and Long Island Wine Council) for the purpose of promoting apple and grape products grown or produced in the state.

In this case, the court found that the state was not barred from the "granting of public funds to public benefit corporations for a public purpose" even as those funds or credits were relayed to a private entity. This decision rested on the finding that a public authority or benefit corporation—in this case ESD—is an independent entity from the state and, therefore, not subject to the same constitutional provisions in Article VIII, Section 1. The decision also reaffirmed *Murphy*'s standard with respect to the funds appropriated to the Department of Agriculture and Markets, finding that "'an incidental private benefit' will not 'invalidate a project which has for its primary object a public purpose.'"[133]

Taken together, these cases reflect that whether the use of public funds for the replacement of privately-owned portions of lead service lines is constitutional may centrally depend on three questions:

1. From and through which public entities the funding emanates and is distributed.
2. Whether replacement of full LSLs, including the privately-owned portion, is considered to be of a public purpose.
3. Whether the private benefit conferred as a result of full replacements of LSLs is incidental to a primary objective that is of a public benefit.

The cases above demonstrate that certain sources of funding and routes of disseminating funding that confer a private benefit in the process of fulfilling a public purpose have been deemed constitutional. This has most clearly been found with regard to the participation of localities in federally-funded and administered programs (*Kradjian v. City of Binghamton*), as well as state funding that is allocated through public authorities or benefit corporations (*Bordeleau v. State*). While cases, where funding was locally derived or directed (*Schulz v. Warren Supervisors, Murphy v. Erie County*), have focused more centrally on the questions of whether there was a public purpose and if the attendant private benefit was incidental. As will be discussed in the examples below, cases in other states with similar constitutional provisions have more directly addressed the use of rate-generated funding and local and state-funded programs that provide funding for the replacement of privately owned LSLs.

## Other State and Municipal Examples

In 2019, the Emmett Environmental Law and Policy Clinic at Harvard Law School in conjunction with the Environmental Defense Fund reviewed state policies on using water rates to fund the replacement of lead pipes. In looking at 12 states with over 200,000 LSLs, including New York, they found that since the water crisis in Flint, six of those states had explicitly approved the use of rate-payer funds for privately-owned LSL replacement. These states include Indiana, Michigan, Missouri, New Jersey, Pennsylvania, and Wisconsin.[134] Only Wisconsin required a contribution from the property owner. As in the summary of New York State's case law above, the authors also determined that "all of the states examined in this paper have a related doctrine, under which governments can spend public funds only for activities that have a predominantly public purpose, as opposed to a predominantly private purpose." Below we summarize the policy developments in three of the most frequently cited respective cities and states that have established policies for full LSL replacement using public funds for the private side of replacements—Wisconsin, Michigan, and New Jersey.

### Madison, Wisconsin

Beginning in 2000, Madison was the first large city in the United States to replace all of their lead service lines with copper lines. Following the EPA's initial Lead and Copper Rule in 1991, the city's testing of drinking water reflected that over 10 percent of samples (10 percent being the regulatory threshold) had lead levels exceeding the then new federal action level of 15 ppb.[135, 136] While treatment techniques to control for corrosivity would have typically been the primary means of addressing the exceedance, independent analysis determined the approach would have adverse public and environmental health impacts in this case, increasing the lead levels and risking further algae blooms in nearby waterbodies.[137]

The Madison Water Utility subsidized half of the cost of the private portions of service lines replaced, up to $1,000. The average cost of replacement for the public side was $1,997, and for the private portion was $1,340, with reimbursements averaging $670.[138, 139] In total, the LSL replacements cost the city $15.5 million and took 11 years to complete for roughly 8,000 lead service lines, finishing in 2012.[140]

In 2016, the Wisconsin Department of Natural Resources established a Private LSL Replacement Funding Program. The two-year program initially provided $27 million in principal forgiveness to disadvantaged communities across 42 municipalities.[141] The state provided an additional $63 million in 2020 through the transfer of funds from its Clean Water Loan Fund under the 2019 federal Water Infrastructure Fund Transfer Act.[142]

In 2018, state legislation was enacted allowing municipalities and water utilities to provide financial assistance (of up to one-half of the total cost) to homeowners for replacing the private portions of LSLs.[143] It also stipulated that any such assistance must be explicitly provided for by local law, approved by the public utilities commission, and be equal as a percentage or flat dollar amount to a class of customers. The state also extended its reporting requirements that year for utilities to identify the number of service lines made of each material on public property to also include private property.[144, 145]

As with other states, it will now need to abide by the Lead and Copper Rule Revisions' reporting requirements. And like other states, Wisconsin has received funding in recent years under the Bipartisan Infrastructure Law for Lead Service Line Replacement—receiving $48.3 million in 2022 and $81.2 million in 2023.[146]

## Flint, Michigan

Michigan's current lead service line replacement policies have been driven by and as a response to the drinking water contamination in Flint that came to light in 2014. Michigan made changes to the state's Lead and Copper Rule in 2018 that required water suppliers to inventory all service lines by 2020. That data reflected that roughly 331,000 service lines (12 percent) contained lead or likely contained lead and that an additional 314,000 were made of unknown material.[147]

The state further required that community water suppliers replace full lead service lines and any galvanized steel service lines that are or were once connected to a lead line at an average rate of 5 percent a year, leading to 100 percent replacement in 20 years and that they do so at the water supply's expense. The rule will also lower the lead action level to 12 ppb on January 1, 2025[148]—under the federal action level of 15 ppb. Those water systems that have an exceedance of lead action levels even after implementing corrosion control treatments, must replace service lines at 7 percent per year until there's no longer an exceedance. The full replacements were directed to be made regardless of the ownership of the line (in whole or in part).

This rule was challenged in court by water systems responsible for providing water to the majority of the state's residents.[149] The plaintiffs asserted that the new rule was deficient in four ways: 1) there wasn't a meaningful study of the affordability and funding for implementation; 2) the rule didn't consider the "legal implications of providing free services—replacement of service lines—to private property owners"; 3) the inventory requirement prior to replacement would require access and/or excavation at least twice, increasing costs; and 4) there wasn't sufficient justification for the lowered action level. The second assertion reflects similar concerns about constitutionality in New York, and was predicated on Article 7, Section 26 of the state constitution of Michigan, which also precludes municipalities from loaning its credit for "any private purpose or, except as provided by law, for any public purpose."[150] On this basis, the plaintiffs argued that they could not charge ratepayers for costs incurred to replace private service lines.[151] The case was dismissed by the state's Court of Claims in 2019. In the court's decision, Judge Christopher Murray began his analysis by stating that "as it concerns their constitutional challenges, the Court must remain mindful that administrative rules, like legislative enactments, are presumed to be constitutional."[152]

There have been logistical and financial challenges reported in implementing the new rule. These challenges have reportedly been related to available funding and meeting the timelines provided given the workforce available. Nonetheless, substantial progress has been made. For example, while the city of Flint—a key catalyst for this policy change—was granted a one-year extension in 2022 for the use of funding to complete LSL replacements, the city has reportedly replaced 95 percent of its LSLs.[153]

In addition, in April of 2022, the Michigan Department of Health and Human Services announced it was updating its definition of an elevated blood lead level for children from 5 µg/dL to 3.5 µg/

dL to reflect the CDC's recently revised blood lead reference value.[154] As the state agency noted, this definition establishes thresholds that are linked to the provision of services such as home environmental lead investigations, lead abatement, and nursing case management. Because of the change to the definition, an additional 1,500 children and their families were reportedly eligible for these services and received support to mitigate lead exposures without them needing to be more significant.[155]

## Newark, New Jersey

While there are a number of municipal examples of LSL replacement programs, Newark, New Jersey, may be the quickest to implement its program. Newark's program was initiated following drinking water testing in 2017 in which 22 percent of samples exceeded the federal lead action level. Initially, in 2018, the city's LSL replacement program was voluntary and homeowners were required to contribute $1,000 towards replacement. The initial funding for which came from $75 million in municipal bonding, and a $12 million loan from the state's Water Bank (with up to $9 million in principle forgiveness).[156] The timeline for all replacements under the program was projected to be eight years. However, this program structure reportedly only resulted in the replacement of 650 LSLs in the initial phase of the program between March and September 2019.[157]

At that time, and to address the legal implications of private property access, the city council enacted a "right of entry" ordinance for LSL replacements.[158, 159] The program also started making the replacements free to homeowners. This was noted as important to the success of the program by city officials, because such a high percentage of residents rent their homes and locating homeowners to gain access for replacements could have proven difficult. In addition, further funding was garnered—$120 million in bonding by the Essex County Improvement Authority.[160] This brought the total cost of the replacement program to nearly $200 million. In 2022, Newark completed the replacement of the city's roughly 23,000 LSLs with copper pipes—in less than three years.

The local law in Newark allowing access to private property for the purpose of LSL replacements acted as model for state legislation that was then enacted in 2020.[161] In 2021, the state of New Jersey enacted further legislation requiring that all public water systems inventory and replace LSLs in the next 10 years, by 2031.[162] That law also provided a process through which investor-owned water systems could recoup the associated costs from customers if they presented a state approved plan.

## Conclusions and Further Questions

Knowledge of the specific harms of lead exposure has developed significantly since the 1970s, particularly at lower levels of exposure and with respect to children, but awareness of these harms has existed for centuries. As federal policies have more substantially addressed lead exposures over the last 50 or so years, blood lead levels have decreased substantially in the United States. Even so, an estimted 500,000 children across the United States continue to have elevated blood lead levels, including thousands in New York State.

Lead service lines remain important routes of exposure that have not been fully addressed in public policy. There is a clear public benefit to replacing lead service lines as demonstrated by a significant body of medical and public health research. More specifically, research has shown that *full replacements* of lead service lines provide additional public health benefits while ensuring that public funds are not spent in ways that, counter to their intent, may result in additional exposures. As discussed above, replacement programs that do not ensure the full replacement of lead service lines—both the public- and privately-owned sections of the service line—and that allow for partial replacements to occur result in increased risks of exposure to lead.

The potential for increasing rather than mitigating or preventing further lead exposures when partial LSL replacement occurs is all the more concerning with respect to the uneven and inequitable distribution of LSLs and potential LSLs, and those who are most likely to be impacted. Given the socioeconomic and demographic indicators associated with higher concentrations of lead service lines, it is further important to consider how policies that require homeowner contributions for LSL replacement might disproportionately impact poor communities and communities of color, and inadvertently result in less replacements or more partial replacements if homeowners are unable to afford the cost of replacing the private side of the service line or if renters reside in buildings where the owner has been nonresponsive or opted out of replacement.

Yet, the full replacement of LSLs is complicated by the fact that their ownership is often split between public and private portions and replacing private portions may confer a private benefit that raises constitutional questions in many states—including New York.

New York's case law, however, appears to reflect a more nuanced set of questions that do not preclude the use of public funds in ways that may confer a private benefit, but that depend on where the funds are generated from and through, whether public law and regulation deem their use to be of public benefit, and the degree to which any private benefit is incidental to that public one.

As outlined in this report, existing public policies in New York State and at the federal level have reflected the position that full replacements of lead service lines are of public benefit. At the state level, funds from New York's Lead Service Line Replacement Program have been used to replace "the entire length of residential lead service lines,

from the municipal water main to the residence,"[163] and the state's new law allowing localities to bond for LSL replacement programs specifies that the programs funded include those to replace both publicly and privately owned lead service lines.

Federal funding from the IIJA for lead service line replacements more specifically denotes that LSL replacements *should* be full (and not partial) replacements. And likewise, under the new Lead and Copper Rule Revisions only full LSL replacements will be considered in meeting the replacement rate for systems that exceed the federal action level. Further revisions are expected to be announced by October 2024. These policies are further aligned with the stated public purposes of the Biden-Harris Get the Lead Out Partnership with the goal of 100 percent replacement of lead pipes in 10 years, predicated on the public health benefits such actions would confer.

Cities outside New York and other states—including those with similar state constitutional provisions to New York—have implemented full service line replacement programs, including those that are entirely publicly funded.

In order to reach the stated federal goal of 100 percent replacement in New York, however, more resources would need to be directed towards that end. Existing cost projections by the New York State Department of Health utilize earlier lower-range estimates of the number of LSLs in the state. But more recent EPA estimates of the number of LSLs are significantly higher, nearly 500,000 as opposed to 360,000. Using this updated estimate, the Department of Health's cost projection would increase by $1 billion, from $2.7 billion to $3.7 billion. Current direct federal funding accounts for over $113 million for the 2023–24 fiscal year, which is anticipated to continue at that level over five years.

As such, continued federal funding, increased state funding, and the ability of water systems and municipalities to spend locally generated funding to replace full LSLs, without unduly burdening ratepayers will be necessary. While New York State has previously earmarked specific funds for lead service line replacement, that funding stopped in 2019, and further proposals from the state Senate and Assembly this year to include specific funds, at $50 million, for LSL replacement at no cost to homeowners, was not enacted.[164]

## Policy Recommendations

- Lower the state's blood lead reference value for children under six years old of 5 µg/dL to align with the federal reference value of 3.5 µg/dL, and to ensure that children with those levels have access to existing services.
    - Determine what the estimated total number of children under six years old with elevated blood lead levels may be for the entire state, including those children that tested between the old federal reference value and the new/lower federal reference value.
- Make New York State data on lead testing for drinking water and LSL material inventories publicly accessible in ways that allow for data to be easily analyzed and to facilitate continually updated projections of progress and resource needs at the local and state levels.
    - Include specific testing result levels for water quality and not below/above threshold levels.
- Establish a state level goal of 100 percent full LSL replacements by a given year .
    - Establish an ambitious but feasible timeline for fully replacing all lead service lines in the state. Notably, two states have already enacted legislation that requires replacement in 10 years, aligning with the current federal goal—this includes the example of New Jersey discussed above, as well as Rhode Island.
    - Prohibit partial lead service line replacements to protect against further exposures.
    - To the greatest extent possible publicly fund replacements—prioritize and ensure full funding for disadvantaged and environmental justice communities, as well as other vulnerable populations (such as families with young children).
    - Increase state funding to align with and complement existing federal funding.
    - Assess the need for further resources and workforce development given the current capacity of localities and contractors to carry out this work in a given time period.

# Appendix

## Earlier Federal Regulations and Programs

Beginning in the 1970s, as research on the impacts of lead exposure at lower levels developed and gained broader attention and social action, federal policy changes began to be enacted. Federal policy changes from the 1970s to the 1990s to address lead have been positively associated with significant reductions in exposure during and since that time.[165] Early on, this included the phase-out of lead from gasoline in 1973 and the prohibition of lead paint in 1978. With respect to drinking water, the 1986 amendments to the Safe Drinking Water Act (SDWA), then included the prohibition of "any pipe, any pipe or plumbing fitting or fixture, any solder, or any flux, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free."[166] Though lead free was defined as solder and flux with up to .2 percent lead, and pipes with up to 8 percent lead. It should be noted that in 1996 the prohibition on lead materials in the installation and repair of water systems established in the 1986 SDWA Amendments was expanded to include a prohibition on the introduction of such pipes or plumbing fixtures into commerce. And, in 2011, the definition of "lead free" was revised to a weighted average of 0.25 percent lead.

In 1988, the Lead Contamination Control Act (LCAA) was enacted, further amending the SDWA. Among its key provisions, the LCAA banned the sale of water coolers containing lead and required the development of federal guidance[167] and state programs to assist schools and daycares "in testing for, and remedying, lead contamination in school drinking water from coolers and from other sources of lead contamination."[168]

The EPA's 1991 Lead and Copper Rule (LCR), also under the SDWA, first established the health-based goal for lead in drinking water (referred to as the maximum contaminant level goal or MCLG) of 0 µg/dL. As the EPA noted, the agency "has set this level based on the best available science which shows there is no safe level of exposure to lead. The fact that there is no safe level of exposure underscores the fact that any action to reduce exposures can have impacts on lives and livelihoods."[169] Under the rule, the agency has established a technology-based action level of 15 parts per billion (ppb) and an enforceable treatment technique.[170] The treatment technique requires that water systems control for corrosivity, which may result in lead entering the drinking water. While larger systems have been required to have a corrosion control treatment (CCT) plan, small and medium-sized water systems serving under 50,000 have only been required to do so when their testing results in an action level exceedance (i.e., over 15 ppb). Water systems are required to test for lead in homes or buildings that are at "high risk" of lead or copper contamination.[171] If 10 percent or more of samples exceed an action level of 15 parts per billion (ppb),[172] they are required to take further actions to address corrosiveness, including treatment, public education, and for many years—partial—replacement of lead service lines.[173]

Under the LCR, systems have only been required to replace lead service lines if they have continued to exceed the action level even after completing treatments to reduce the lead levels. While the initial 1991 LCR required the replacement of the entire service

line, court rulings from a 1994 case brought by the American Water Works Association (and Industry Association of Water Utilities), resulted in revisions of that requirement in 2000 to allow for partial replacements.[174] This contention primarily rested on the fact that the owner of a service line, or a portion of a service line, is legally responsible for the cost of replacement.[175] In many cases, the water system owns part of the service line *and* a homeowner owns part of the service line. This has meant that systems working to replace LSLs need to get the homeowner's agreement to allow their portion of the line to be replaced and—as will be further discussed below—figure out how that portion of the replacement is going to be paid for, a cost that has typically fallen to the homeowner responsible for that portion of the service line.

Following the Lead and Copper Rule, the 1996 amendments to the Safe Drinking Water Act (SDWA) established the federal Drinking Water State Revolving Loan Fund (DWSRF).[176] These funds, in combination with a state match of 20 percent, provide states with capital required to establish a revolving (low interest) loan fund, as well as grant funding and other financial resources, based on the federal Drinking Water Infrastructure Needs Survey and Assessment.[177] Water systems can apply to their state for eligible infrastructure projects that address serious health risks and ensure compliance with the SDWA. These projects have included lead service line replacements in many states.[178]

New York State also established a Drinking Water State Revolving Fund (NYS DWSRF) in 1996 through legislation to work with the federal DWSRF program.[179] This program includes a hardship policy where disadvantaged communities may apply for interest-free financing, grants, or principal forgiveness. The state Department of Health prepares an annual Intended Use Plan for those funds to outline sources of funding, the types of assistance available, and priority projects. Since it was established, the NYS DWSRF has provided $7.6 billion in total project financing.[180]

## 2021 Lead and Copper Rule Revisions

As referenced above, the 2021 Lead and Copper Rule Revisions include a requirement for systems to complete an initial service line materials inventory by October 16, 2024, among several other changes. Further federal regulatory action is expected to be taken by the time the initial inventories are due. Those changes may or may not further impact the longer list of provisions included in the LCRR (as outlined below), but they are not anticipated to impact the requirement for inventories. The provisions in the 2021 LCRR:

- Require systems to develop and annually or triennially update a service line materials inventory, beginning October 16, 2024.
- Require notice annually to homeowners with LSLs and require that water systems replace their portion of the service line when property owners choose to replace their portions (within 45 days or up to 180 days if the state is notified).
- Establish a new lead trigger level of 10 ug/L, based on the 90th percentile of lead tap sample results, and includes requirements for systems that test at

or above the trigger level but below the action level of 15 ug/L to establish or optimize their corrosion control and to conduct a Lead Service Line Replacement (LSLR) program at a rate approved by the state.

  - Sets new requirements for how samples for testing of water systems for lead should be taken with respect to better identifying the highest levels of lead present.

- Require community water systems (CWSs) serving over 3,300 people that are above the action level to replace LSLs at a rate of at least 3 percent per year (based on a two-year rolling average of the number of known or potential LSLs in the inventory). Such replacement programs can only end following lead levels below the action level for two years. Sets further requirements for other CWSs and non-transient, noncommunity water systems (NTNCWs).

  - Only full LSL replacements will be considered in meeting the replacement rate, not partial replacements.

- Establish new testing requirements for schools and childcare facilities.

  - CWSs must sample 20 percent of elementary schools and 20 percent of childcare facilities each year, as well as sampling at secondary schools upon request, such that all facilities are tested within a five-year cycle (excluding facilities that have built or replaced all plumbing in 2014 or later).

*TABLE 3*. **Lead and Copper Rule Revisions Requirements, 2021**

| Testing Results For 90th Percentile (P90) | CWSs Serving >3,300 People | Small CWSs and NTNCWSs |
|---|---|---|
| P90 >15 µg/L | "fully replace 3% of LSLs per year based upon a 2-year rolling average (mandatory replacement) for at least 4 consecutive 6-month monitoring periods" | Systems "that select LSLR as their compliance option must complete LSLR within 15 years if P90 >15 µg/L" (see below for other options |
| P90 >10 to 15 µg/L | "Implement an LSLR program with replacement goals in consultation with the primacy agency for 2 consecutive 1-year monitoring periods" | "Allows CWSs serving ≤10,000 people and all NTNCWSs with P90 >10 µg/L to select their approach to address lead with primacy agency approval: [...] CCT, LSLR, provision and maintenance of point-of-use devices; or replace all lead-bearing plumbing materials." |

*SOURCE*: US Environmental Protection Agency, Rule, "National Primary Drinking Water Regulations: Lead and Copper Rule Revisions," Federal Register 86 (January 15, 2021): 4198, https://www.federalregister.gov/documents/2021/01/15/2020-28691/national-primary-drinking-water-regulations-lead-and-copper-rule-revisions.

As referenced above, the 2021 LCR Revisions included new testing requirements for schools and childcare facilities. The revisions require testing 20 percent of elementary schools and 20 percent of daycare facilities (excluding facilities built during or after 2014) each year over a five-year period in a given community water system. According to the EPA, as of 2019, just 12 states have required programs for testing lead in drinking water at schools, including New York's.[181] Likewise, just 10 states have required testing programs for childcare facilities, not including New York.[182] This means that as the new revisions are implemented, it will be the first time many schools and childcare facilities across most states fall under any state or federal lead testing requirements.

*TABLE 4*. **Economic Analysis for the Proposed Lead and Copper Rule Revisions**

| Program Type | Number of States | States |
|---|---|---|
| **Number of States with Programs for Testing Lead in Drinking Water at Schools** | | |
| Required Program | 12 | CA, DC, IL, MD, MN, NH, NJ, NY, RI, TN, VA, WA |
| Targeted/Pilot Program | 3 | AZ, UT, VT |
| Voluntary Program | 16 | AL, AR, CO, ID, IN, IA, ME, MA, MI, NV, NM, OH, OR, PA, TX, WY |
| No Information Found | 19 | AK, CT, DE, FL, GA, HI, KS, KY, MS, MO, MT, NE, NC, ND, OK, SC, SD, WV, WI |
| **Number of States with Programs for Testing Lead in Drinking Water at Childcares** | | |
| Required Program | 10 | CA, CT, DC, IL, NH, NJ, OK, OR, RI, WA |
| Voluntary Program | 2 | NM, UT, VT |
| No Information Found | 39 | AL, AK, AZ, AR, CO, DE, FL, GA, HI, ID, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NM, NY, NC, ND, OH, PA, SC, SD, TN, TX, VA, WV, WI, WY |

*SOURCE*: *Economic Analysis for the Proposed Lead and Copper Rule Revisions* (Washington, DC: Office of Water, US Environmental Protection Agency, October 2019), https://downloads.regulations.gov/EPA-HQ-OW-2017-0300-1769/content.pdf.

Saliently, the EPA also highlighted the need to more immediately move forward with lead service line inventories by water systems as "necessary to achieve 100% removal of lead service lines," and required that initial inventories be completed by October 16, 2024—by which time the agency anticipates it will take further regulatory action.[183] EPA also noted that outside of the Safe Drinking Water Act regulatory framework, there were additional actions that could help reduce lead in drinking water, those included discouraging partial LSL replacement and encouraging full LSL replacement.[184]

*TABLE 5.* **Classifying Service Line Materials When Ownership is Split According to the LCRR 40 CFR § 141.84(a)(4)**

| System-Owned Portion | Customer-Owned Portion | Classification for Entire Service Line |
|---|---|---|
| Lead | Lead | Lead |
| Lead | Galvanized Requiring Replacement | Lead |
| Lead | Non-Lead | Lead |
| Lead | Lead Status Unknown | Lead |
| Non-Lead | Lead | Lead |
| Non-Lead and Never Previously Lead | Non-Lead, Specifically Galvanized Pipe Material | Non-Lead |
| Non-Lead | Non-Lead, Material Other Than Galvanized | Non-Lead |
| Non-Lead | Lead Status Unknown | Lead Status Unknown |
| Non-Lead, But System Is Unable to Demonstrate It Was Not Previously Lead | Galvanized Requiring Replacement | Galvanized Requiring Replacement |
| Lead Status Unknown | Lead | Lead |
| Lead Status Unknown | Galvanized Requiring Replacement | Galvanized Requiring Replacement |
| Lead Status Unknown | Non-Lead | Lead Status Unknown |
| Lead Status Unknown | Lead Status Unknown | Lead Status Unknown |

*SOURCE*: *Economic Analysis for the Proposed Lead and Copper Rule Revisions* (Washington, DC: Office of Water, US Environmental Protection Agency, October 2019), https://downloads.regulations.gov/EPA-HQ-OW-2017-0300-1769/content.pdf.

Following the 2021 LCR Revisions, the EPA issued guidance in August 2022 for the development and maintenance of service line inventories.[185] These inventories must be publicly available, for water systems serving more than 50,000, they must be made available online, and all water systems must notify those served by the connections with LSLs, galvanized service lines that were or may have been downstream of a LSL at any time, or where the lead status is unknown within 30 days of completing their inventory. When ownership is split between a water system and a customer, the guidance document reflects (see Figure 3) that if either portion is lead, the pipe is to be classified as lead in the inventory. If either portion is of unknown lead status, even if the other portion is not lead, the inventory should reflect that the lead status is unknown. While the inventories are not expected to be complete until October of 2024, as noted above, the guidance document noted that:

> EPA encourages water systems to begin service line inventory and replacement efforts as soon as possible. EPA emphasizes that given the many benefits of lead service line replacement (LSLR), water systems should not wait until their inventory is complete to begin replacement efforts.[186]

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