EXECUTIVE SUMMARY

Lead-free water for all: Making the case for rapid lead pipe removal across the U.S. Six steps to scaling up equitable lead pipe replacement

The ROCKEFELLER FOUNDATION

In July 2021, as the world continued to reel from the Covid-19 pandemic, 47 experts assembled virtually to tackle a silent tragedy that has plagued impoverished inner-city dwellers for over a century: **lead poisoning** from tap water piped in through lead service lines.

Convened by The Rockefeller Foundation, city officials, scientists, and philanthropists sought to forge ties to expedite **nationwide lead pipe replacement**. Participants explored ways to tackle lead-triggered harm that disproportionately affects poor communities of color unable to pay for pipe replacements, just as Americans cried out to correct prior health injustices.

Technological change is proving to be a key driver. Using artificial intelligence to analyze expanded data sets—including those in handwritten notes, annotated maps, and service records—five years prior in Flint, Michigan, had materially boosted the odds and speed of finding lead pipes versus the prior 'excavate, test and replace' method, while cutting costs by tens of millions of dollars. The material identified as likely coating pipes was correct 70% of the time versus 14% for prior excavations. Historically, the cost of exploratory digging to identify the makeup of an individual pipe has made up around 40% of its total removal cost, wasting thousands of dollars per pipe on fruitless 'false positive' pursuits.

Spearheading this predictive model were two assistant professors at Georgia Tech and the University of Michigan who subsequently created analytics firm BlueConduit to expand their work, focusing its algorithm on highly concentrated lead pipe clusters in communities engaged in pipe replacement efforts. They hoped to help cities prioritize digging based on the highest likelihood of finding lead among those who most suffer from its toxicity.

The time was right, The Rockefeller Foundation decided, to scale up such efforts across the country, first by partnering with BlueConduit to pilot this work in four cities: Benton Harbor and Detroit, Michigan; Toledo, Ohio; and Trenton, New Jersey; and next by exchanging ideas from these and other cities' lead pipe replacement learnings at a virtual convening in July 2021.

In lively discussions, experts shared anecdotes, workarounds, tips, and tricks to start, expand, and accelerate lead abatement work already underway. Below we lay out six critical and enabling steps that peer cities may find useful as they pursue lead pipe removal projects. Each step is then explored in more detail, with case studies that illustrate real-world learnings from those who have undertaken this work. We hope this information can help guide the search for funds and ensure that strategies for equitable lead pipe replacement are at the forefront of lead abatement work.

«This is a once in a generation opportunity to solve this problem [that] we've been stuck with for 130 years.»

Tom Neltner
Chemicals Policy Director,
Environmental Defense Fund

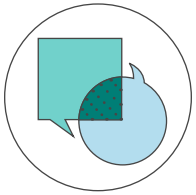
Six steps to fast-track lead pipe replacement in your city

1. Get as granular and visual as possible with data to tell a compelling story to funders, communities, the public, and decision makers

Collect and analyze compelling demographic, health, housing, and environmental data using artificial intelligence to paint a more accurate and complete picture of lead service lines in your city. Consider incorporating maps to demonstrate areas of focus and boost your odds of finding financing. Be sure to attribute all data sources.

2. Forge partnerships with organizations that have the skills, knowledge, and connections that your city or utility lacks to expedite lead pipe removal efforts

University researchers or think tanks with expertise in finding and analyzing data can help identify neighborhoods with lead pipes. Faith-based organizations may have tight connections with affected communities. Funders will be keen to learn of recent efforts to engage such partners and the tasks they would undertake to tackle this work through Letters of Support, with precise information about how their involvement will speed up, expand, and cut the cost of lead pipe removal, particularly in low-income communities.



3. Reach out to affected communities through trusted leaders, channels, and organizations to alert them to the risks of lead in water and of pipe replacement opportunities

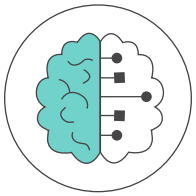
By addressing privacy and financing concerns, highlighting job opportunities, and articulating positive health outcomes in multilingual meetings led by local leaders, residents will be more inclined to approve lead pipe removal below and around their homes. Channels might include community forums, online messaging, webforms, and op-eds in community papers. Pilot projects that demonstrate the ease of working with a city on pipe replacement will also help spread the word, accelerate work, and generate goodwill.

4. Consider non-traditional financing vehicles and partners

Reaching out to philanthropists, social entrepreneurs, community banks, hospitals, and local businesses can help grow the universe of grants and no- to low-interest loans. Other possibilities include revolving funds linked to the Safe Drinking Water Act, bonds, innovation challenges, and prizes.

5. Launch a campaign to raise awareness of and build broad support for pro-replacement policies, funding, and projects

Frame the need for lead pipe replacement around environmental justice and health equity concerns. Through local champions, raise awareness of the need for full pipe replacement and connect lead poisoning to front page topics such as inequitable health outcomes. Consider engaging pro-bono lawyers and environmental organizations to advocate for statewide lead pipe removal deadlines; an end to partial pipe replacement; and mandatory disclosure notification and home inspection for lead pipes and their replacement if found before any sale or rental—all on environmental justice grounds.



6. Think creatively about key challenges

Challenges might include access to lead lines on the home side, distrust of government and science by residents, and resistance from private utilities. Pilot projects can surface solutions to obstacles; local messengers offering valued services like water testing or filters can foster trust and help garner approval for private home access for pipe removal work. Workarounds include immediate replacement of lead pipes found by plumbers doing routine work on water mains or repairing broken or leaky pipes, to reduce the cost of excavations.

Quick Facts About Lead in Drinking Water

Lead-tainted water: Harms and remedies

Among all ages, the fallout from lead exposure includes damage to the heart, brain and kidneys. Some 400,000 deaths a year are linked to lead, which is harmful at any level. This is particularly pronounced among low-income communities of color where historically absentee landlords contributed to neglect and under-investment in housing. Black children in the U.S. are much more likely to have higher levels of lead in their blood than their White or Hispanic peers. Moreover, more children of color missed tests for lead in their blood during the Covid-19 pandemic, while the risks of lead exposure increased during remote learning at home. These compounded harms make ending lead poisoning a pressing environmental justice issue.

The damage from lead pipes extends well beyond rustbelt cities in Illinois, Michigan, New Jersey, New York, and Ohio, which have the most lead service lines (about one quarter of all lead pipes in the U.S. are in the first three states). Up to 10 million homes risk exposure to lead-tainted water due to the nation's aging infrastructure. Flint, Michigan's, all-in removal was exceptional, triggered by public outcry (nearly 57% of its then-residents were Black). But the damage was done.

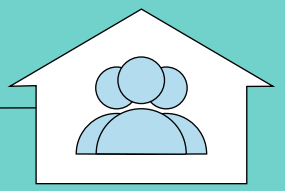
Meanwhile, healthcare, special education, and justice system remedies continue to drain municipal coffers. Altarum's analysis of the costs of lead exposure pegs annual economic loss per year from lead at $84 billion in medical and welfare costs, lower worker productivity, and premature deaths linked to lead exposure (from both tainted tap water and paint). Nationwide almost 60 million people do not drink their tap water, due in part to distrust about its safety. Conversely, just $1 invested in lead pipe removal returns $1.33 in economic benefits, and boosts tax revenue.

"When lead was finally restricted from paint, it was said that the nation's IQ increased," said Dr. Mona Hanna-Attisha, Founder of Hurley's Children Hospital's Pediatric Public Health Initiative, in her April 2021 testimony to the House Ways and Means Subcommittee on Trade. But the missed potential is immeasurable.

QUICK TAKE

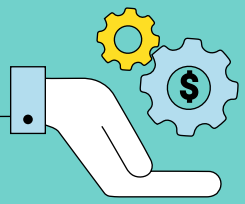
10M HOUSEHOLDS

UP TO 10 MILLION HOUSEHOLDS ARE AT RISK FROM LEAD-TAINTED WATER IN THE U.S.



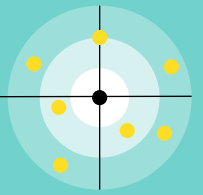
$1.33 IN ECONOMIC BENEFITS PER $1 INVESTED IN LEAD REMOVAL

RETURNS ARE SEEN ACROSS HEALTH AND EDUCATION OUTCOMES, LIFETIME EARNINGS, AND MORE*



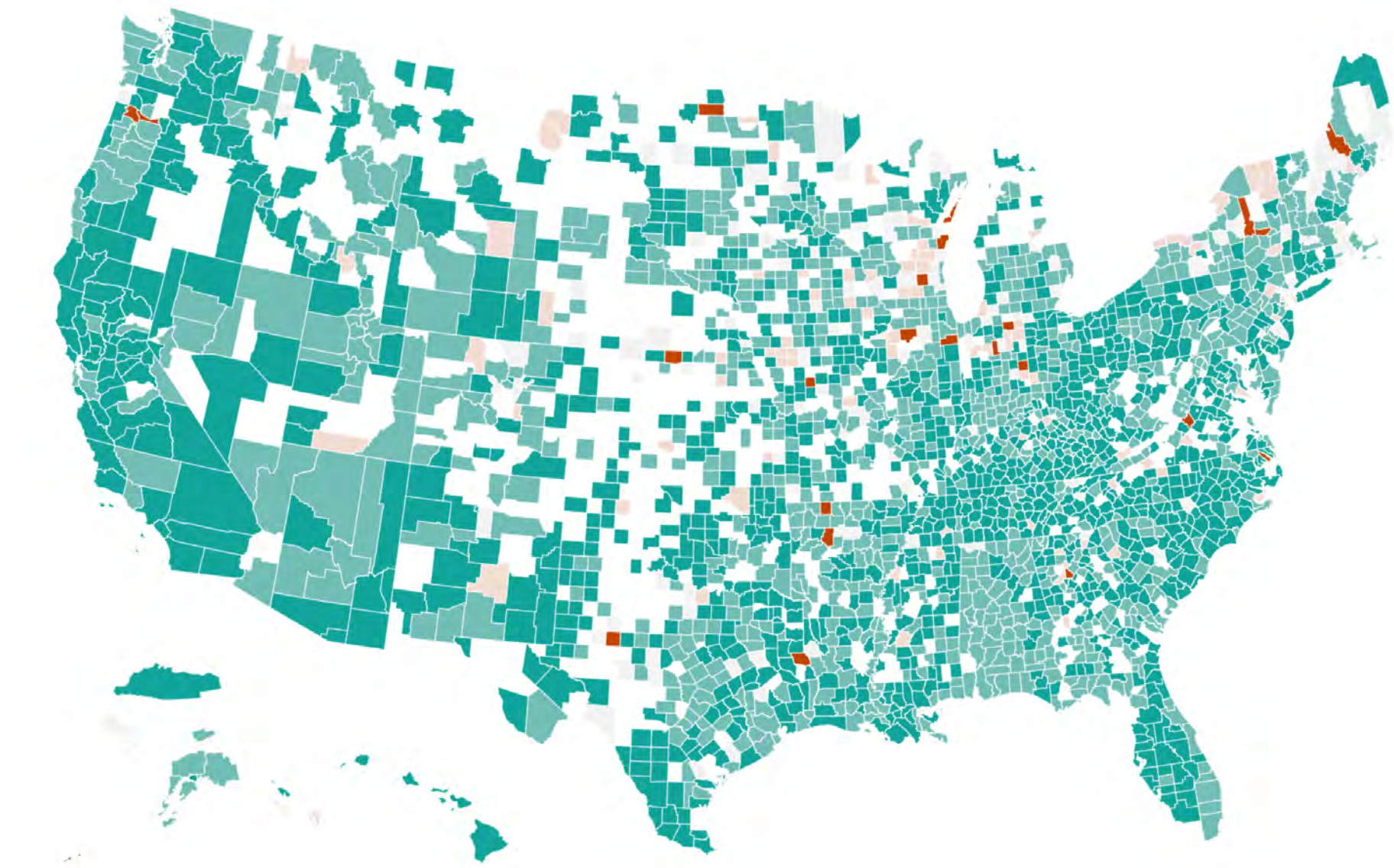
5X MORE ACCURATE THAN BIG DIGS

POWERFUL DATA ALGORITHMS CAN HELP PINPOINT LEAD PIPE LOCATIONS MORE ACCURATELY, SAVING CITIES TIME AND MONEY



* Source: "10 Policies to Prevent and Respond to Childhood Lead Exposure," by The Health Impact Project, the Robert Wood Johnson Foundation and The Pew Charitable Trusts

Elevated lead levels across the U.S. (2013 - 2019)



AVERAGE LEAD LEVELS IN PARTS PER BILLION

- 0.000 – 2.149
- 2.149 – 5.175
- 5.175 – 6.891
- 6.891 – 11.034
- 11.034 – 47.000

EPA considers levels of lead above 15 parts per billion in drinking water to be harmful to human health.

Timeline of U.S. lead pipe legislation

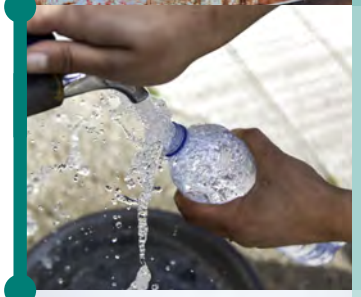
Though awareness of lead's adverse effects took root in the 1960s, lead pipes were only banned in the U.S. in 1986. Since then, pipes have increasingly been made from copper and plastic. Rapid progress is possible. From the 1970s to 1994, the percentage of U.S. children aged five and under with elevated blood lead levels (10 ppb or above) fell sharply to 8% from 88% after laws limiting or eliminating lead content in gasoline, soda cans, paint, and plumbing took effect. Newly built homes reduced the portion of homes with lead-based paint and pipes. But up to 10 million homes are still at risk from lead pipes, particularly in low-income communities and those of color.

1986

LEAD PIPES BANNED

The federal government bans the use of lead in plumbing. However, housing stock built before 1986 may still contain lead pipes or fixtures.

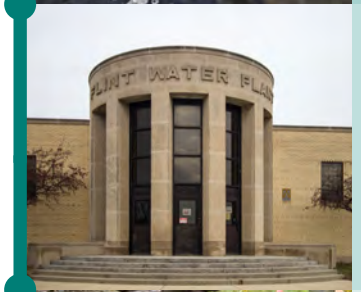
1991



LEAD AND COPPER RULE (LCR)

First federal legislation limits the concentration of lead and copper in drinking water.

2016



FLINT WATER CRISIS

The Flint water crisis sparks a series of updates to the Lead and Copper Rule. Among states, some place a higher priority on bolstering and expanding their lead pipe replacement programs.

2020

START OF REVISIONS TO THE LCR

Changes in exceedance thresholds and the required replacement of service lines are under consideration.

2021

EXTENSION OF THE LCR REVISION PERIOD

In June 2021, EPA extends the period for LCR revisions to December 2021, to allow for more input from the public.


Read the full report
rockefellerfoundation.org