

CHAPTER ONE

Chicago's Leaded Legacy: Past, Present, and Future

Brianna Gonzalez

Following the Flint Water Crisis of 2014-2016, concerns of lead in drinking water heightened nationwide. Due to the increased attention on the issue of water quality, many residents began to reevaluate Chicago's surprisingly extensive leaded water infrastructure. In Spring of 2016, Mayor Rahm Emanuel and various city departments announced additional precautionary measures to the city's water testing protocol, while applauding the city for "exceeding current state and federal regulations as well as industry standards" ("Mayor Emanuel...").

That same year, Chicago Public Schools (CPS) announced it would test all its schools for lead in the water. The first round of testing consisted of 324 schools that were built before 1986 and had pre-K programs, and results revealed that 113 schools had levels above the 15-ppb federal action level ("Water Testing Program"). Following the school district's water testing activities, the Chicago Park District announced it, too, would launch a pilot program to test water quality in its parks. A year later, the Park District continuously ran water fountains for a month after 300 of the 1200 the water fountains tested indicated elevated lead levels ("Chicago to Replace..."). Continuously running a tap, otherwise known as flushing, is done to prevent lead build-up and makes water safer to drink ("EPA in Illinois"). Several outdoor water fountains were found to be connected to lead service lines, but Park District officials decided to keep them in operation, as the water threat did not exceed the federal action level (Eng 2021).

Lead concerns aren't exclusive to public, city-owned properties: many Chicago residents have lead service lines connecting their homes and apartment buildings to the city's main water supply. The preponderance of lead service lines exists because of a longstanding city code, finally abandoned in 1986, that required the use of lead service lines (Shapiro et al.). Water tests conducted for Chicago residents between 2016 and 2021 indicated that approximately 1,000 out of 24,000 tests detected lead levels above the 15 parts per billion (ppb) federal limit (McCormick et al.). The tests were voluntarily undertaken by residents, so the results exclude the vast majority of city homes. About 71% of the tested homes showed lead levels at 1 ppb, which poses

a threat to the development of children's brains; children are particularly susceptible to harm from lead exposure (McCormick et al.).

With lead found in schools, parks, and various homes, Chicago residents are consistently being exposed to water sources containing the toxic metal. Both elevated and low lead concentration levels are consequential, and as more lead sources are being uncovered, an evaluation of the city's efforts to protect its residents from lead is necessary. The city's seeming lack of urgency to replace lead service lines has been emphasized by its slow replacement rates and overall failure to promote its resources aimed at countering lead. Left untreated, the lead problem that lies underneath the city will continue to harm residents of Chicago, and, in particular, will hinder the development of children.

Historical Background on Lead

For centuries, versatility and low cost made lead a popular choice for a multitude of uses, including lead plumbing systems, lead-based paints, and leaded gasoline. Although the first documented case of lead toxicity dates to the Roman Empire, it wasn't until the twentieth century that lead's harmful effects were acknowledged on a wider scale (Morris). Lead's toxicity was most notable in children, and by the late 1960s, the country could no longer deny the effects of lead on child development (Morris). Consequently, federal policies of the late twentieth century targeted the most common pathways of exposure: inhalation and ingestion (Tarragó and Brown). Lead-based paint was banned in 1978, lead service lines in new plumbing additions were banned in 1986, and leaded gasoline was banned by 1996 (Zaleski). These federal policies, however, failed to remove existing sources of lead inside public and private buildings and, in particular, from water service lines. As a result, leaded water infrastructure continues to pose dangers today.

Chicago's tap water meets federal and state quality standards when it is first prepared: there is no lead found in Chicago water when it leaves the water treatment plant. Lead enters the drinking water as it travels through city pipes; water dissolves lead in plumbing, and although the city adds phosphate to its water to avoid leaching, water that sits in pipes for long periods of time without being used will cause lead to dissolve into and contaminate the water ("Lead-Safe Chicago").

Health Effects of Lead

The Environmental Protection Agency (EPA) and Centers for Disease Control and Prevention (CDC) believe that there is no safe level of lead exposure. The prolonged presence of lead in the body can produce toxic effects such as high blood pressure, kidney disease, heart disease, and fertility issues (“Lead: Health Problems”). Neurological effects such as cognitive problems, impaired executive function, and abnormal social behavior have been linked to lead exposure – and children suffer from these effects at much lower blood-lead levels than adults (Tarragó and Brown). Lead is especially dangerous for children as it inhibits them from absorbing essential minerals such as iron, zinc, and calcium, which aid in proper brain and nerve development (Tarragó and Brown). As a result, there is no positive blood-lead level that does not pose a risk to a child's development.

The severity of harm from lead in the Chicago environment can best be seen by examining the impact of lead exposure on children. A 2015 study that linked the Chicago Birth Registry, Chicago Blood Lead Registry, and 3rd grade Illinois Standard Achievement Test scores for almost 60,000 children born in Chicago found that early childhood exposure to low levels of lead is associated with poorer academic performance (Evens et al.). The Chicago Health Atlas defines childhood lead poisoning as occurring in children ages 1-5 when they have a blood lead level at or above 5 micrograms per deciliter. In 2020, there were 1,081 reported incidents of child lead poisoning (Chicago Health Atlas).

Chicago’s Lead Politics

Given lead’s dangers, one might wonder why the city of Chicago continued to install lead service lines well into the mid-1980s. (Most major cities discontinued the use of lead pipes in favor of copper pipes by the 1960s (McCormick and Uteuova)). A significant factor in Chicago’s decision to accumulate approximately 400,000 lead service pipes appears to be the political clout of the Chicago Plumbing Union. Until the federal ban on lead pipes in 1986, the Chicago city code required homes and small apartment buildings to use lead service lines to connect to the water system (McCormick and Uteuova). The city code also required these pipes to be installed by a licensed union plumber, as lead pipes necessitate fittings that must be assembled by skilled plumbing professionals, whereas copper pipes do not (Bukro). These plumber-friendly codes were enforced by Chicago mayors presumably in hopes of gaining the electoral support of the Chicago Plumbing Union, as well as other labor unions.

Unsurprisingly, efforts to change the city code were unsuccessful and met with resistance from union leaders, who seemingly had a financial interest in the matter (Bukro).

Overview

With approximately 400,000 lead service lines, Chicago is the city with the most lead drinking water pipes in the United States (Eng 2021). According to the 2021 Service Line Material Inventory Report, there are an additional 118,746 service lines of unknown material, suggesting that Chicago could have more lead service lines than previously thought (“Illinois Service Line Report”). The 2021 Illinois Lead Service Line Replacement and Notification Act requires that Chicago remove all lead service lines by 2077. Prior to this state-level mandate, Chicago launched its Lead-Safe Chicago project, which consists of two initiatives: the Equity Lead Service Line Replacement Program (Equity LSLR Program) and the Homeowner-Initiated Program. These programs are meant to overcome the difficulties of lead service line replacements (LSLRs), focusing on alleviating the financial burdens of this large-scale infrastructural reform.

With the implementation of the Equity LSLR Program and the Homeowner-Initiated Program, Mayor Lori Lightfoot promised to have replaced 650 lead pipes by the end of 2021. As of December of 2022, the city has only replaced 280 (Chase). Of the 280 LSLRs, 225 were done through the Equity LSLR Program. So far, the implementation of the two city programs has been disappointing, having only replaced less than one-tenth of one percent of Chicago’s lead service lines.

This chapter will analyze why the city is failing to meet its proposed project timeline, and craft policy recommendations to address the challenges. To identify potential policy improvements, comparisons will be drawn to the completed lead service line replacement programs of Madison, Wisconsin and Newark, New Jersey. As the first major city in the United States to launch a full LSLR program, Madison is a noteworthy model to draw from. The city began replacing its 8,000 lead service lines with copper in 2001 after multiple properties tested for elevated lead levels (“EPA Seeks...”). Madison’s controversial program addressed resident reluctance and aimed to minimize costs. Another notable predecessor is Newark. Like Illinois, the state of New Jersey passed a bill (in 2021) requiring the complete removal of all lead service lines; however, the New Jersey legal timeframe is ten years, much shorter than that in Illinois. After Newark made headlines with its own lead crisis, the city replaced almost

its complete inventory of 23,000 lead service lines with copper pipes in just two years (Armstrong).

Additionally, this chapter identifies the obstacles that Chicagoans face in accessing aid to replace their lead service lines. The program application process has proven to be quite burdensome for Chicago residents, who decry the city's inaction and its lack of transparency. Routes of increasing lead understanding will also be discussed as a means to increase program participation. Ensuring that Chicagoans are aware of waterborne lead and its consequences is necessary as the city faces many more decades of potential lead exposure.

Lead-Safe Chicago: Equity Lead Service Line Replacement and Homeowner Initiated

It can cost up to \$27,000 to replace lead service lines in private homes, a price that would have to be shouldered by Chicago homeowners themselves (Shapiro et al.). An analysis of voluntary water tests conducted between 2016 and 2021 found that nine of the ten zip codes with the highest percentages of elevated lead levels were communities with predominantly Black and Hispanic populations (McCormick et al.). These zip codes consist of low-income communities in the South and Northwest parts of Chicago. To help low-income residents replace their lead service lines, the city of Chicago initiated the Equity LSLR Program, which provides eligible residents with grants to fully cover the price of service line replacement. Eligible houses must be single-family or two-flat, owner-occupied; they must submit water samples for free lead testing, and have a household income below 80% of the area median income ("Lead-Safe Chicago"). Starting in 2022, houses were no longer required to demonstrate elevated levels of lead to qualify, though priority is given to houses that have elevated lead levels or households with children under the age of 18 ("Lead-Safe Chicago"). Residents are also required to submit a multitude of supporting documents that include identification information for all household members, property information (property deeds, estate tax bills, utility bill copies, etc.), and income information for all household members ("Lead-Safe Chicago"). The second program, the Homeowner-Initiated Program, waives permit fees for eligible homeowners who would like to hire a contractor to remove an existing lead service line, saving homeowners up to \$3,100 ("Lead-Safe Chicago"). Under this program, replacements are paid for entirely by homeowners.

Lead-Safe Chicago expects to launch in 2023 a Daycare LSLR program. This project will provide daycares licensed by the Illinois Department of Children and Family Services and located in low-income neighborhoods with free LSLRs (“Lead-Safe Chicago”). Public information for this program is scarce, with no online application available, nor are eligibility requirements posted. Daycares are encouraged to send their contact information to the Department of Water to be considered for the program. There's no indication on the Lead-Safe Chicago website that any replacements under this program have started. In an article published in December of 2022, Water Commissioner Andrea Cheng expressed that the Daycare LSLR program aims to complete 120 replacements in 2023 (Chase). The Lead-Safe Chicago website also gives no indication if this program is meant to be geared towards licensed home daycares or childcare centers (or both). Ensuring that the Daycare LSLR Program is an option available to all childcare facility types is important to eliminate all sources of lead exposure for children. Lead service lines in home daycares impact multiple children, and not just the family that resides at the location.

Arduous Application Process

Past applicants have found the application process to be difficult. Residents have raised issues over the multitude of documents that must be submitted, as well as the faulty nature of the online application portal that often crashes during attempts to submit the paperwork (McCormick et al.). According to Megan Vidis, a spokesperson from the city’s Department of Water Management (DWM), approximately 800 households applied to the program in 2021 – but only 300 households submitted the required documentation with their application to qualify for the program (Cherone 2021). The large volume of incomplete applications suggests that the documentation requirements present a significant challenge to many of the households seeking the replacement of their service.

Lack of Communication / Promotion Efforts

The application process has also been marked by a number of features that have engendered further confusion and frustration. Originally, the city had assured residents they could begin to apply for the Equity LSLR program before the end of 2020, but the application portal did not open until March of 2021 (Monica 2021). Applicants have also reported long wait times for responses and, in some instances, no response at all (McCormick et al.). This reality conflicts with the program’s

statement that once a DWM staff member receives all required documents, they will mail out a status letter within two weeks (“Equity LSLR Application”).

Furthermore, the communication between the city and residents on the status of the program has been underwhelming. On the Lead-Safe Chicago website, there is no section dedicated to how the program has been doing so far; numbers regarding how many lead service lines have been replaced are not easily accessible to the public. A large portion of the information regarding the progress of the replacement plan has come from journalists reaching out to the Department of Water Management for comments. An April 2022 hearing on the lead replacement program in Chicago featured Commissioner Cheng, who participated in a US Senate Committee on Environment and Public Works hearing, chaired by Senator Tammy Duckworth, (D-Ill.) in April of 2022. The public was not able to attend this hearing, though a recording was later uploaded (“Implementation of Drinking Water...”). The lack of an open public hearing prevented Chicago residents from having the opportunity to ask their own questions regarding the Lead-Safe Chicago plan and discuss issues they are experiencing with the city officials present. No report has been forthcoming regarding where LSLRs have occurred, rendering it impossible to determine if the distribution of replacements has been equitable across Chicago communities. The question of whether the city is replacing lead service lines in the areas most impacted by lead exposure is thereby left unanswered.

In an informational session with the Chicago Bungalow Association, Commissioner Cheng reported that the city has been hosting community events to aid residents with their application at locations such as libraries (“LSLR Info Session”). Even so, residents will find it difficult to access these community outreach events when there is little city effort to announce them. A search through the city’s social media pages does not reveal any publicity for these events, nor is there a section dedicated to promoting outreach on the Lead-Safe Chicago website.

The City’s Logistical Challenges

Although city officials have not explicitly addressed the underperformance of the programs, Commissioner Cheng has cited issues such as state health codes requiring the replacement of sewer drains during service line replacements, residents’ reluctance to allow city construction on their property, and the cost of replacement (McCormick et al.). Indeed, cost is the issue most emphasized when discussing the challenges the city is facing in replacing lead service lines. Due to the scale of

Chicago's leaded infrastructure, the city estimates that the cost to replace lead service lines over the next 50 years is \$8 to \$10 billion ("Implementation of Drinking Water..."). In the April 2022 Senate Hearing, Commissioner Cheng addressed the need for federal funding to aid the city's efforts.

The precise mechanics of service line replacement construction present another difficulty. The two primary construction methods are "open cut" and "trenchless" installation ("LSLR Executive Summary"). Open cut installation requires digging a trench from the water main to the lead service line; this trench, stretching from the road to the residence, is quite disruptive and more costly than the trenchless option ("LSLR Executive Summary"). Nonetheless, trenchless construction is not feasible under current rules: trenchless construction on public right of way property is prohibited because it presents a risk of damaging other buried utilities ("LSLR Executive Summary"). The city's inability to use less expensive and faster methods partially accounts for the expensive nature of service line replacements in Chicago.

Lead Awareness

Another challenge of the Lead-Safe Chicago program being voluntary is that many residents do not know if their homes have lead service lines. Chicago currently provides its residents free water testing kits upon request, and residents can choose to mail in their water samples after collecting them or have a DWM worker pick up the test kit. The DWM states that it might take several weeks for residents to receive their results, depending on demand (Lead-Safe Chicago). In 2019, 7,364 kits were requested between April and July, residents sent back 3,695 samples to the DWM, but only 2,188 households received results (Cherone 2022). Although the Equity LSLR program no longer requires residents to have elevated lead levels to qualify for a free removal, evidence of an existing lead service line on the property is necessary for the city to get involved. This includes water testing kit results that indicate some level of lead or a licensed plumber's inspection of the service line. The slow response rate regarding the free water testing kits makes it difficult for residents to test their water quality and figure out if they face an immediate lead issue. This complication is especially important considering that problems caused by low levels of lead are difficult to trace, as most symptoms of low-level lead blood poisoning (abdominal pain, headaches, tiredness) can be caused by other issues ("Lead: Health Problems"). Even so, chronic exposure to lead has dangerous effects on one's health. The fact that

lead can be undetectable unless there's extremely high levels that discolor the water makes lead an insidious toxin.

Another difficulty regarding awareness of lead in one's home is the lack of lead disclosure laws in Chicago. Although there is a federal law that requires homeowners to inform potential buyers about the existence of lead-based paint hazards in the house, there is no such law for lead service lines. Additionally, tenants who rent a new unit do not receive a pamphlet regarding the potential dangers of lead pipes, unlike the ones required for lead-based paint. The EPA "Protect Your Family From Lead in Your Home" brochure highlights lead-based paint dangers, with much less prominent mention of the possibility of lead pipes in one's home ("Protect Your Family From Lead").

Case Study: Madison, Wisconsin

The full-service line replacement program in Madison, Wisconsin presents applicable solutions to the Equity LSLR program's logistical and participation challenges. Due to the passage of the Environmental Protection Agency's Lead and Copper Rule, Madison began testing various old homes in 1992 and frequently found elevated lead levels ("EPA Seeks..."). Per the Lead and Copper Rule, the city was required to bring levels down with a corrosion control treatment (CCT) of the city's choosing that would diminish the lead in the water ("EPA Seeks..."). Abigail Cantor, an independent consultant and chemist, was hired by Madison Water Utility (MWU) and found that the most common option of using phosphoric acid was not feasible for Madison due to the risk of contaminating area lakes and watersheds ("EPA Seeks..."). Cantor's recommendation to Madison was to replace all its lead service lines when she first presented her findings to MWU in 1994. For years, however, the MWU and Department of Natural Resources (DNR) went back and forth on how to abate lead, until the DNR relented and allowed the MWU to move towards full lead service line removal ("EPA Seeks..."). Despite facing relentless opposition from residents concerning service line removals due to skepticism about the dangers of lead and disagreements over using public money to partially fund private lead service line removals, the city managed to replace virtually all its lead service lines in a little over a decade ("EPA Seeks...").

How did Madison achieve this feat? To circumvent resident reluctance to remove their private lead service lines, the MWU worked with Madison's Common Council in 2000 to establish an ordinance regarding lead service lines. Madison

General Ordinance 13.18 required property owners to self-inspect or have a licensed plumber inspect and identify the material of their private service line and replace any lead ones (“MGO 13.12”). The ordinance also established that the city would provide financial assistance that covered half the cost (up to \$1000), and specified different time schedules, depending on the type of property, for owners to replace their lead service line (“MGO 13.12”). The ordinance also included a penalty of \$50-\$1000 a day for non-compliance in removing a private lead service line by the date MWU requested and/or for filing a false statement regarding the material of one’s service line (“MGO 13.12”). The total cost of the project over the span of 12 years was \$15.5 million for the city, not including the cost to homeowners (“Information for...”). To minimize costs and disruption, MWU avoided partial service line replacements by withholding requests for a private lead service line removal until the city could concurrently replace the public side (Theising). Furthermore, MWU and contractors made efforts to replace service lines in neighboring properties in succession as this also reduced costs (Theising).

Madison’s early removal of nearly all its lead service lines had implications for the rest of the nation. It bolstered the idea that local governments could address their lead problems by treating the issue at its root rather than relying on CCTs to limit the harms of lead service lines. As with Madison, Chicago’s water quality test results present a serious health hazard – a hazard that CCTs can in some circumstances control but not eliminate. The only viable long-term solution to Chicago’s waterborne lead is an efficient full LSLR program. By providing financial assistance to remove private lead service lines regardless of income eligibility, Madison ensured that residents would be less reluctant to replace their existing lead service lines. Chicago’s Equity LSLR program requires residents to apply, and the timeline and logistics can be discouraging to residents. The extensive list of necessary application materials inhibits many Chicagoans from completing their application and getting their lead service line replaced. Partial subsidies that would be available based only on a certification of a lead service line could incentivize more Chicago residents to remove their lead service lines.

Another key takeaway from Madison is that increasing efforts to remove neighboring lead service lines in succession can help alleviate the cost of LSLRs. Commissioner Cheng has acknowledged that block level replacements reduce the cost of LSLRs for Chicago (“Implementation of Drinking Water...”). Program participation among neighboring homeowners is necessary for block-level

replacements, emphasizing the need for high participation in the program. Conscious efforts to review and approve Equity LSLR applications for neighboring properties will facilitate city scheduling for these sorts of replacements.

Case Study: Newark, New Jersey

A review of a second city's full-service line replacement program can provide further insight on how to increase program participation for Chicago. In 2016, Newark experienced a water crisis due to tests indicating elevated lead levels in drinking water at several public schools. New Jersey's water distribution system utilizes two water sources, the Pequannock Water Treatment Plant (WTP) and the Wanaque WTP, which employ different CCTs (Stratton et al). The water treatment performed at Pequannock WTP was revealed to be ineffective due to its CCT, which caused widespread lead pipe corrosion and elevated lead levels throughout Newark (Stratton et al). City officials were heavily criticized for their initially slow response, as there was hesitancy on the city's side to admit that there was a problem to begin with (Armstrong). Although the issue was first raised in 2016, it was not until 2019 that the city started to distribute bottled water and begin an aggressive LSLR program (Armstrong). One motivating factor in the city's aggressive response was an EPA threat to impose penalties under the Safe Drinking Water Act "should the city not promptly undertake" its recommended action items (Lopez). Public attention to Newark's crisis spurred city action, as did state legislation passed in New Jersey. The state's bill to replace all lead service lines provided a 10-year timeframe for complete LSLR and, additionally, public water systems had only six months to deliver an initial service line inventory identifying the locations of all known lead service lines ("New Jersey Assembly Bill 5343").

Beginning in March of 2019, the city of Newark began replacing lead service lines at no cost to homeowners (Armstrong). City Ordinance No.6PSF-M, known as the Lead Service Lines Prohibited Ordinance, mandated homeowners to choose between a free LSLR done by the city or replacing the service line at their own cost and expense ("Chapter 16:23"). The only way that homeowners could exclude themselves from the requirement was by submitting written proof from a licensed plumber that there was no lead service line on the property. To overcome resident reluctance to consent to the city's replacement activity, the ordinance authorized the city to access private property and complete the LSLR without the consent of the owner if proof of exemption was not submitted within 90 days. If a resident failed to

sign up for the LSLR Program or replace their own service line, and prevented access to their property for city contractors (“Chapter 16:23”), they would be considered non-compliant. The penalties for noncompliance included a fine of \$250 - \$1000, or imprisonment not exceeding 90 days, or community service not exceeding 90 days (“Chapter 16:23”).

Each LSLR cost the city \$5,000 to \$10,000 and, according to the program’s website, it has replaced 23,186 lead service lines as of October 2022 (“City of Newark...”). The effort to replace all lead service lines consisted of construction workers going block-by-block and replacing about 125 service lines each day – a massive project that required temporary roadblocks and traffic reroutes (Armstrong). The city utilized the “pull through” method to remove its lead pipes, a method that requires some excavation but is generally trenchless as it avoids digging across yards and streets (Armstrong).

Newark’s aggressive LSLR program suggests that compulsory action with stricter timeframes is necessary to seriously address a city’s lead problem. Despite a slow start, Newark has had significantly faster replacement rates than Chicago. The city of Chicago needs to reevaluate its replacement rates and question why it was only able to replace 280 lead service lines in two years when it had received federal grants to cover the cost of a proposed 650 service lines (Cherone 2022). An increased sense of urgency seems requisite for Chicago officials and contractors regarding LSLR removal efforts.

Takeaways

In both Madison and Newark, the cities enacted an ordinance mandating removal of lead service lines that included penalties for noncompliance and guaranteed either full or partial financial assistance. Although the Illinois House Bill requires Chicago to remove all lead service lines in the next 50 years, the city itself has passed no ordinance similar to Madison’s or Newark’s regarding its lead legacy issue. The responsibility for service line removal has been passed on to homeowners, but there is no deadline for when homeowners must replace their lead lines other than a vague deadline of 2077 for the city. The lack of urgency is exacerbated by the lack of financial assistance. In this regard, Madison’s and Newark’s decision to provide financial assistance to its residents for LSLRs without the need of applying to a program is another notable suggestion for Chicago.

The ordinances in Newark and Madison also targeted homeowner reluctance to remove their lead service lines. Both cities were empowered to impose fines if homeowners refused to comply with their respective LSLR programs, whereas Chicago's Lead-Safe program remains voluntary. In the Senate Hearing of April 2022, Water Commissioner Cheng cited resident reluctance to participate in the Lead-Safe Chicago as an issue but maintained that the city would rather explore other options before it turned to any sort of compulsory ordinance ("Implementation of Drinking Water..."). In Newark, homes that were suspected to have a lead service were mailed instructions with how to complete the Right-of-Entry form online, and given paper versions that they could mail to the Department of Water Sewer Utility ("Registration and Right of Entry"). In Chicago, no such outreach regarding Lead-Safe Chicago's Equity LSLR program has occurred. The lack of publicity for the Equity LSLR could be a potential barrier as residents might not be aware that they can even apply for this aid.

Neither Madison nor Newark required owners to reside on their properties at the time of LSLRs to be eligible for their programs ("Chapter 12:63" & "MGO 13.12"). In contrast, Chicago's program excludes rental homes: eligible homes must be owner occupied (Lead-Safe Chicago). Excluding rental properties precludes the cost-saving strategy of scheduling LSLRs for neighboring properties. Should the city want to explore block-level LSLRs, it needs to be cognizant of what properties are eligible for LSLR, regardless of whether the property is owner or renter occupied.

Madison, Newark, and Chicago all had their own motivations for requiring LSLRs, but the common factor was elevated lead levels revealed in water testing results. The city government responses ranged from denial to proactive resolutions. Whereas officials in Newark initially refused to address their problem, Madison hired consultants like Cantor pushing the city and its residents to remove lead service lines before more cases of elevated lead water were seen. Chicago has an opportunity to treat the problem with the attention it deserves before it becomes a comprehensive crisis, as it did in Newark. Overall, the Madison and Newark case studies show that Chicago can and should be more aggressive in its LSLR programs.

Recommendations

Mayor Lightfoot notes that a succession of Chicago mayoral administrations have been "kicking the can down the road" in regards to Chicago's lead legacy (Cherone 2021). In comparison, Lightfoot is the first mayor to address this issue by

implementing a program that is meant to help homeowners replace their lead service lines. Lead-Safe Chicago is the first step in Chicago's attempt to address its legacy issue, but the program has been riddled with both internal and external complications. Although there are logistical challenges beyond the scope of the city's control (such as the need for more federal grants), there are other considerations that policymakers and program staff can look to to minimize costs and increase resident participation.

Expanding Eligibility: Owning vs. Renting

A key feature of Lead-Safe Chicago is that it is intended to be equitable by targeting the disproportionate rates of lead exposure in Chicago. The city's decision to make the Equity LSLR Program available only for homeowners who reside on their property, however, is an impediment to equity. Racial and ethnic minorities, and those with lower incomes, are more likely to rent rather than own homes (DeSilver). By requiring homeowners to live on their property to be eligible for a LSLR grant, the city is placing the onus of delivering safe water on landlords, who are unlikely to take on a costly construction job. The expensive nature of LSLRs might particularly discourage landlords from taking on the responsibility by themselves if they are not the ones being exposed to lead. Due to the non-compulsory nature of Chicago's LSLR programs, landlords have no external motivation to replace their lead service lines unless their property has tested for elevated lead levels and has been reported to the city. Consequently, low-income tenants have no pathway to remove lead service lines in their rental properties, even if it is low-income populations that are disproportionately affected by this crisis. By expanding Equity LSLR program eligibility to houses that are not owner occupied, Chicago could eliminate more sources residential lead exposure. Expanding program eligibility to rental properties protects low-income residents who have limited housing options by offering more aid for landlords to provide safe housing.

Addressing Resident Reluctance

The Lead-Safe Chicago program is voluntary, and Commissioner Cheng has discussed that Chicago would like to explore additional avenues to overcome resident reluctance before enforcing a mandatory right-of-entry ordinance such as that adopted by Newark (Implementation of Drinking Water...). What could these further avenues involve?

A potential tool to counter resident reluctance is to incorporate lead service lines into real estate disclosure laws. For example, property owners could be required to test their water and inform potential buyers and/or tenants of the test results before any new purchase or leasing transactions are finalized. (This obligation would be similar to federal laws that require property owners to disclose lead-based paint hazards.) Lead disclosure laws would encourage homeowners to proactively identify and replace their lead service lines if they wish to sell or rent their property. Although such a disclosure mandate would not require homeowners to replace their lead service lines, it would foster greater transparency regarding the lead status of a building and allows potential residents to make an informed decision on whether they wish to live in a property with water-based lead exposure.

Disclosure could also be mandated with respect to the composition of water-line pipes. That is, the city could require homeowners to verify and report their service line material, such as lead or copper. (The resulting data would also respond to the requirement in Illinois law for Chicago to inventory its lead service lines). A template exists in an ordinance from Madison, which gave residents 90 days to inspect their service lines and submit information on the material to the city (“Chapter 16:23”). Awareness of one’s lead service line material can incentivize owners who learn that their service line is lead to undertake a LSLR. Homeowners previously unaware of the dangers of lead and or its presence within their homes will be forced to confront issues with their water infrastructure.

Adopting Cost-Effective Strategies

Another reform that could facilitate implementation of Chicago’s Equity LSLR and target the cost problem is allowing trenchless construction on public right-of-way property. The program acknowledges that trenchless construction is less expensive than open-cut construction, but regulations bar the technique from being used in the city. According to Commissioner Cheng, a large contributor to cost is the fact that “open cut” trench methods add 35 percent to 50 percent to the overall cost of service line replacements (Implementation of Drinking Water...). Additionally, the disruptive nature of trench methods and the inconvenience caused some residents to turn down LSLRs on their property. Local regulations prohibit the city from using trenchless construction due to the possibility of impacting other buried utilities, but this potential problem has been surmounted in other cities’ LSLR programs (“LSLR

Executive Summary”). Safety regulations short of a ban could control the risks of trenchless construction, while offering considerable cost savings.

In combination with less expensive construction methods, Chicago could also reduce costs by strategically completing LSLRs in spatial clusters. Replacements in the city of Madison often occurred sequentially along a given street by intentionally focusing on specific neighborhoods, one at a time (Theising). Chicago could minimize costs by enacting a similar strategy, and this would have the additional benefit of prioritizing the most affected neighborhoods. (As mentioned before, there is no public record regarding where Chicago has completed replacements under the Equity LSLR program.) Conducting multiple neighboring replacements can limit the cost associated with construction.

Increasing Lead-Safe Chicago Publicity

Although Commissioner Cheng discussed community outreach events regarding the Equity LSLR Program, the fact remains that they have not been well publicized, as their lack of online traces attests. Most residents have not been aware of these community outreach efforts and were not able to procure help in completing the application and submitting associated documentation. A section on the Lead-Safe Chicago Website, the city’s hub for information regarding the program, could be dedicated to community outreach events, increasing communication between the Department of Water Management and residents. To overcome possible technological barriers, the city could also mail brochures describing the Lead-Safe Chicago Program to properties, to make sure some sort of non-electronic information is available to residents.

Conclusion

Chicago’s lethargic efforts to replace lead service lines demonstrate that the Lead-Safe Chicago program needs serious attention. A lack of public participation in the Equity LSLR program – a program that is of almost pure benefit to families by abating lead in their homes – signals that the city needs to seriously troubleshoot its application process and promotional efforts. If residents are consistently failing to submit documentation or are confused about requirements due to a lack of access to information sessions, then these aspects need to be reformed.

Chicago is still in its early phases of implementing the Lead-Safe Chicago program. Fortunately, this means that the city has time to explore solutions to its

current difficulties and make the program successful. Even with a relatively distant state-imposed deadline of 2077 to remove all of its estimated 400,000 lead lines, the city still needs to complete LSLRs at an enhanced rate. Most citizens cannot afford the expense of a service line replacement, so many will rely on programs like the Equity LSLR or the Homeowner's Initiative to abate lead in their homes. A compulsory ordinance to remove lead service lines would be the most direct and effective way to aggressively target Chicago's lead legacy issue, but unless the city pledges to subsidize lead service line removals for those who need it, an ordinance of this nature would be inadvisable.

To faithfully protect the health of Chicago residents, the city needs to prioritize its full-lead service line removal plan and proactively minimize the threat of waterborne lead. Left untreated, Chicago's extensive leaded water infrastructure will pose a danger for generations to come.

References

Armstrong, Kevin. "'Hallelujah Moment': How This City Overcame Its Lead Crisis." *The New York Times*, The New York Times, 11 Aug. 2021, <https://www.nytimes.com/2021/08/11/nyregion/newark-lead-pipes-drinking-water.html>.

Bates, Josiah. "Newark Water Crisis: What We Know about Lead Contamination." *Time*, Time, 27 Aug. 2019, <https://time.com/5653115/newark-water-crisis/>.

Bukro, Casey. "Lead-Pipe Issue Surfaces Again." *Chicago Tribune*, 30 Mar. 1986, <https://www.chicagotribune.com/news/ct-xpm-1986-03-30-8601230396-story.html>.

"Chapter 16:23 Mandatory Replacement of Lead Service Line." *City of Newark, NJ Code*, City of Newark, Sept. 2019, <https://ecode360.com/36709572>.

Chase, Brett. "Lightfoot's Plan to Replace Chicago's Lead Water Pipes Has Switched out 280 of an Estimated 390,000 Service Lines." *Chicago Sun-Times*, Chicago Sun-Times, 5 Dec. 2022, <https://chicago.suntimes.com/2022/12/2/23488902/lead-water-service-line-replacement-chicago>.

Cherone, Heather. "Crews Have Replaced Less than 0.5% of Lead Service Lines Shown to Contaminate Tap Water in Chicago Homes: Data." *WTTW News*, 22 Sept. 2022, <https://news.wttw.com/2022/09/20/crews-have-replaced-less-05-lead-service-lines-shown-contaminate-tap-water-chicago-homes>.

Cherone, Heather. "Biden Calls for Chicago's Lead Pipes to Be Removed within 10 Years, as Slow Roll out Continues in Chicago." *WTTW News*, 16 Dec. 2021, <https://news.wttw.com/2021/12/16/biden-calls-chicago-s-lead-pipes-be-removed-within-10-years-slow-roll-out-continues>.

“Chicago Lead Poisoning Rate.” *Chicago Health Atlas*, City of Chicago, 2022, <https://chicagohealthatlas.org/indicators/LDPP?topic=lead-poisoning-rate>.

“Chicago Lead Service Line Replacement Program Info Session (Webinar Recording).” *YouTube*, Chicago Bungalow Association, 20 Sept. 2022, <https://www.youtube.com/watch?v=R8nVpw5-saQ>. Accessed 24 Oct. 2022.

“City of Newark: Lead Service Line Replacement Program.” *Newark's Lead Service Line*, City of Newark, 2022, <https://www.newarklead serviceline.com/replacement#:~:text=The%20program%20will%20remove%2018%2C000,from%20between%20%245%2C000%20and%20%2410%2C000>.

DeSilver, Drew. “As National Eviction Ban Expires, a Look at Who Rents and Who Owns in the U.S.” *Pew Research Center*, Pew Research Center, 3 Aug. 2021, <https://www.pewresearch.org/fact-tank/2021/08/02/as-national-eviction-ban-expires-a-look-at-who-rents-and-who-owns-in-the-u-s/>.

Eng, Monica. “Chicago to Replace, Remediate or Remove Park Fountains with Lead Pipes.” *NPR*, NPR, 24 Apr. 2019, <https://www.npr.org/local/309/2019/04/24/716773193/chicago-to-replace-remediate-or-remove-park-fountains-with-lead-pipes>.

Eng, Monica. “Despite a Promise, Chicago Has Made No Progress on Removal of Lead Pipes.” *WBEZ Chicago*, WBEZ Chicago, 3 Sept. 2021, <https://www.wbez.org/stories/despite-a-promise-chicago-has-made-no-progress-on-removal-of-lead-pipes/02644e18-4cd5-4e7e-b595-3ebc111c62a6>.

“EPA in Illinois: Advice to Chicago Residents About Lead in Drinking Water.” *EPA*, Environmental Protection Agency, 6 June 2022, <https://www.epa.gov/il/advice-chicago-residents-about-lead-drinking-water>.

“EPA Seeks Details of Madison’s Lead Service Replacement Program.” *City of Madison, Wisconsin, Water Utility Administrative Office*, 7 Nov. 2014, <https://www.cityofmadison.com/water/insidemwu/epa-seeks-details-of-madisons-lead-service-replacement-program>.

Equity Lead Service Line Replacement Program, City of Chicago Department of Water Management, 1 Feb. 2022. https://assets.website-files.com/5f122867a5f32dc8569c0765/627c75a851816d10f8941b7b_Equity%20LSLR%20Application%20Feb%202022.pdf. Accessed 24 Oct. 2022.

Evens, Anne et al. “The impact of low-level lead toxicity on school performance among children in the Chicago Public Schools: a population-based retrospective cohort study.” *Environmental health: a global access science source* vol. 14 21. 7 Apr. 2015, doi:10.1186/s12940-015-0008-9

“Illinois Service Line Material Inventory Reports.” *Illinois.gov*, Illinois Environmental Protection Agency, 15 Apr. 2021, <https://www2.illinois.gov/epa/topics/drinking-water/public-water-users/Pages/lead-service-line-information.aspx>.

“Implementation of the Drinking Water and Wastewater Infrastructure Act: State Planning for Full Lead Service Line Replacement.” *US Senate Committee on Environment and Public Works*, 22 Apr. 2022, Accessed 24 Oct. 2022.

“Information for Utilities on Lead Service Replacement.” *City of Madison, Wisconsin*, Water Utility, <https://www.cityofmadison.com/water/water-quality/water-quality-testing/lead-copper-in-water/information-for-utilities-on-lead-service-replacement>.

Lead Service Line Replacement Plan: Executive Summary, City of Chicago, Apr. 2021. https://assets.website-files.com/5f449d7e5b8d215f7b02837c/609069f57742b643238fe77b_Chicago%20LSLR%20Program%20Executive%20Summary.pdf.

“Lead Service Line Replacement.” *Water: Lead-Safe Chicago*, City of Chicago, <https://www.lead-safe-chicago.org/lead-service-line-replacement>.

“Lead: Health Problems Caused by Lead.” *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 8 Dec. 2021, <https://www.cdc.gov/niosh/topics/lead/health.html>.

Lopez, Peter D. “Letter August 9, 2019 from Peter D. Lopez to Hon. Catherine McCabe Commissioner and Hon. Ras Baraka Mayor.” Received by Catherine McCabe and Ras Baraka, *US Environmental Protection Agency*, 9 Aug. 2019, <https://www.epa.gov/sites/default/files/2019-08/documents/r2letteraugust092019.pdf>.

Madison General Ordinance (MGO) 13.18, City of Madison, Wisconsin, 2000. <https://www.cityofmadison.com/water/documents/MGO%2013%2018.pdf>. Accessed 24 Oct. 2022.

“Mayor Emanuel, City of Chicago Applaud Work of State and Federal Legislators to Address Lead; Announce Additional Actions to Increase Monitoring, Reassure Public of the Safety of Chicago.” *City of Chicago*, 27 Apr. 2016, https://qa.chicago.gov/city/en/depts/mayor/press_room/press_releases/2016/april/Aplaud-Work-of-State-and-Federal-Legislators-Address-Lead.html. Accessed 24 Oct. 2022.

McCormick, Erin, and Aliya Uteuova. “Profiting from Poison: How the US Lead Industry Knowingly Created a Water Crisis.” *The Guardian*, Guardian News and Media, 22 Sept. 2022, <https://www.theguardian.com/us-news/2022/sep/22/us-lead-industry-history-water-crisis>.

Morris, Frank. “Before It Was Dangerous, Lead Was the Miracle Metal That We Loved.” *NPR*, NPR, 6 Apr. 2016, <https://www.npr.org/2016/04/06/473268312/before-it-was-dangerous-lead-was-the-miracle-metal-that-we-loved>.

“New Jersey Assembly Bill 5343.” *LegiScan*, legiscan.com/NJ/text/A5343/2020.

“Registration and Right of Entry.” *Newark's Lead Service Line Replacement Program*, City of Newark Department of Water and Sewer Utilities, 10 Sept. 2019, <https://www.newarkleadservice.com/register>.

Protect Your Family From Lead in Your Home, Environmental Protection Agency, 2021, <https://www.epa.gov/sites/default/files/2020-04/documents/lead-in-your-home-portrait-color-2020-508.pdf>.

Shapiro, Ari, et al. “New Report Finds 'Shocking' Levels of Lead in Chicago Water.” *NPR*, NPR, 23 Sept. 2022, <https://www.npr.org/2022/09/23/1124836898/lead-contamination-in-chicagos-water-system-was-exposed-by-journalists-analysis>.

Stratton, Sean A., et al. “The Lead and Copper Rule: Limitations and Lessons Learned from Newark, New Jersey.” *WIRES Water*, 2022, <https://doi.org/10.1002/wat2.1620>.

Tarragó, Oscar, and Mary Jean Brown. *Case Studies in Environmental Medicine: Lead Toxicity*, https://www.atsdr.cdc.gov/csem/lead/docs/CSEM-Lead_toxicity_508.pdf.

Theising, A. Lead Pipes, Prescriptive Policy and Property Values. *Environ Resource Econ* 74, 1355–1382 (2019). <https://doi.org/10.1007/s10640-019-00372-5>

“Water Testing Program at Chicago Public Schools.” *Chicago Public Schools: Water Quality Testing*, Chicago Public Schools, 31 Aug. 2016, <https://www.cps.edu/globalassets/cps-pages/services-and-supports/school-facilities/water-quality-testing/r1-watertestingprogramoverview.pdf>. Accessed 16 Oct. 2022.

Zaleski, Andrew. “Undoing the Legacy of Lead Poisoning in America.” *Bloomberg.com*, Bloomberg, 2 Jan. 2020, <https://www.bloomberg.com/news/articles/2020-01-02/undoing-the-legacy-of-lead-poisoning-in-america>.

Editorial note: For a related op-ed in the *Chicago Policy Review*, please see <https://chicagopolicyreview.org/2023/01/23/has-the-city-done-all-it-can-to-make-its-lead-service-line-replacement-program-accessible/>.