

September 2018

Safe at Home?

Lead in Tap Water Remains Issue in Some City Dwellings

Summary

Lead has been in the news and on the minds of many New Yorkers in recent months. The City Council is considering at least 23 bills that address various issues around lead exposure. As recent reports about the city's public housing have underscored, lead paint is the predominant source of lead in city residences. But tap water can also be a source of lead. Numerous privately owned older, smaller residential buildings in New York have plumbing that contains a much higher level of lead than is currently allowed to be used in new construction.

In this report, IBO examines the potential scale of lead contamination in New York City tap water and the rules that set the standards for detection and amelioration. Overall, the city is in compliance with federal and state regulations for at-the-tap monitoring in residences. The city spends about \$10 million annually treating the water supply with anticorrosive chemicals to help prevent lead from leaching into the water as it passes through lead pipes. The city also offers free lead-testing kits to any resident who requests one.

Among the specific findings from our study:

- Since 1993, tap water samples have had on average lower levels of lead and fewer tests have exceeded the federal Environmental Protection Agency threshold for lead. Although most test results find no traces of lead, lead above the threshold continues to be detected in a small percentage of buildings.
- Smaller, older buildings, especially those built in the 1920s and 1930s, generally have higher rates of lead tests above the federal threshold.
- Based on test data from 2006 through 2016, the highest rates of tap water test levels exceeding the federal threshold were in community districts that included neighborhoods such as Ridgewood and Maspeth in Queens, Bedford Stuyvesant in Brooklyn, Co-Op City and Riverdale in the Bronx, and South Beach in Staten Island.

While the city meets federal and state regulations regarding lead in water, it is important to note that federal rules permit 10 percent of residential buildings in the Department of Environmental Protection's annual compliance testing group to exceed the threshold for lead. There is no water lead standard for individual private residential buildings. In a city the size of New York, this means a substantial number of homes and families may be exposed to lead from their faucets. The city has no means to compel landlords or homeowners to remove lead leaching service lines or fixtures and landlords are not required to notify tenants or prospective tenants if a building has been found to have elevated levels of lead in the water or if renovation work may cause lead levels to temporarily rise.

Background

The New York City Department of Environmental Protection (DEP) is responsible for providing clean water to the city's 8.5 million residents. Approximately 1 billion gallons are delivered daily with around 90 percent of the water historically coming from the Catskill-Delaware watershed and the remainder from the Croton watershed. A system of reservoirs upstate provides water via aqueducts to the city, where it is treated and flows through the city's water mains and into individual buildings. DEP regularly tests water quality at reservoirs, treatment facilities and in the distribution system and finds good quality water with virtually zero lead detected. Before water flows out of a residential tap, though, it must pass through the piping in private buildings—which may have plumbing fabricated with lead prior to laws prohibiting its use.

Lead was commonly used in residential plumbing, including in New York City, until its use was restricted by federal law. Service lines, the pipe that connects a building to the city's water mains, were prohibited from containing lead for new installations in 1961. Previously, two inch and smaller diameter service lines commonly contained lead, while larger service lines did not contain lead. Amendments to the Safe Drinking Water Act, put in place in 1986, stipulated that states had to greatly reduce lead levels in solder by 1988. The Lead and Copper Rule, promulgated in 1991, restricted the percentage of lead that could be used in fixtures, which has been lowered in subsequent amendments to the rule. These regulations, however, only covered new construction, so the stock of existing lead plumbing was allowed to remain in use.

At the local level, New York City regulations prohibit lead service lines at private residences from being repaired if they are damaged, instead requiring that such lines be replaced with pipes that do not contain lead. New York City has no local requirement that undamaged lead service lines be replaced. Considering this regulatory framework and the age of the city's housing stock, many small residential buildings likely contain lead in some facet of their plumbing system, and are therefore at risk of lead leaching into drinking water delivered to the tap.

The federal Environmental Protection Agency (EPA) has determined that there is no safe level of exposure to lead based on the best available science. The EPA has set the action level for at-the-tap lead contamination, however, at 15 parts per billion (ppb). The lead action level refers to the concentration of the contaminant, which

if exceeded in more than 10 percent of tested homes, triggers requirements that a water system must follow. The lead action level is set higher than zero because of other considerations such as cost, public benefit, and the ability of public water systems to reduce contaminant levels through corrosion control. In comparison, the federal Food and Drug Administration has set the allowable lead limit for bottled water at 5 ppb.

Local Responsibilities. The regulatory burden for controlling lead levels falls on the city's Department of Environmental Protection (DEP), as the EPA holds the public municipal water system responsible for lead contamination even where the source of contamination occurs in private buildings. Monitoring of the water lead level in private homes is meant to measure the need for and efficacy of corrosion control. Adding anticorrosion additives at water treatment plants is the most cost effective citywide control method to minimize lead leaching when water passes through lead pipes.

In accordance with the EPA Lead and Copper Rule and the New York State Sanitary Code, DEP is required to conduct at-the-tap monitoring in residences at risk for exposure to lead. DEP maintains a compliance sample of buildings known to have lead in their plumbing that agree to test their water at least annually for lead contamination. If more than 10 percent of the samples collected from the compliance pool are above the EPA's 15 ppb action level, the city is considered to be out of compliance and must take action, which could include public education or adjustments to the water treatment process. New York State law requires that all schools comply with the 15 ppb EPA limit and DEP has coordinated the replacement of all known city-owned lead service lines. But there are currently no requirements to mandate removal of lead plumbing materials from private buildings regardless of the lead concentration in their tap water.

In addition to the compliance monitoring, DEP offers a free lead testing kit to any city resident who requests it. If a test shows lead in the water, this household is solicited to join the compliance pool. The compliance pool consists of several hundred households who test their water in exchange for a small credit on their water bill.

By examining these records of residential water sampling since 1993, the Independent Budget Office sought to understand the potential scale of lead contamination in New York City residential water taps. We identified building ages and sizes that are most at

risk, and the parts of the city where at-the-tap lead water contamination is most prevalent.

Rates of Positive Lead Water Tests Falling

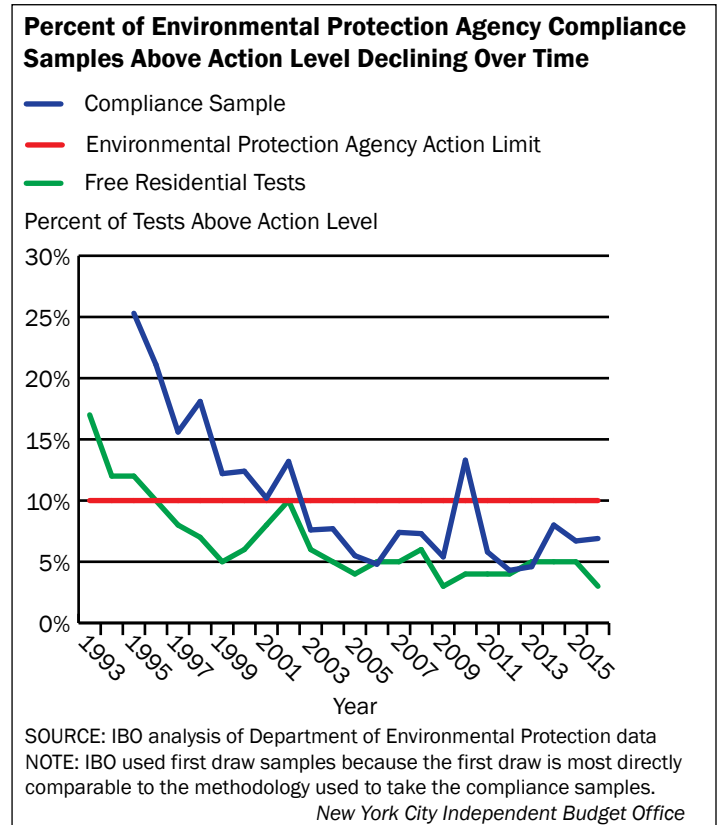
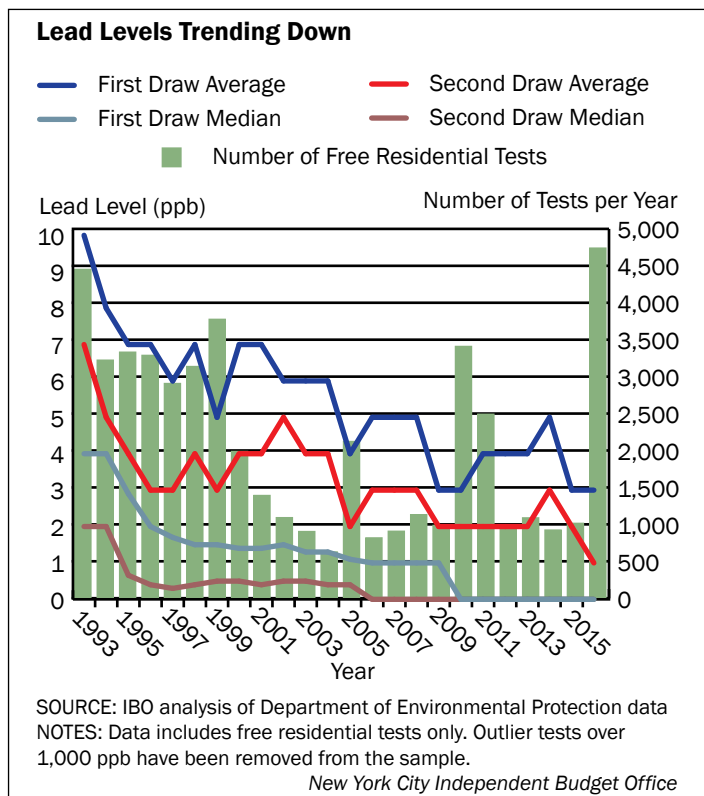
IBO analyzed changes in the average and median lead test results as well as the rate of tests exceeding the action level of 15 ppb for the free residential tests. As lead is no longer used in service lines or plumbing, these rates should gradually decline over time. We found lower average test results and fewer tests exceeding the EPA action level, but lead results above the action level continue to be detected in a small percentage of buildings.

The lead testing kits sent to residents who request them contain two testing bottles in order to check water exposed to different parts of the plumbing for different amounts of time.¹ The first draw is taken after the water has been sitting in the pipe for at least six hours and represents water in extended contact with the fixtures and adjacent piping. The second draw is taken after flushing the pipes of stagnant water by running the water for a minute or two, representing water that has been exposed for only a short amount of time. DEP also recommends flushing as a way to reduce lead exposure in buildings that have lead in their plumbing, so the post-flush test measures the lead concentration after reasonable measures have been taken to reduce lead exposure.

As expected due to the water's longer retention time in the pipes, first draw samples mostly record higher lead levels. Results from the second draw record lower lead levels with fewer outliers. Median lead test results also show a decline in the number of tests with lead present. The median test result for the first draw has been zero since 2010 and zero for the second draw since 2006, indicating that in recent years more than half of tests detect no lead. Among tests that do detect lead and excluding outliers, the first draw averages 7.6 ppb and the second draw averages 6.5 ppb.

Average lead levels among the tests that find lead have been fairly steady since 1993, suggesting that declines in lead levels overall in the sample are driven by more tests showing zero lead over time. Public interest in requesting lead tests is highly variable from one year to the next, with spikes in the number of tests requested in a given year generally corresponding to years where lead is in the news, such as the recent Flint water crisis.

Testing Limits. Though informative, these test results should not be taken as representative of the average condition of residential tap water in the city. Some households that know they have lead in their plumbing will repeatedly order tests to monitor their water and in general, people who live in older housing who suspect they may have an issue with their water are more likely to request a test than those who live in newer buildings and have no reason to suspect contamination.



Therefore, the group of people who request lead test kits from the city are more likely to have lead in their water than the overall population. Nevertheless, test kits are ordered by people living in buildings of all ages and sizes, even those very unlikely to have any lead in their plumbing.

Data from both the compliance sample and free residential tests show that lead levels have generally been declining. Over time, the share of lead samples that exceed the EPA action level has fallen as lead service lines and older buildings are replaced, but this decline has slowed in recent years with little change over the past decade. New construction and renovation may eventually replace nearly all service lines and pipes, but given that around 4 percent of the free residential water tests in recent years are still above the EPA action level, this may take a very long time. The compliance sample consists of homes with known lead in their water distribution systems so this rate might be expected to remain steady, but even the free samples show only a small decline over the past decade.

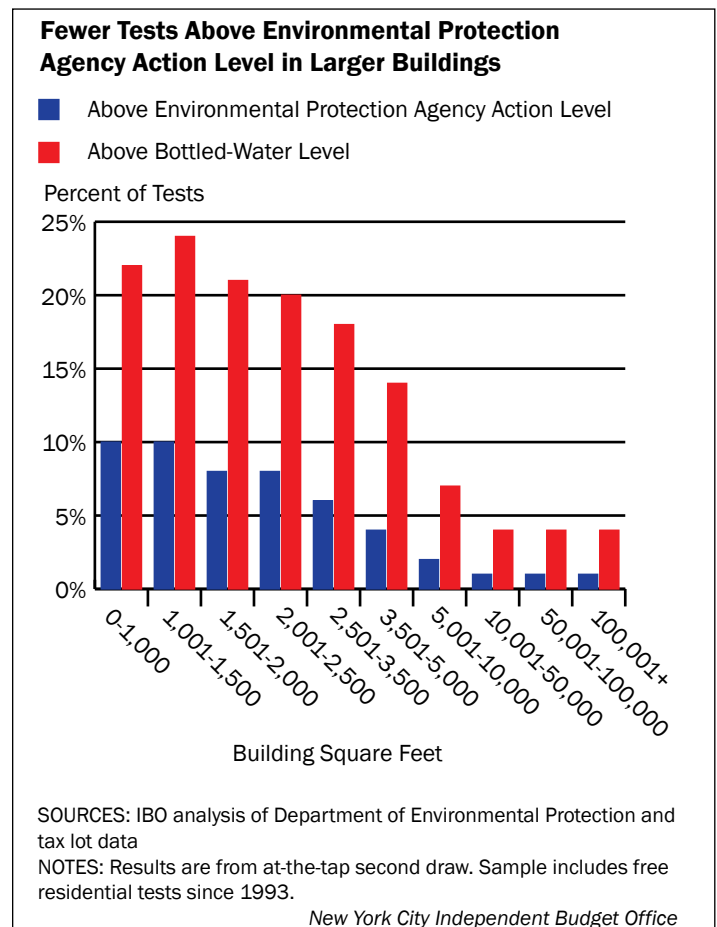
With the exception of one year, less than 10 percent of city water samples have exceeded EPA's lead compliance limit of 15 ppb in each year since 2002. The only recent year in which the city has not been in compliance with EPA lead regulations was 2010. That year, DEP's contracted testing laboratory closed, and the agency began in-house testing of lead samples. Different procedures used in-house resulted in increased concentration of lead during testing. DEP took a larger volume of water from the original container to test for other water quality parameters, leaving less water in the container. Because some lead had attached to the walls of the original sample container, lead was concentrated into a smaller volume of water prior to testing. When DEP identified the issue, staff began taking the same volume of water from the sample container as the contract laboratory had previously taken, which brought the results back in line for 2011. In addition, DEP had work underway on the water supply in 2010 that resulted in temporary shutdowns of the corrosion control treatments for some of the city's water. DEP determined that both causes contributed to the 2010 noncompliance and has since taken steps to minimize fluctuations in the corrosiveness of the water supply.

DEP monitors lead compliance rates to confirm its anticorrosion measures remain effective. At its water treatment facilities, DEP uses sodium hydroxide to increase the water's pH and adds phosphoric acid to create a protective film on pipes that inhibits the release of metals, including lead, from service lines and plumbing. DEP spends around \$10 million per year on these treatments and \$10.5

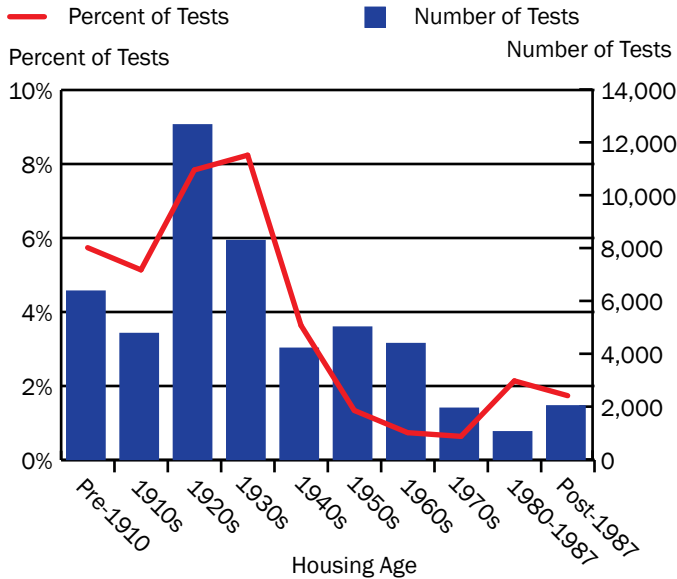
million is budgeted for each year of the city's financial plan.

Smaller, Older Buildings at Higher Risk

Smaller buildings generally have higher rates of lead tests above the EPA action level, with the rate of buildings testing above both this level and the Food and Drug Administration's bottled-water limit falling rapidly in buildings greater than 5,000 square feet. Historically, lead service lines were only used with smaller buildings because the lead material limited the pipe diameter to two inches, while larger buildings required wider diameter service lines, which were produced using materials other than lead. This removed a major potential source of contamination from larger buildings, leaving only lead solder and lead fixtures inside the building as possible contamination sources. Larger buildings also use more water, so it is less likely to sit in the pipes for extended periods of time. For small buildings, around 20 percent of tests since 1993 recorded a level of lead that would be disallowed in bottled water, although less than 10 percent actually exceeded the EPA action level. For large buildings, it was rare to record a result above the action level, but roughly 4 percent of tests still recorded a level above bottled-water limits.



Older Buildings More Likely to Test Above Environmental Protection Agency Action Level



SOURCES: IBO analysis of Department of Environmental Protection and tax lot data
 NOTES: Results are from the at-the-tap second draw. Sample includes free residential tests since 1993.
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highest rate of lead tests exceeding the EPA action level were in community districts in Staten Island, outlying parts of Queens and the Bronx, as well as central and southern Brooklyn. Dense areas in Manhattan, the South Bronx and downtown Brooklyn have generally the lowest rates of lead tests above the action level. The five community districts with the highest rates of lead water test levels above the EPA threshold include the neighborhoods of Ridgewood, Glendale, and Maspeth in Queens; Bedford Stuyvesant in Brooklyn; New Springville and South Beach in Staten Island; and Throgs Neck, Co-Op City, Pelham Bay in the Bronx; and Riverdale, Kingsbridge, and Marble Hill, also in the Bronx. Each of these areas had more than 6 percent of samples above the action level over the 2006-2016 period.

Given that older, smaller buildings are at greater risk for higher lead levels in their tap water, the pattern of contamination rates across the city is unsurprising. In particular, lower density areas that are dominated by smaller residential buildings are disproportionately affected, while parts of the city with higher density and newer residential construction are largely spared.

These patterns of elevated risk of lead in tap water in some areas of the city are important because of the impact of lead on public health. Elevated blood lead levels in children are associated with decreased academic achievement, lower IQ scores, attention-related behavior problems and antisocial behavior.² These developmental effects of lead toxicity are considered to be permanent.³ While lead paint is generally regarded to be the main contributor to high lead levels in children, lead in water also plays a role.⁴ DOHMH has reported to IBO that according to limited data from its Healthy Homes Program an estimated 2 percent of children with elevated blood lead levels had water lead levels in their home above the EPA's action level, while more than 60 percent had exposure to lead based paint. IBO requested data from Department of Health and Mental Hygiene to independently measure the link between at-the-tap water lead levels and rates of elevated blood lead levels in New York City children, but DOHMH did not provide IBO with the data requested.

Implications

It is important to stress that occurrence of tap water contamination and the resultant public health hazards are not due to malfeasance. Unlike many other cities, New York City and the Department of Environmental Protection are fully compliant with EPA and state regulations. But federal water regulations permit 10 percent of buildings in the compliance sample to be above the EPA action level

Older Buildings at Risk. Like smaller buildings, older buildings are also at much higher risk of testing above the EPA action level. In particular, buildings built before lead service lines were prohibited from use in construction in 1961 are at higher risk. The highest rates of tap water testing above the 15 ppb action level occur in buildings constructed during the 1920s and 1930s. Unfortunately, much of New York City's housing stock was constructed during these decades. Lead tests are most commonly requested and returned for these prewar buildings, indicating a justified level of concern about water quality among the large population of residents in older buildings.

The presence of the highest lead levels in small buildings and buildings built before 1961 suggests that much of the lead contamination in New York City's water is attributable to old lead service lines in small, older houses. Both larger buildings, which do not have lead service lines, and buildings constructed after 1961, when lead service lines were no longer used, record much lower rates of tests above the EPA action level. Despite the potential presence of lead in solder and fixtures, these large and newer buildings appear to be at much lower risk for excessive lead in their tap water.

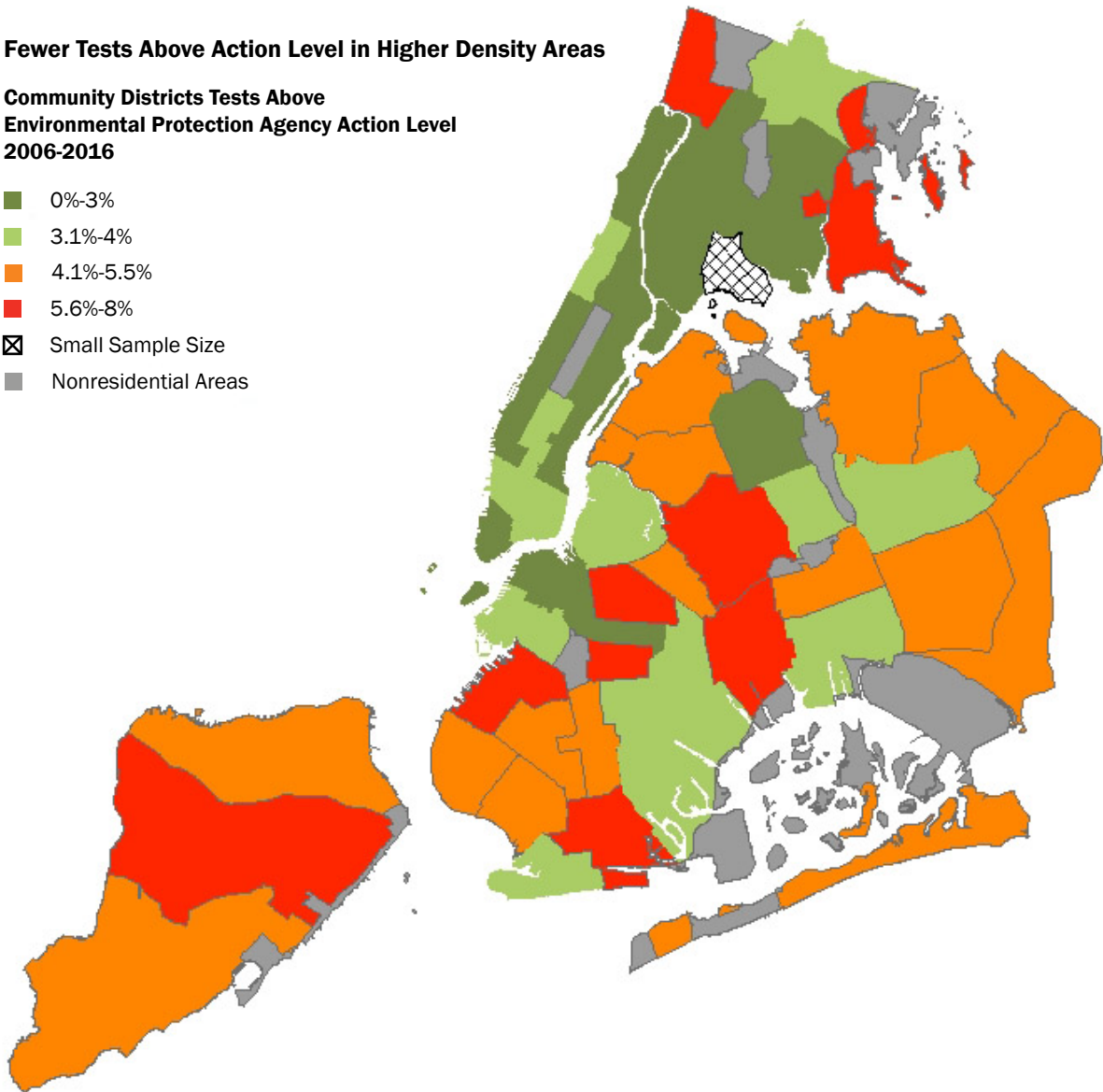
Variation in Neighborhood Test Results

Based on data from both the compliance and free residential test groups from 2006 through 2016, the

Fewer Tests Above Action Level in Higher Density Areas

Community Districts Tests Above Environmental Protection Agency Action Level 2006-2016

- 0%-3%
- 3.1%-4%
- 4.1%-5.5%
- 5.6%-8%
- ▣ Small Sample Size
- Nonresidential Areas



SOURCES: IBO analysis of Department of Environmental Protection and tax lot data

NOTES: Samples are not evenly distributed among community districts. Results are from at-the-tap first draw because both compliance and free residential groups tests are included. Data are limited to buildings still standing in 2016. Areas with under 30 samples are excluded.

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and there is no upper limit to the allowable lead levels in an individual home. In a city the size of New York, if even a small share of buildings have water that is persistently contaminated, this could mean many homes and families are legally exposed to contaminated drinking water—even as the city as a whole complies with federal regulations. Because the burden of federal regulation falls on the municipality rather than on the owner of the building where the contamination is occurring, DEP has no leverage to compel lead cleanup within private residences so long as the problem remains contained to less than 10 percent of buildings sampled in the compliance pool. There is no lead

standard for an individual home, which means the removal of lead from plumbing is at the building owner's discretion.

This regulatory structure leaves a gap where buildings that continue to have lead water issues, even after DEP has exhausted their ability to make water less corrosive citywide, are under no obligation to address high water lead in private residences. This situation is problematic regardless of whether a household rents or owns their home. While tenants can request a free lead testing kit from the city and identify a potential lead problem with their water, they lack the tools to compel building owners to provide lead-free water. If regular flushing of the pipes

proves insufficient, the tenant can start buying water, purchase a lead filter, move to another building, or choose to ignore the problem. Similarly, homeowners are offered free lead testing, but if they cannot afford the required repairs themselves, they are on their own to find financing to replace their pipes.

There is also a lack of transparency on potential lead water issues in a building. Landlords are not required to notify a prospective tenant if a building has lead-containing solder, lead-containing fixtures or a lead service line. Similarly, landlords are not required to inform existing tenants about a water test that is above the EPA action level. State law only requires that new homebuyers be notified if the home has lead in the pipes or service lines.

This lack of transparency about lead contamination is also an issue during construction or renovation, which can cause a building's at-the-tap lead levels to spike if service lines are disturbed by the work. However, there is no requirement to notify tenants if work may disturb a building's water system. The end result is that a number of buildings in the city likely have high lead levels in their

water, but tenants of these buildings generally are not aware of the problem.

Other municipalities that are persistently out of compliance with EPA regulations and therefore are required to take action have subsidized loan programs to incentivize removal of lead service lines or have distributed lead filters to residents. While disclosure of lead service lines to homebuyers is required in New York State, further transparency could be extended to renters about their exposure to lead through their tap water. Renters could also benefit from clarity about who is responsible for the water at their taps—DEP or the building owner—and whether they have recourse if faced with persistent lead exposure through tap water. New York City is compliant with federal lead regulations and at-the-tap lead levels are falling, but there are still gaps in water quality regulation that could affect thousands of New Yorkers. Addressing these gaps could have public health benefits and would allow all residents equal access to lead free drinking water.

Prepared by Daniel Huber

Endnotes

¹Tests from the compliance pool can contain one, two, or three samples while free residential tests contain two samples.

²"Prevention of Childhood Lead Toxicity" Council on Environmental Health, *Pediatrics*, June 2016, <http://pediatrics.aappublications.org/content/early/2016/06/16/peds.2016-1493>

³Dietrich KN, Ware JH, Salganik M, et al; "Treatment of Lead-Exposed Children Clinical Trial Group. Effect of chelation therapy on the neuropsychological and behavioral development of lead-exposed children after school entry." *Pediatrics*. 2004

⁴Lanphear BP, Hornung R, Ho M, Howard CR, Eberly S, Knauf K. "Environmental lead exposure during early childhood" [published correction appears in *Journal of Pediatrics* 2002;140(4):490]. *Journal of Pediatrics* 2002;140(1):40-47 pmid:11815762

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