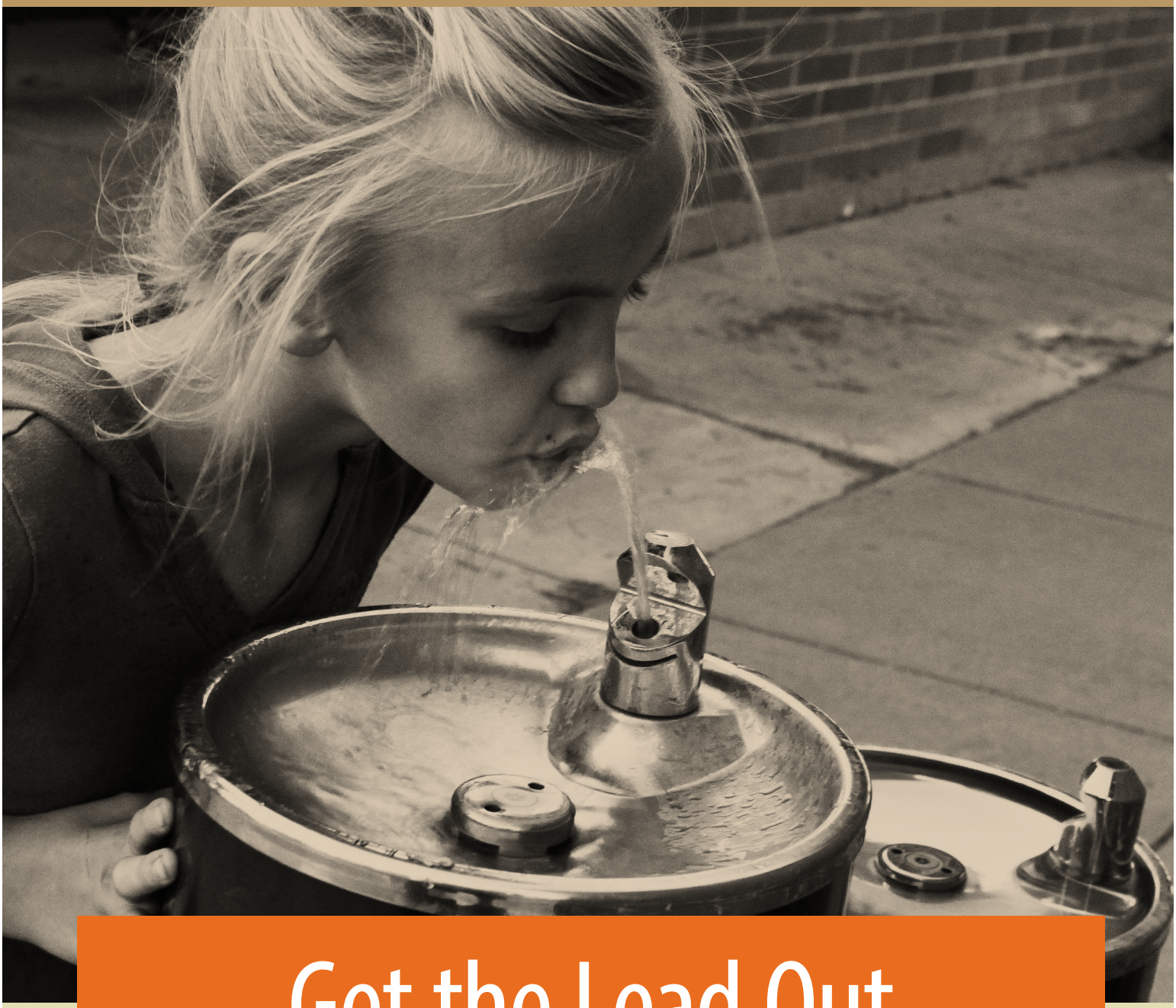

Get the Lead Out

Ensuring Safe Drinking Water for Our Children at School

ENVIRONMENT NEW YORK
RESEARCH & POLICY CENTER

Get the Lead Out

Ensuring Safe Drinking Water for Our Children at School

Written by:

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Environment America Research & Policy Center

February 2017

Acknowledgements

Environment New York Research & Policy Center and thank Marc A. Edwards, PhD, Environmental Engineering at Virginia Tech; Yanna Lambrinidou, PhD, anthropologist at Virginia Tech Department of Science and Technology in Society; Professor David Bellinger, Harvard School of Public Health; Sylvia Broude, Executive Director of Toxics Action Center; Dr. Daniel Faber, Northeastern University; Tony Dutzik, senior policy analyst at Frontier Group; and Steven G. Gilbert, PhD, DABT for their review of this report. Thanks also to Dr. Faber and the students in his Environmental Sociology class at Northeastern for their research assistance.

The authors bear responsibility for any factual errors. The recommendations are those of Environment New York Research & Policy Center. The views expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided review.

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Executive Summary

Over the past two years, the tragedy of Flint, Michigan has stunned the nation. We watched the drinking water of an entire city become contaminated with lead. And now we know this toxic threat extends well beyond Flint to communities across the country. In fact, test results now show that lead is even contaminating drinking water in ***schools and pre-schools*** **—** flowing from thousands of fountains and faucets where our kids drink water every day.

In all likelihood, the confirmed cases of lead in schools' water are just the tip of the iceberg. Most schools have at least some lead in their pipes, plumbing, or fixtures. And where there is lead, there is risk of contamination.

The health threat of lead in schools' water deserves immediate attention from state and local policymakers for two reasons. First, **lead is highly toxic and especially damaging to children** — impairing how they learn, grow, and behave. So, we ought to be particularly vigilant against this health threat at schools and pre-schools, where our children spend their days learning and playing.

Second, **current regulations are too weak to protect our children from lead-laden water at school.** Federal rules only apply to the roughly *ten percent* of schools and pre-schools that provide their own water. Moreover, these rules only require remediation when testing confirms lead concentrations in excess of 15 parts per billion, even though medical and public health experts are unanimous that there is no safe level of lead for our children. The error of this approach is compounded by the fact that testing, even when properly done, often fails to detect maximum lead levels in water coming out of the tap.

Unfortunately, so far most states are failing to protect children from lead in schools' drinking water. Our review of 16 states' laws and regulations finds:

- Several states have no requirements for schools and pre-schools to address the threat of lead in drinking water; and
- Of the few states with applicable laws, most follow flaws in the federal rules — relying on testing instead of prevention, and using standards that allow health-threatening levels of lead to persist in our children's water at school.

More specifically, when assessed in terms of protecting children from lead in water at school, these states' policies earned the following grades:

State	Grade
Washington, DC (proposed)	B
New York	C
New Jersey	C-
Illinois, Massachusetts	D
CA, CT, GA, FL, MD, ME, PA, OH, OR, TX, WA, WI	F

Given the high toxicity of lead to children, the most health-protective policy is simply to "get the lead out" of our schools and pre-schools. This involves proactively removing lead-bearing parts from schools' drinking water systems — from service lines to faucets and fixtures — and installing filters certified to remove lead at every tap used for drinking or cooking. Because all this prevention work will take time to complete, schools should also immediately begin regular and proper testing of all water outlets used for drinking or cooking and promptly remove from service those outlets where lead is detected. And schools should provide the public with easy access to all testing data and the status of remediation plans.

The promise and viability of this "get the lead out" approach can be seen in municipal and voluntary programs across the country. Madison, Wisconsin and Lansing, Michigan have removed all lead service lines from homes, and New York City has replaced them at schools. Seattle has adopted a somewhat more protective standard for lead in water. And Washington, D.C. is considering an ordinance that would not only set the standard for lead at one part per billion for schools but also require installing certified filters at all outlets used for drinking or cooking in schools.

Recommendations

The science now makes clear that there is no safe level of lead exposure for our children. To ensure safe drinking water for our children, we need policies that will "get the lead out" at school and pre-school.

States and communities should:

- Proactively "get the lead out" of schools and early childhood programs by removing lead service lines, lead-bearing plumbing, fixtures, etc.
- Install and maintain filters certified to remove lead on taps and fountains used for cooking and drinking
- Adopt a 1 ppb standard for lead in schools' drinking water, consistent with recommendations of the American Academy of Pediatrics
- Require testing at all water outlets used for drinking or cooking at all schools annually, using protocols designed to capture worst-case lead exposure for children
- Immediately remove from service any faucet or fountain used for drinking or cooking where testing indicates lead in the water
- Disclose all available information about lead in water infrastructure, test results, and remediation plans/progress both onsite and online
- Provide funding to remove lead in schools' water infrastructure

The federal government should:

- Enforce and strengthen federal rules to protect drinking water from lead - e.g. the Lead and Copper Rule
- Propose major funding to help states and communities remove lead in water infrastructure — including lead service lines and plumbing/fixtures in schools
- Marshal the authority of all relevant federal agencies to protect public health from contamination of drinking water

And of course, we should fully protect all sources of drinking water from pollution.

Introduction

As our nation rushed through more than a century of unprecedented economic growth, we allowed several toxic health threats to become embedded into the fabric our lives. One of the more enduring and pervasive of these threats has been the use of lead. While the toxic nature of lead has been known for centuries, we allowed manufacturers to put it in our paint, plumbing, gasoline, and many other products.

For the past few decades, public health officials have been working to undo the damage. Banning lead in gasoline immediately removed a major source of toxic air pollution. Barring lead in paint stopped a major threat to children's health from becoming even worse, but we are still cleaning up the damage from millions of homes with lead paint, as well as related lead in dust and soil.

Yet until recently, few Americans paid as much attention to another pervasive pathway for this potent toxin: the delivery system that brings drinking water right to our faucets.

Over the past two years, many Americans have watched in horror and disbelief as an enormous tragedy unfolded in Flint, Michigan. Through a combination of appalling decisions and denials, an entire city had its water contaminated with high levels of lead. Between 6,000 and 12,000 children were exposed to lead in Flint.[1] In addition to acute symptoms and other illnesses, by one estimate, these children will lose 18,000 future healthy years combined.[2]

While Flint is an extreme case, it is hardly alone. In fact, thousands of communities across the country have lead in their drinking water. A review of data by USA Today found that nearly 2,000 water systems across the 50 states had levels of lead in their water in excess of U.S. Environmental Protection Agency (EPA) standards over four years.[3] And the contamination is likely even more widespread. More than 18 million people get their drinking water from systems that violated federal rules for lead in 2015 alone, according to a review of data from EPA's Safe Drinking Water Information System by researchers at the Natural Resources Defense Council.[4]

And now we know that lead is even contaminating the water at many of our schools and pre-schools — the places our children go each day to learn and play.

Lead in Schools' Water: A Threat to Children's Health

"Anything above zero is harmful. Just like crack cocaine and heroin, there's no safe amount."[5]

—Ron Saff, MD, who coordinated lead tests at Florida schools

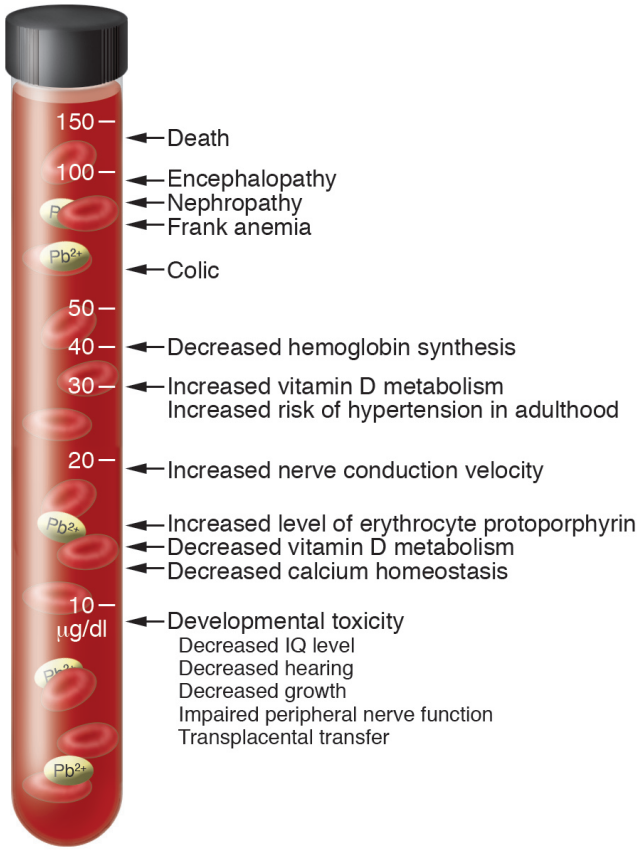
Lead is Harmful to Children — Even at Low Levels

Lead is a potent neurotoxin. It is particularly damaging to children for several reasons. Children absorb as much as 90 percent more lead into their bodies than adults. Once ingested, lead flows from the blood to the brain, kidneys, and bones. Yet children's organs and bones are immature and more vulnerable than adults'; they also have an incomplete blood-brain barrier.[6]

"We see learning difficulties, hyperactivity, developmental delays," said Marcie Billings, a pediatrician with Mayo Clinic in Rochester, Minn. "Any damage is irreversible."[7]

We have known for some time that high levels of lead can cause severe health impacts — including anemia, kidney disease, abnormal brain function and even death. (See Figure 1)

Figure 1: Adverse Effects of Lead at Low Levels [8]



Yet the medical science now confirms that even *low levels of lead* can cause permanent damage to our children. According to EPA, "In children, low levels of [lead] exposure have been linked to damage to the central and peripheral nervous system, learning disabilities, shorter stature, impaired hearing, and impaired formation and function of blood cells."[9]

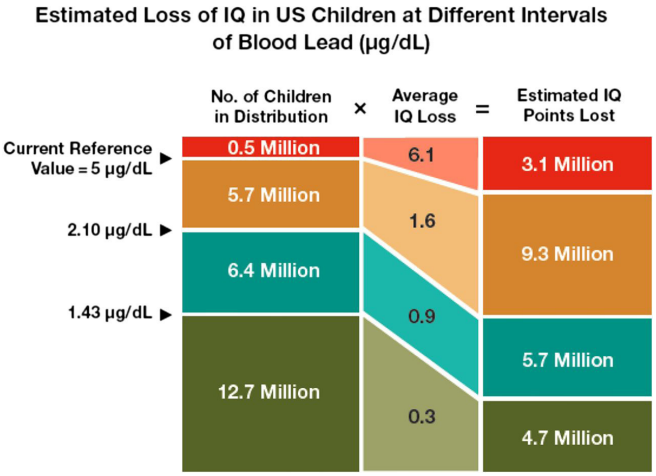
Of particular alarm for schools, the data now links low lead levels with long-term loss of learning in our children. For example, a Wisconsin study found that 3,757 fourth-graders with relatively low lead levels in their blood "scored significantly lower on reading and math tests than those without elevated blood-lead levels"- an adverse effect that persisted for these children seven to eight years later.[10]

Lead poses additional risks for children with other health conditions. For example, last year OPB.org ran a profile on nine-year old Abigail Harper in Portland, Oregon. Abigail has kidney disease, and high or prolonged exposure to lead can damage kidneys. Last school year, Abigail was hospitalized multiple times for extremely high blood pressure. Doctors were mystified, and ran a barrage of tests. During the same time, the Portland Public School District had begun testing lead levels at its schools. When Abigail's school (Creston) was tested, the results confirmed taps with elevated levels of lead. Doctors also found high levels of lead in Abigail's blood.[11]

Last summer, the American Academy of Pediatrics concluded that "[e]xtensive and compelling evidence now indicates that lead-associated cognitive deficits and behavioral problems can occur at blood lead concentrations below 5 µg/dL"(micrograms per cubic deciliter).[12]

One stunning fact underscores the danger at hand: more than 24 million children in America will lose IQ points due to low levels of lead. See Figure 2.

Figure 2: More Than *24 Million Children* Will Lose IQ Points Due to Low Levels of Lead[13]



Moreover, because lead flows from blood into the organs and bones within several weeks, its damage to a child's health will not always show up in blood tests. Lead is a persistent toxin, so once absorbed, the lead remains in the body.[14] So, a child who drinks water from a fountain at school that episodically contains a slug of lead might not show elevated blood-lead levels a month or two later. But the harm persists in her body.

In light of this alarming data, the conclusion of public health experts and agencies is now unanimous: *there is no safe level of lead for our children*.[15]

Lead is Contaminating Water at Our Schools

It's a scary thing. Nobody expects to have this in their schools. Who knows how big the problem actually is?"

— Nicole Rich, mother in Ithaca, N.Y.

Seven-year old Jamison Rich goes to Caroline Elementary School in Ithaca, New York. Like many kids his age, he often drinks from a water fountain at the school after running around in gym or at recess. Unfortunately, the water at Caroline Elementary was contaminated with lead, with tests showing lead concentrations at 100 parts per billion (ppb). As reported by USA Today, a blood test revealed that Jamison has twice the average level of lead in his blood.[17]

Unfortunately, Jamison is not alone. Even the limited available data shows drinking water laced with lead at thousands of faucets and fountains in schools and early childhood programs across the country, as seen in the map at Figure 3.

The threat of lead in schools' water affects not only big cites but also suburban and rural communities. Jamison Rich lives in Ithaca, New York. Elsewhere, tests have documented lead tainted water in schools in Cherry Hill, New Jersey[19], Yarmouth, Maine[20], several other school districts in upstate New York[21] and suburban communities in Illinois.[22]

Moreover, some tests are showing exceedingly high levels of lead. For example, one drinking water fountain at a Montessori school in Cleveland had 1,560 parts per billion.[23] A school in the Chicago suburbs had lead at 212 times the federal standard.[24] Leicester Memorial Elementary in Massachusetts had a tap that tested at 22,400 ppb.[25]

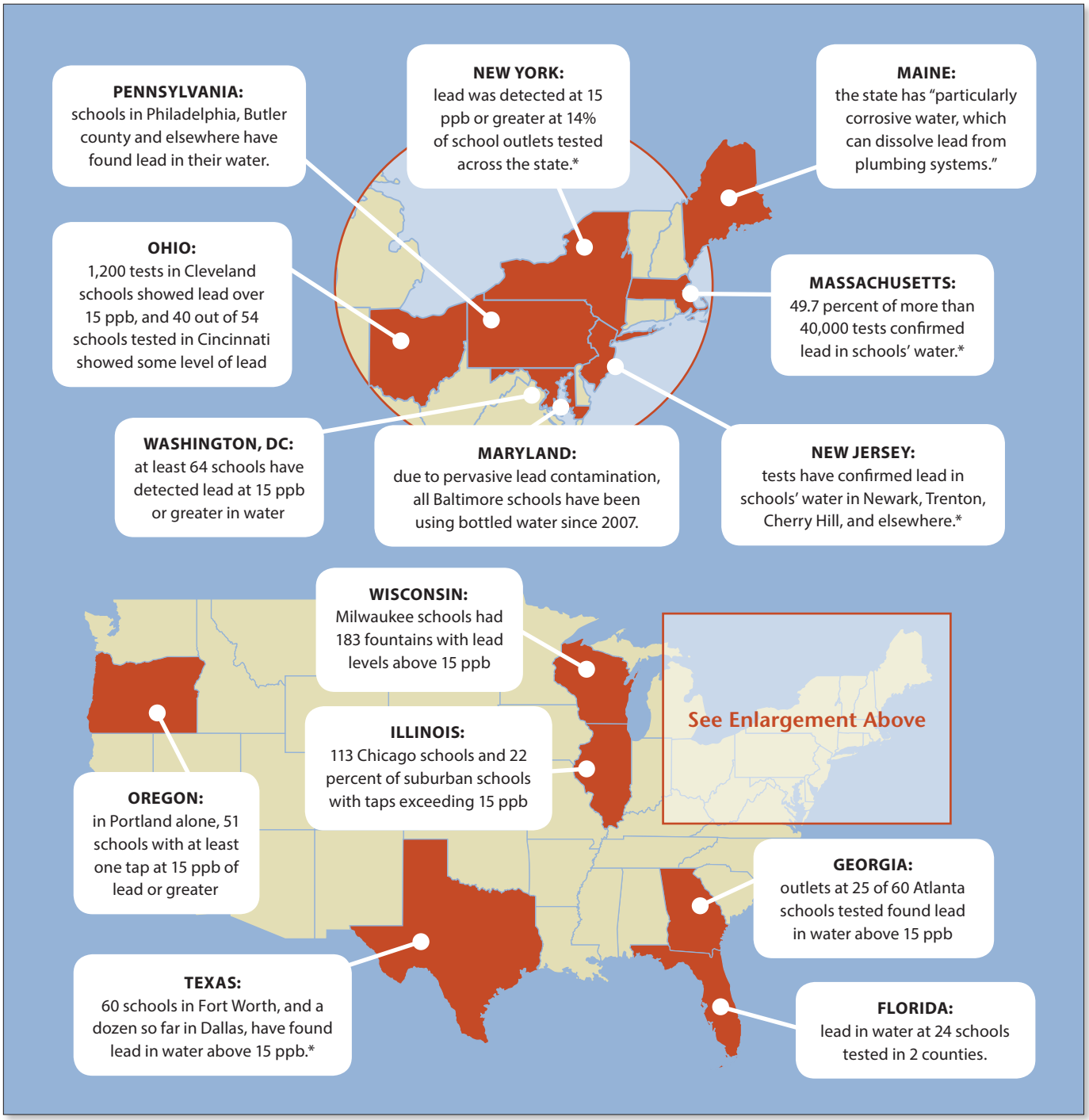
A More Pervasive Threat Than Confirmed by Testing

In all likelihood, these confirmed cases of lead in schools' water are just the tip of the iceberg. Most schools are not testing for lead at all. And even in those states and school districts that are testing, much of the available data is limited to test results showing concentrations in excess of 15 ppb (or a 20 ppb equivalent for schools, using a different sampling method). Yet we know that lead is toxic at very low levels.

Massachusetts is one of the few states to include test results confirming lead in concentrations below the 15 ppb level. Moreover, the data is extensive, with more than 40,000 test results reported by schools as of January 2017.

It is also shocking: *nearly half of the tests* (49.7 percent) conducted at Bay State schools so far have found some level of lead in the water, according to data published by the state as of January 6, 2017. The vast

Figure 3: Lead in Schools' Water Across the Country[18]



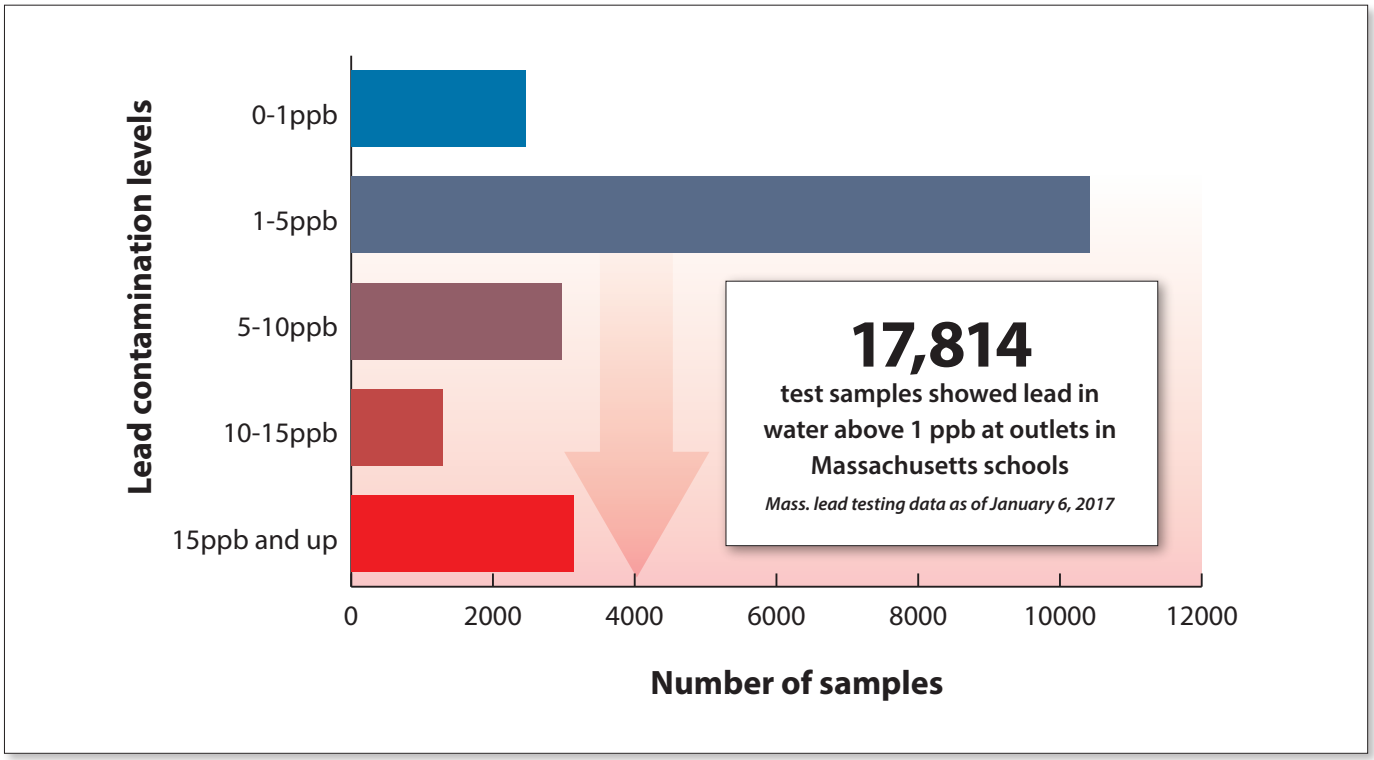
**more extensive test results are expected in these states in 2017.*

+ this map documents only where tests have confirmed lead in schools' drinking water; due to variability in conditions and test procedures, tests can fail to detect lead in schools' water systems.

++ for several of these states, data is only available from tests exceeding 15 ppb, though lead is hazardous at any level.

+++this map does not reflect where, whether, or how effectively some schools have sought to remediate lead contamination. But remediation is voluntary for most schools.

Figure 4: Massachusetts data shows lead in schools' water is pervasive threat[26]



majority of test results with some measurable level of lead were in concentrations greater than 1 part per billion. See Figure 4.

As demonstrated by the breakdown of Massachusetts' testing results in Figure 4, test results above 15 ppb only reveal a fraction of a much more pervasive lead contamination problem at our children's schools.

Finally, tests — even when properly done — can fail to capture lead exposure. Part of this conundrum is that corrosion and breaking off of lead particles from pipes is highly variable. Multiple water tests from one tap can result in highly variable lead levels between samples.[27] In a lead sampling study conducted in 2013, researchers concluded that a single sample from a water tap could not accurately reflect the level of lead flowing through the tap. In their test of 32 homes with lead service lines, samples from the same tap varied from below the lead action level to well above it. Not only that, but this level of variation was also true for most samples in the study.[28]

> "This is like Russian roulette." Marc Edwards, on testing for lead in drinking water.[29]

In addition to the inherent variability in testing, some testing techniques mask lead risks even further. Chief among these is a practice known as pre-stagnation flushing, where taps are run for a certain number of minutes or even hours before test samples are drawn. This practice can artificially lower lead levels in test samples because it removes the water which was sitting stagnant in lead service lines or other lead-laden plumbing, and this extended period of time is when lead typically leaches into the water. With these considerations in mind, EPA is now recommending against the use of pre-stagnation flushing in testing water for lead.[30]

The recent experience of New York City provides a dramatic example of how pre-stagation flushing can fail

to capture lead in schools' drinking water. In the summer of 2016, the city flushed the water in every school for two hours before sampling the water for lead. According to Dr. Yanna Lambrinidou from Virginia Tech, who has done extensive research on leaded drinking water, "Unless N.Y.C. schools flush every drinking water tap every evening for 2 hours routinely, their sampling technique is both unreliable and scientifically and morally indefensible." Dr. Marc Edwards, another nationally recognized lead expert at Virginia Tech, agrees. "The results should be thrown into the garbage, and the city should start over."[31] The city is now retesting taps at all its schools without the two-hour flushing step. With one third of the retesting complete as of early February, 2017, the results so far show *nine times* as many outlets with levels of lead above 15 ppb.[32]

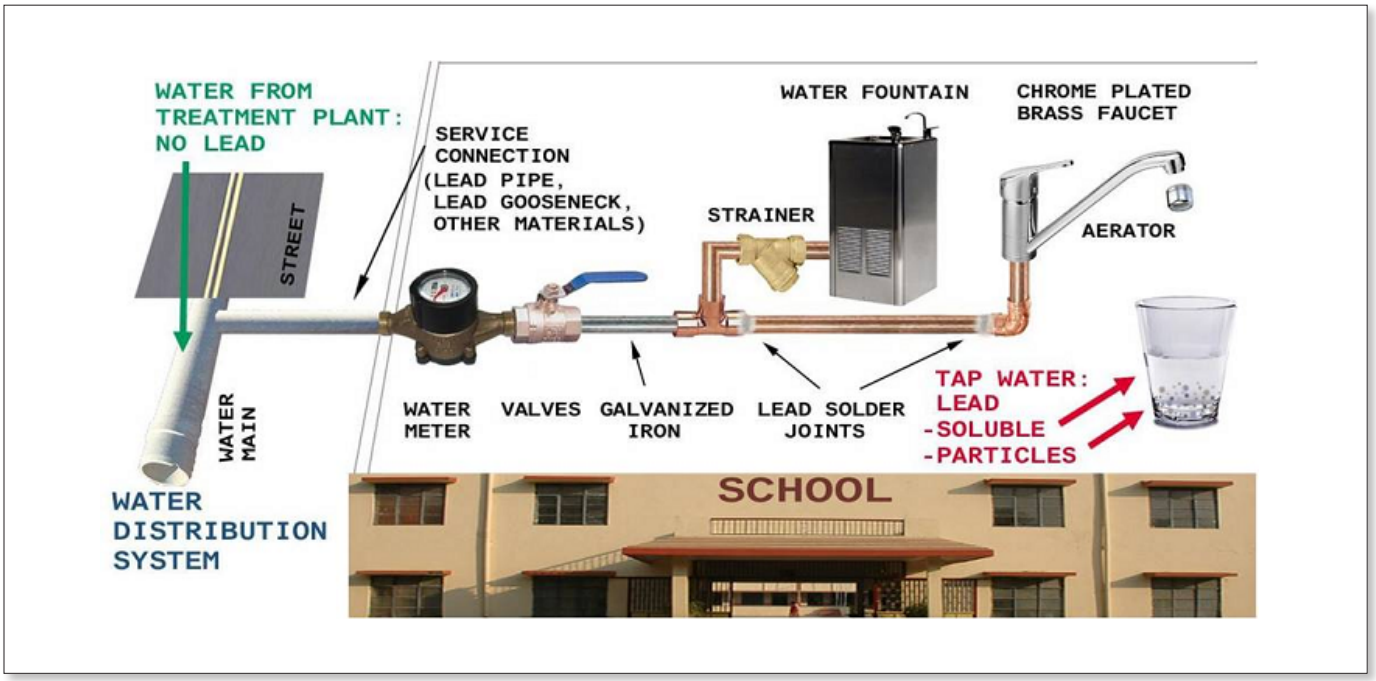
To be sure, the limited available test results are alarming enough, as they confirm the presence of a potent neurotoxin in thousands of faucets and fountains in schools across the country. But in truth, the scope of this lead-laden threat to our children's health is even wider.

How Lead Gets into Schools' Drinking Water

Most schools have at least some lead in their pipes, plumbing, or fixtures. And where there is lead, there is risk of contamination.

As with lead contamination elsewhere in our communities, the problem often starts with the pipe that brings water into a school or early childhood program — called the service line (or service connection). Where this service line is made of lead, it is a major source of water contamination.

In fact, *experts calculate that lead service lines account for 50-75 percent of lead found at the tap.*[33] In part, this is a function of the unparalleled surface area inside the service line where water is in direct contact with lead. In addition, the service lines are in closer proximity to disturbances from construction — especially repair work on water mains — which can dislodge lead particles into the water.[34] The role of lead service lines



Reproduced from Lead in School Water Delivery Systems. W.K. Kellogg Foundation, Managing Lead in Drinking Water at Schools and Early Childhood Education Facilities (February 2016), reproduced from Edwards, Marc and Simoni Triantafyllidou, Lead (Pb) in U.S. Drinking Water: School Case Studies (2009).

in water contamination is so strong that the Center for Disease Control was actually able to correlate them with elevated blood lead levels in Washington, D.C.[35]

While installing new lead service lines was halted decades ago, their toxic legacy is pervasive. According to a recent estimate by the American Water Works Association, over 6 million lead service lines remain in use across the nation. Though estimates vary, a conservative estimate is that the drinking water of 15 to 22 million people still passes through lead service lines.[36]

But if lead service lines are the beginning of the problem, they are not the end. Until 1988, many drinking water fountains or bubblers were manufactured with lead liners.[37] And until 2014, significant amounts of lead were allowed in new pipes, pipe fittings, plumbing fittings, and fixtures.[38] In other words, all but the most recently constructed schools and early childhood education programs are likely to have had lead in their water delivery systems.

A Lead Service Line[39] *Credit: EPA*

Data from several school districts underscores the danger from this source. For example, after brass fixtures were installed at 131 schools in Los Angeles, the school district found elevated lead levels.[40] And in Milwaukee, even after the school district stated that all lead service lines had been removed, tests showed 183 samples with lead in drinking water at levels greater than 15 parts per billion.[41]

Current Policies Do Not Ensure Lead-Free Drinking Water

Common sense suggests that the best way to keep drinking water free of lead is to stop using it in water delivery systems. Over time, national policies have embraced this preventative approach, at least with respect to new products. In 1986, new lead service lines were banned. In 1988, Congress passed the Lead Contamination and Control Act, which dramatically reduced the lead content of *new* pipes and plumbing to 8 percent. And then, as recently as 2014, the definition of "lead free" plumbing was ratcheted down to "not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures."[42] Moreover, some experts are concerned that even this relatively small amount of lead can still cause some contamination.[43]

Unfortunately, because these critical prevention policies were only adopted recently, we are still left with an extensive legacy of lead in the pipes and fixtures that bring water to the faucets in our homes and the fountains our children use at school. And with thousands of test samples now confirming the presence of lead in water, it is self-evident that our existing laws and rules are doing a poor job of protecting our children from this dangerous legacy.

The problem is not a failure to acknowledge the serious threat lead poses to children. Every relevant federal agency — including EPA — agrees that there is no safe level of lead for children, and that the *goal* should be to have zero lead in drinking water. So why is national policy falling so far short of this critical health goal?

Since 1974, the Safe Drinking Water Act (SDWA) has provided an important framework for ensuring that the water public utilities send to their customers and communities is clean and safe. As such, the primary focus of regulations promulgated by EPA pursuant to the Act — such as the Lead and Copper Rule — is on establishing and enforcing system-wide responsibilities of water utilities.

Unfortunately, this narrow regulatory focus leaves our drinking water vulnerable to contamination both before and after it is in possession of public water utilities. On the front end, it does little to prevent pollution of the rivers, lakes and streams that serve as sources of our drinking water; recently, we have seen cases where toxic threats — including nitrates, cyanotoxins, and chemical spills — have entered the drinking water supply.[44] And on the back end, it leaves water susceptible to contamination as it travels through plumbing in our homes and schools, all the way to the faucet where we actually drink it.

And yet it is on this "back end" where most lead contamination of drinking water occurs. This is particularly true with large buildings like schools, which have extensive pipes and plumbing before water reaches the tap. In this context, one can begin to understand why federal policy has been formulated in ways which fail to ensure the water coming out of the faucet is safe to drink.

Corroded water main with lead fittings. Photo by Mike Thomas via Flickr, CC BY NC ND 2.0

In 1991, EPA promulgated the Lead and Copper Rule, pursuant to SDWA. The rule is primarily designed to get utilities to identify problems that require system-wide action, such as adjusting corrosion control at the treatment plant. At least to some degree, the Lead and Copper Rule (LCR) has reduced lead concentrations in drinking water in large water systems that it requires to use corrosion control.

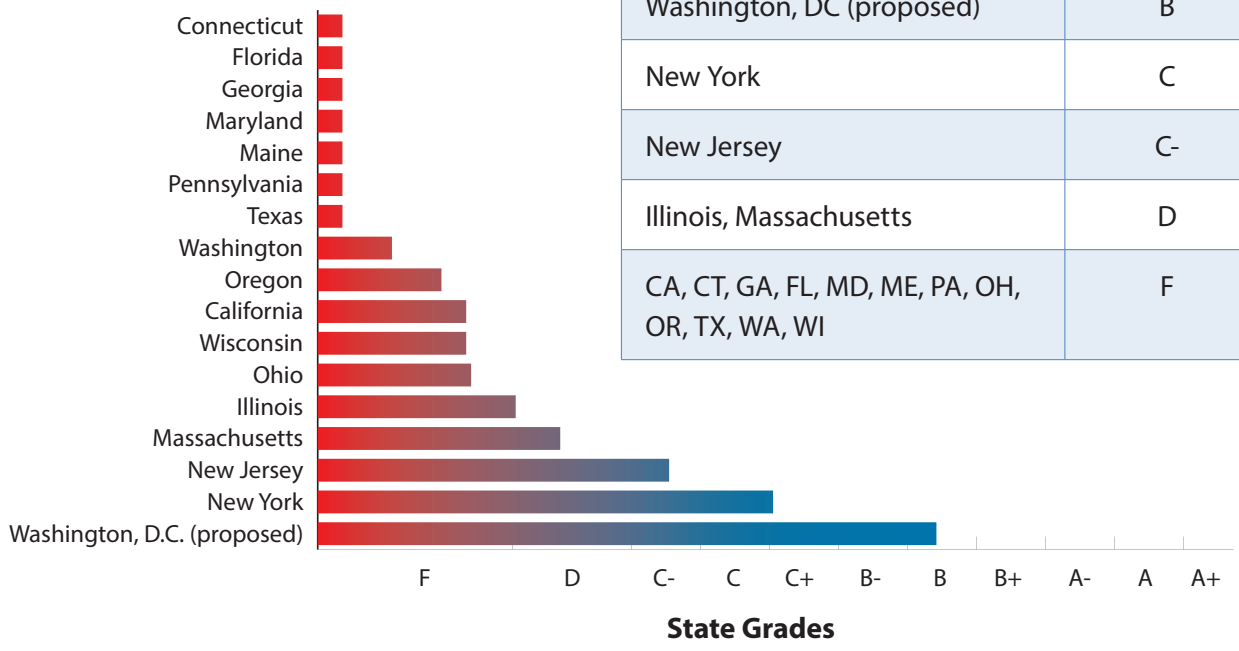
Yet the rule has four key shortcomings. First, ***the rule relies heavily on testing*** (rather than proactively removing lead-bearing parts). As discussed above, testing for lead can often lead to false negatives due to the "Russian Roulette" factor in corrosion and water sampling. In the wake of Flint, EPA has sternly warned water utilities of their obligations to implement this system faithfully — insisting on representative test samples and barring testing practices that mask lead levels (such as pre-stagnation flushing, per above).[45] There is much more that EPA can and must do to ensure its directives are enforced. But even if utilities scrupulously followed proper testing protocols, they are all but certain to miss significant amounts of lead in the water.

Second, ***the rule only mandates remediation when tests show lead concentrations in water greater than 15 parts per billion*** *(or 20 parts per billion in a sampling method for schools)*, even though there is no safe level of lead in drinking water. Third, even though we should be concerned with the health of any one household where there is lead in the water, ***the rule only requires utilities to take action when more than 10 percent of test samples exceed this 15 ppb "action level."***[46]

Fourth and finally, as the LCR only applies to water utilities, ***roughly 90 percent of schools and daycares across the country are exempt*** from even its limited requirements.[47]

In summary, federal requirements to protect our children from lead-laced water at schools and early childhood programs are weak to non-existent. Much stronger action by state and local officials will be critical for our children's health.

Figure 5: States not making the grade in keeping lead out of schools' drinking water



State	Grade
Washington, DC (proposed)	B
New York	C
New Jersey	C-
Illinois, Massachusetts	D
CA, CT, GA, FL, MD, ME, PA, OH, OR, TX, WA, WI	F

State Policies: Not Making the Grade

For this report, we evaluated laws and policies in 16 states - and proposed ordinance in the District of Columbia - on how well they protect children from lead in drinking water at school. The states were graded on five main criteria:

- *Getting the lead out: Are schools required to proactively remove lead from water delivery systems, or only required to take action in response to testing if at all? Are required steps sufficient to eliminate the threat of lead contamination?*
- *The "lead standard:" What level of lead triggers mandatory remedial action?*
- *Testing: Is testing required, and if so, how are tests conducted, and how often?*
- *Public disclosure and transparency: How much information is being shared with parents and the public?*
- *Applicability: Do the state laws apply to both schools and early childhood programs?*

The relative strength/weakness of these states' policies is shown in Figure 5. Nearly half of the states reviewed have failed to establish any meaningful law or policy for schools to reduce risks of lead in drinking water. Of the few states with laws on the books, some only require testing. (Washington state's board of health adopted a testing program in 2009, but it is unenforceable without funding from the legislature.[48])

Only two states — New York and New Jersey — require both testing and remediation, but their policies

replicate some of the key limitations of the federal Lead & Copper Rule, such as only requiring action when lead levels exceed 15 ppb.

While mandatory rules to protect children's health received higher scores in our assessment, states did receive partial credit for well-funded voluntary measures with demonstrated results.

Heralding a more preventative approach, last year California became the first state in the nation to pass a law to eliminate lead service lines — not just for schools but across the entire state.

Signed into law by Governor Jerry Brown in September of 2016, SB 1398 requires public water systems to compile an inventory of known lead service lines by July 2018, after which they are required to provide the state with a timeline for the replacement of these lines. Erring on the side of public health, public water systems must either affirmatively determine whether service lines are made of lead, or have a plan for replacing them where the lead content cannot be determined by 2020.[49] One key caveat is that the state has yet to establish an enforceable timeline for this ambitious and preventative measure.

Wisconsin is also beginning to tackle lead service line removal. While the Badger State's program is not mandatory or comprehensive, it has already provided $14.5 million for a voluntary program that is beginning to remove lead service lines in Milwaukee and 17 other communities.[50]

As noted earlier, however, service lines are only one source of lead in schools' water. Neither California nor Wisconsin require schools to take specific measures to "get the lead out" of their fixtures or plumbing, or to shut off taps with elevated lead levels.

For purposes of comparison, we have included an ordinance currently under consideration by the District of Columbia. This proposed policy is far and away more protective of children's health than any state statute already on the books. If adopted, the ordinance would make Washington, D.C. the first jurisdiction in the country with the following protections: 1) requiring NSF filters at every tap in school used for drinking; 2) setting the "action level" at 1 part per billion, as recommended by the American Academy of Pediatrics; 4) requiring annual tests of all outlets; 5) publishing all testing and remediation data online; 6) placing bar codes with access to filter maintenance data on fountains at school; and 7) the law will apply to schools, early childhood programs, and even public parks.[51]

It is perhaps no accident that such a far-reaching measure should emerge in Washington, D.C., as the District has experienced a major crisis with lead in its drinking water back as far as 2003. Many of the policy ideas in the proposed ordinance came from parents and long-time lead-in-water activists, who have been spearheading the push for this potentially precedent-setting measure. The proposed ordinance is sponsored by nine District council members, including committee chairs Mary Cheh and David Grosso, as well as council member Charles Allen.

Finally, while our analysis focused on laws applicable to schools, we did give additional credit where those same policies also applied to early childhood programs. As per a previous study by the Environmental Law Institute, some states — such as Washington and Wisconsin - have requirements that apply *solely* to child care facilities.[52] We did not include such policies in our analysis.

Solutions to Ensure Safe Drinking Water at School

All of our children deserve safe drinking water — especially at the places they go each day to learn and play. Yet we have constructed systems that deliver water to their fountains and faucets laced with lead. And wherever there is lead, there is an ever-present risk of corrosion and contamination. Given this reality, the following solutions are imperative to ensure safe water at our schools and early childhood programs:

1) Get the Lead Out. The most effective way to ensure lead-free water for our children is, quite simply, to ***get the lead out.*** As documented above, lead service lines (LSLs) are a major source of water contamination. Last year, the National Drinking Water Advisory Council — comprised of experts, advocates, and affected communities advising EPA - made the clear case for LSL removal:

> The Council considers that the driving proactive principle to improve public health protection is removing full lead service lines from contact with drinking water to the greatest degree possible and minimizing the risks of exposure to the remaining sources of lead in the meantime.[53]

Marc Edwards, the Virginia Tech engineer who helped Flint residents confirm their water contamination, has called for the "complete removal of all lead service lines" across the country."[54]

Yet prevention cannot stop at the service line. As the data from Milwaukee to Los Angeles shows, schools and early childhood programs must take action to ensure that every part of their water delivery systems — from plumbing to fixtures to faucets — is lead-free.

2) Install and maintain NSF Certified Filters. Getting the lead out will take time. In the interim, every outlet used for drinking or cooking should be fitted with filters certified by the National Sanitation Foundation (NSF) to remove lead from water. Even with high levels of contamination in Flint, an EPA analysis documented that NSF filters proved effective at removing lead.[55]

3) Proactively prevent lead contamination. Rather than waiting for tests to confirm that the water our children drink is laced with lead, schools should be removing lead-bearing parts and installing filters certified to remove lead proactively. This preventative approach is critical because tests — even when properly done — can fail to capture lead exposure.

Photo by Jeff Turner via Flickr, CC BY 2.0

Moreover, a proactive prevention approach is consistent with other national policies aimed at protecting children's health from lead. To address lead from auto emissions, our nation has banned leaded gasoline. Belatedly, we also banned lead in paint. For a home to be certified as lead-safe, policies require rigorous remediation to "get the lead out."

4) Require action at 1 part per billion. Medical experts agree that there is no safe level of lead, and standards that trigger mandatory remediation — often called an "action level" — should reflect this health assessment. For this reason, the *American Academy of Pediatrics* is calling on officials "to ensure that water fountains in schools do not exceed water lead concentrations of 1 ppb."[56] At a minimum, *outlets with water exceeding this concentration should immediately be removed from service until permanent remediation — not mere flushing — ensures safe drinking water on an ongoing basis.*

5) Proper Testing. While schools must "get the lead out" proactively over time, testing in the interim can at least confirm some immediate threats to children's health and ensure that remediation steps are working properly. Schools and early childhood programs should test at *all* water outlets used for drinking and cooking annually, and use protocols designed to capture worst-case lead exposure for children. For example, U.S. EPA put out a clarification on sampling procedures in 2016 that recommends against pre-stagnation flushing.[57] And given the inherent variability in lead concentrations, officials must be careful to avoid suggesting that a failure to detect lead is the same as a permanent assurance of safe water.

6) Provide full disclosure and accountability. Parents have a right to know whether their children's water at school is safe. Moreover, as securing lead-free water at school will require several steps over time, transparency and accountability are critical to ensure that those steps are implemented and effective. Schools and early childhood programs should provide the public with information about lead-bearing parts in their water infrastructure, test results, and remediation plans and progress. Such information should be available both onsite and online, with community-appropriate language access. In Washington DC, citizen activists have urged local officials to require a bar code on each tap at school, so that parents can verify that filters are being maintained properly wherever their child fills her water bottle. Finally, all such information should be made accessible online on a statewide basis as Massachusetts has done. This provides the public with a clear picture of the scope of the lead-in-water problem, which facilitates informed statewide policy responses.

Finally, it is critical that all of these lead prevention measures apply to outlets used for *cooking* as well as drinking. As Edwards explains, "If you're cooking pasta in the tap water, you're using a huge volume of water and a high flow rate. Then you pour the water away and the lead sticks to the food. The net result is almost the same as drinking that entire volume of water."[58]

Communities Rising to the Head of the Class

"People walk up to me in the streets now and say, 'Thanks.'"

—Susan Bauman, former mayor of Madison, WI as the city replaced lead service lines

A small number of cities are beginning to embrace the precautionary principle and have already been working either on getting the lead out of their water systems completely or providing a safe alternative. These trailblazers include Seattle, Baltimore, New York City, Milwaukee, Madison, and Lansing.

Seattle began testing the water at every one of its schools in 2004, a procedure that is repeated every three years. The Seattle School District has also set a lead action level that is lower than the national standard — 10 ppb — and any test that does not meet this threshold is investigated.[59] More importantly, Seattle has taken concrete action to "get the lead out." In 2006, the city's voters approved capital funding that allowed replacement of drinking water lines at nearly a third of its schools.[60] The district's most recent school tests, conducted between 2013 and 2016, show that 97% of all tests passed district requirements.[61] Furthermore, all school test results going back to 2004 are published on the district website.

In ***Baltimore***, elevated levels of lead had plagued schools' drinking water again and again over the course of 15 years. In 2007, the city shut off all drinking water outlets at schools and began providing bottled water instead. According to the city's commissioner of health at the time, "Since our goal is 100 percent confidence, the best approach is to switch to bottled drinking water."[62] Baltimore's wholesale move to bottled water was clearly more protective of children's health than continuing to react to piecemeal and uncertain test results. However, the bottled water approach is not without drawbacks. One issue is cost over time: The city now spends approximately $450,000 per year making bottled water available at all but a few of its 180 schools.[63] Moreover, bottled water is not guaranteed to be lead-free; in fact, FDA regulations allow up to 5 ppb of lead in bottled water.[64] This is five times as much lead as the AAP's recommended 1 ppb standard.

New York City replaced all the lead service lines at its schools. In addition, when water tests show high lead levels, fixtures are removed and replaced as well. The upshot of these precautionary measures has been a substantial reduction in lead detected in almost 90,000 tests conducted since 2002.[65] Dr. Philip Landrigan, an expert on lead and a professor of preventive medicine and pediatrics at the Icahn School of Medicine at Mount Sinai, called New York City's efforts "a model for the nation."[66] Yet there is still work to be done. As noted earlier, the city only recently stopped

flushing schools' pipes for two hours before testing. And with one-third of the retesting complete as of early February, 2017, the results so far show *nine times* as many outlets with levels of lead above 15 ppb.[67]

More broadly, a trio of Midwestern cities is at the forefront of efforts to fully replace lead service lines — not just at schools but across their communities.

Madison, Wisconsin, is already ahead of the pack. Faced with test results confirming lead in its water, the city dug out approximately 8,000 lead pipes between 2001 and 2010. Since then, the highest lead level in the city's water has been 3.5 ppb.[68] Moreover, in opting to "get the lead out" instead of adding phosphates to its water for corrosion control, Madison helped protect its beloved lakes. Phosphates contribute to algal blooms, which can harm wildlife and human health as well. And in the wake of Flint, Susan Bauman, who was Mayor of Madison during the pipe replacements can see the impact it has had on the city. "People walk up to me in the streets now and say, 'Thanks.'"[69]

Just 60 miles from Flint is ***Lansing,*** another city that has successfully removed lead from its water infrastructure. Last year, Lansing completed the removal of 14,500 lead pipes underneath the city.[70] And lastly, after identifying about 70,000 properties with lead pipes or lead service lines, ***Milwaukee*** is now planning to borrow $2.6 million from the federal-state loan fund for lead pipe replacement. The city is prioritizing lead pipe replacement at 385 day care centers.[71]

Other cities moving forward with lead service line replacement include Galesburg, Illinois, which is using a $4 million federal loan to remove half of the 10,000 lead service lines there.[72] Denver is also working to replace lead service lines as it finds them during construction projects.[73]

Policy Recommendations

"When it comes to schools, there often is an ideological divide…but potable water should know no ideological or political constraint."

—Bob Casey, Senator from Pennsylvania[74]

The science now makes clear that there is no safe level of lead exposure for our children. And in the wake of Flint, there is unprecedented interest from state decisionmakers to take action; according to the National Conference of State Legislatures, 40 bills to address the issue were introduced in 13 states last year.[75]

However, to ensure safe drinking water for our children, we need policies that are strong enough to "get the lead out" at school and pre-school.

States and communities should:

- Proactively "get the lead out" of schools and early childhood programs by removing lead service lines, lead-bearing plumbing, fixtures, etc.
- Install and maintain filters certified to remove lead on taps and fountains used for cooking and drinking
- Adopt a 1 ppb standard for lead in schools' drinking water, consistent with recommendations of the American Academy of Pediatrics
- Require testing at all water outlets used for drinking or cooking at all schools annually, using protocols designed to capture worst-case lead exposure for children
- Immediately remove from service any faucet or fountain used for drinking or cooking where testing indicates lead in the water
- Disclose all available information about lead in water infrastructure, test results, and remediation plans/progress both onsite and online
- Provide funding to remove lead in schools' water infrastructure

The federal government should:

- Enforce and strengthen federal rules to protect drinking water from lead — e.g. the Lead and Copper Rule
- Propose major funding to help states and communities remove lead in water infrastructure — including lead service lines and plumbing/fixtures in schools
- Marshal the authority of all relevant federal agencies to protect public health from contamination of drinking water

And of course, we should fully protect all sources of drinking water from pollution.

Methodology

For presentation of Massachusetts testing data in Figure 4:

Figure 4 presents data from Massachusetts' voluntary program for testing lead in schools' drinking water, as of January 6, 2017. Since mid-2016, the Massachusetts Department of Environmental Protection (MassDEP) has provided funding for Massachusetts schools to participate in a voluntary water testing program to test for the presence of lead and copper. More than 40,000 tests of fountains and faucets have been completed so far. The state compiles and publishes all the test results — and reported remediation — online in a single spreadsheet. *Significantly, the published results include those tests detecting levels of lead in water at concentrations below 15 parts per billion.* As of early January 2017, Massachusetts is one of the few states that provides such a comprehensive statewide picture of lead in schools' water.

MassDEP periodically provides updated information on test results from the school taps that have been tested, including tap identifying information and the lead and copper test results, in an excel sheet on the department's website.[76] The results are reported in mg/L (milligrams per liter), but can be converted to parts per billion (ppb) using a metric conversion calculator.

To examine the Massachusetts results, the excel spreadsheet was downloaded from the state's website and the results were custom sorted, first by "analyte name" (to sort out the lead results from the copper results) and then by "result" (or lead/copper level found). The "results" were ordered highest to smallest so that the highest lead levels would appear first. Then the results were grouped into the following categories:

- tap samples that had lead results higher than .015 mg/l (15 ppb)
- samples that had a lead level higher than .01 mg/l (10 ppb), up to and including .015 mg/l
- samples with a lead level higher than .005 mg/l (5 ppb), up to and including .01 mg/l
- samples with a lead level higher than .001 mg/l (1 ppb), up to and including .005 mg/l
- samples that had any determinable lead level below .001 mg/l (1 ppb) but above 0 mg/l
- samples where no lead was detected (identified by MassDEP as "ND" results)

For assessing state policies:

In scoring states' laws and policies related to lead in schools' drinking water, we assigned the following values for specific measures based on our assessment of their relative importance in ensuring lead-free water at school:

Criteria	Score
Lead Standard In Water	
uses EPA action level of 15 ppb (1 liter sample) or 20 ppb (250 mL sample)	5
uses more protective state standard but greater than 1 ppb	10
uses 1 ppb or zero	20
law does not specify	0
Get the Lead Out	
requires pro-active replacement of lead service lines	35
requires pro-active install of NSF-certified filters at every tap/fountain used for drinking or cooking	35
requires immediate shut off of water outlets used for drinking or cooking that exceed testing standard for lead	20
requires replacing lead plumbing and/or fixtures	20
requires some remediation (broad discretion, could allow flushing only)	10
no action required (at schools)	0
Public Disclosure/Transparency	
disclosure of lead infrastructure — service lines, fixtures	5
disclosure of all specific test results	5
disclosure information available online	5
disclosure information available at the outlet — e.g., bar code on the fountain	5
disclosure of remediation plan and implementation	5
no notification required (specific to schools)	0
Testing Protocols	
test for worst-case results — several samples per tap, not just a first-draw sample and prohibit sampling protocols known to hide lead — e.g., pre-test stagnation flushing	15
prohibits sampling protocols known to hide lead — e.g., pre-test stagnation flushing	10
test all faucets and fountains used for drinking or cooking	15
test at least some outlets at every school	5
test every year (at schools)	5
test every 2-5 years (at schools)	2
no testing required (at schools)	0
Applicability	
law applies to schools and early childhood programs	15
TOTAL SCORE	**185**

Score	Grade
175-185	A+
162-175	A
148-161	A-
134-147	B+
120-133	B
106-119	B-
92-105	C+
78-91	C
64-77	C-
40-63	D
0-39	F

For some criteria, states could earn points towards their grade for multiple, applicable policies: for example, we credited New York with a total of 30 points for "Get the Lead Out" because its law requires both 1) immediate shut off of outlets (20); and 2) some form of remediation (10). Where appropriate, we gave states partial credit for credible voluntary measures that, as best we could verify, were actually being implemented.

Finally, while our analysis focused on laws applicable to schools, we did give additional credit where those same policies also applied to early childhood programs. As per a previous study by the Environmental Law Institute, some states — such as Washington and Wisconsin - have requirements that apply *solely* to child care facilities. We did not include these policies in our analysis.

To a large degree, the successful implementation of lead prevention policies will depend on funding and enforcement. Yet funding comes from so many different sources — including the federal drinking water state revolving fund — that we could not establish a reliable way to assess sufficient funding for any given state's efforts. Similarly, absent uniform data, we had no meaningful way to compare the effectiveness of state enforcement or compliance efforts.

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Appendix

History of Federal Policy on Lead in Drinking Water

National Policy/Guidance	What it does
Safe Drinking Water Act, 1974	Authorized EPA to establish Maximum Contaminant Levels for all substances known or suspected to be hazardous to humans. These requirements applied to every Public Water System in the U.S.
EPA Interim Drinking Water Regulations, 1975	Kept the standard maximum allowable concentration of lead at 50 parts per billion (ppb) where water enters the distribution system.
Lead Ban, 1986	Among other bans, pipes and pipe fittings with more than 8% lead were banned. Any pipe or fitting under 8% lead was considered "lead free".
Lead Contamination and Control Act, 1988	Banned the manufacture and sale of water fountains that did not meet the "lead free" definition. The LCCA defined "lead-free" as: "not more than 8 percent lead, except that no drinking water cooler which contains any solder, flux, or storage tank interior surface which may come in contact with drinking water shall be considered lead-free if the solder, flux, or storage tank interior surface contains more than 0.2 percent lead." In addition, the EPA was mandated to issue guidance to schools on how to identify and remediate lead-contaminated drinking water. States were required to distribute this guidance and required to help develop testing and remediation programs for schools. However, school testing was not mandatory.
EPA Guidance, 1989	The first federal guidance to schools on assessing and remediating leaded drinking water. EPA also recommended that "action be taken to limit exposure" whenever lead levels exceeded 20 ppb.
Lead and Copper Rule, 1991	Public Water Systems are required to provide corrosion control and routine water monitoring. If over 10% of samples collected from a water system exceeded lead levels of 15 ppb, the system was to intensify water quality monitoring, optimize corrosion control, issue public notification and other education materials, and in some cases, monitor and/or replace lead service lines.
ACORN v. Edwards, 81 F.3d 1387 (5th Cir. 1996)	The State of Louisiana was sued for failing to implement several provisions of the SDWA that required the establishment of water testing programs. The Court's decision held the Act's provisions were unconstitutional and compelled the state to enact federal programs which the state had no option to decline. The decision does not restrict states from creating their own school drinking water programs.
EPA Guidance, 2006	EPA issues its latest guideline for monitoring lead in school drinking water, focused on three aspects: training of school officials on the hazards of lead, proper lead testing, and proper telling to school communities about test results. The EPA guidance is stated to be "only suggestions... not requirements".

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