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REPORT

THREATS ON TAP:
WIDESPREAD VIOLATIONS HIGHLIGHT NEED FOR INVESTMENT IN WATER INFRASTRUCTURE AND PROTECTIONS

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Acknowledgments

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Executive Summary

The Safe Drinking Water Act (SDWA), one of our bedrock environmental laws, established the role of government in providing safe, clean drinking water. Instituted in 1974, the SDWA requires the U.S. Environmental Protection Agency (EPA) to identify and regulate contaminants to ensure drinking water quality. States then are generally the primary enforcers of the law, subject to EPA oversight. These requirements are meant to protect us from serious health impacts—cholera outbreaks, lead poisoning, and even cancer. But the EPA and the states have been falling short. For more than 25 years, NRDC has been documenting serious problems with our outdated and deteriorating water infrastructure and the inadequate implementation of the Safe Drinking Water Act.[1] These problems include poor EPA and state enforcement, serious underreporting of violations, and weaknesses in the EPA's drinking water standards for contaminants like arsenic and lead.[2]

For more than 25 years, NRDC has been documenting serious problems with our outdated and deteriorating water infrastructure and the inadequate implementation of the Safe Drinking Water Act.

In 2015, the heartbreaking lead emergency in the city of Flint, Michigan, captured national attention, causing public uproar and spurring local mobilization. In 2016, NRDC teamed up with the American Civil Liberties Union of Michigan (ACLU-MI) to represent the community in court as Flint's residents fought for access to clean drinking water. Our analysis of EPA data revealed that, sadly, Flint was far from alone.[3] We found that in 2015, more than 18 million people were served by community water systems that had violated the Lead and Copper Rule, one of the EPA regulations issued to carry out the SDWA.[a]

This report expands our analysis beyond lead to examine all drinking water contaminants regulated under the SDWA. Much as Flint is not the only water system with lead problems, we have found that Lead and Copper Rule problems are far from the only widespread violations of drinking water rules. Our research shows that in 2015 alone, nearly 77 million people were served by more than 18,000 community water systems[b] that violated at least one SDWA rule, and there were more than 80,000 violations of SDWA rules that year. These violations included exceeding health-based standards, failing to properly test water for contaminants, and failing to report contamination to state authorities or the public.

Further analysis of the violations of health-based standards showed that in 2015, there were more than 12,000 health-based violations in some 5,000 community water systems serving more than 27 million people. In other words, these drinking water systems violated the parts of the rules that set health-protective standards that stipulate permissible levels for each contaminant or require treatments to reduce health threats.

Troublingly, we also found that systems serving very small communities—such as rural and more sparsely populated areas—had a significantly higher rate of violations of the health standards and a higher percentage of total violations compared with larger systems. Systems serving less than 500 people accounted for nearly 70 percent of all violations and a little over half of all health-based violations. This means that rural Americans could be at greatest risk from some drinking water contaminants.

These violations—combined with shortcomings in the EPA's rules, lackluster enforcement, and the aging drinking water treatment and distribution infrastructure—have very real public health consequences. In fact, the Centers for Disease Control and Prevention (CDC) says that approximately 19.5 million Americans fall ill every year from pathogens as a result of contaminated drinking water from public water systems. The young, the elderly, and immunocompromised individuals are particularly vulnerable.[4] And that's just the microbiological waterborne illnesses like cryptosporidiosis and Legionnaires' disease. No comprehensive estimates have been published of the number of cancers, reproductive and neurological diseases, or other serious chronic health problems caused by contaminated tap water.

Fixing the infrastructure problems that cause these violations can save lives, reduce the occurrence of disease, and create hundreds of thousands of jobs in communities that need them most.

a Primary drinking water regulations cover contaminants that may have an adverse effect on people's health. They either establish specific limits for how much of a contaminant can be found in water or establish a specific treatment technique that will reduce the level of the contaminant in the drinking water. 42 U.S.C. § 300f(1).

b The Safe Drinking Water Act defines a community water system as a public drinking water system that "serves at least 15 service connections used by year-round residents" or "regularly serves at least 25 year-round residents." 42 U.S.C. § 300f(15). This definition is in contrast to the broader term "public water system," which includes community water systems as well as noncommunity water systems that do not serve people year-round.

FIGURE I: 76.9 MILLION PEOPLE SERVED BY COMMUNITY WATER SYSTEMS WITH AT LEAST ONE REPORTED VIOLATION OF THE SAFE DRINKING WATER ACT (2015). POPULATIONS ARE SHADED AT THE COUNTY LEVEL TO SHOW THE NUMBER OF RESIDENTS SERVED BY COMMUNITY WATER SYSTEMS WITH VIOLATION(S) IN 2015.

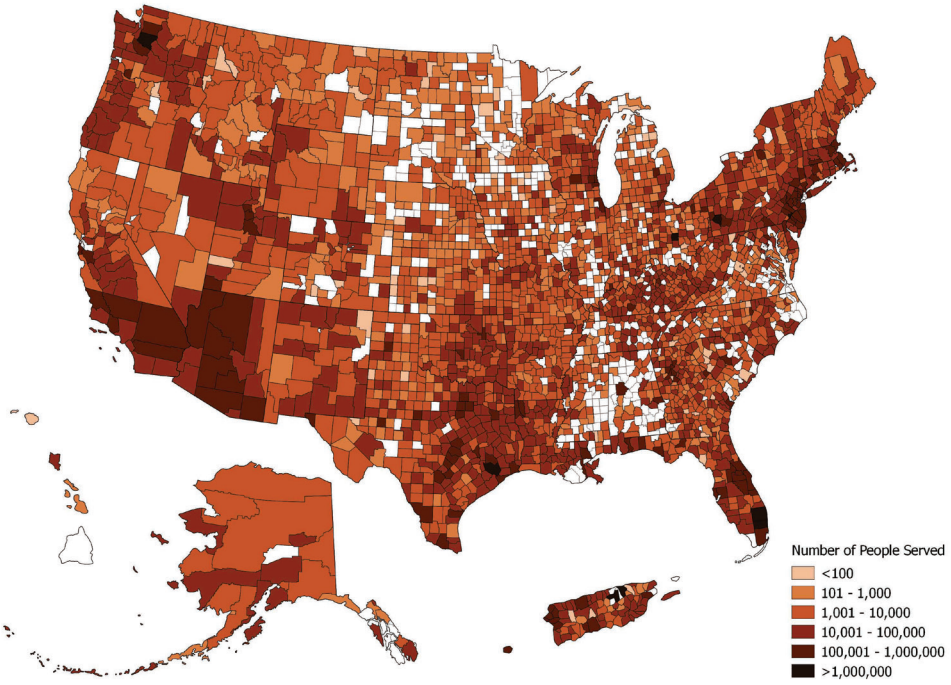
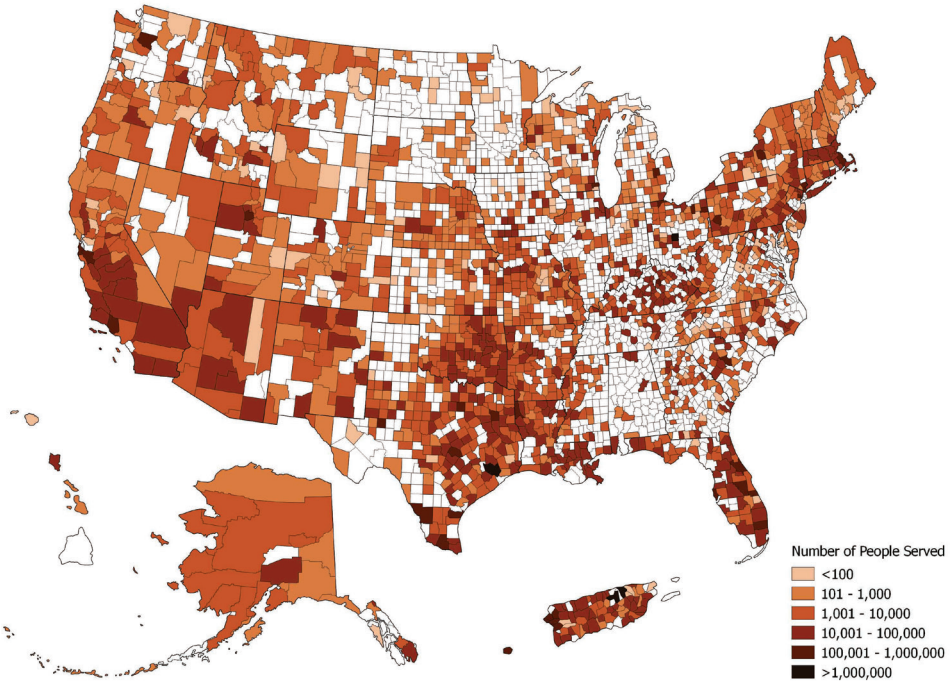


FIGURE 2: 27.4 MILLION PEOPLE SERVED BY COMMUNITY WATER SYSTEMS WITH AT LEAST ONE REPORTED HEALTH-BASED VIOLATION OF THE SAFE DRINKING WATER ACT (2015). POPULATIONS ARE SHADED AT THE COUNTY LEVEL TO SHOW THE NUMBER OF RESIDENTS SERVED BY COMMUNITY WATER SYSTEMS WITH VIOLATION(S) IN 2015.



THE SAFE DRINKING WATER ACT: HOW IT WORKS . . . AND HOW IT DOESN'T

Under the SDWA, the EPA must identify hazardous drinking water contaminants—from arsenic to xylene—and develop rules that either set maximum permissible levels for them or establish protocols to treat the contaminated water to minimize the levels of the contaminant. These drinking water rules cover around 100 contaminants such as toxic chemicals, microorganisms, radioactive elements, and metals that can cause health impacts like cancer, birth defects, miscarriages, and cognitive impairment.[c]

The SDWA requires the EPA to review its regulations every six years and to strengthen them as the science advances. And right now, many rules need to be made more stringent. For example, the Flint crisis highlighted weaknesses in the Lead and Copper Rule. Although Flint residents had extraordinarily high levels of lead in their water, the city's water system had no reported violations of that rule. Problems with how, where, and when drinking water samples were taken and reported resulted in the presence of very high levels of lead in the tap water without any official report of a violation. Weaknesses in the current Lead and Copper Rule, and numerous deficiencies in other EPA drinking water rules, require strengthening changes for the sake of public health.

Since 1996, the EPA has not set a single new standard for a drinking water contaminant under the SDWA's provisions for establishing such standards.

Beyond the regulated contaminants, many more are found in drinking water but are not regulated. Since 1996, the EPA has not set a single new standard for a drinking water contaminant under the SDWA's provisions for establishing such standards. In those 20 years, the EPA has decided that only one new contaminant should be regulated—perchlorate (a component of rocket fuel). But since that initial decision six years ago, the agency has not actually proposed any standard.[5] In addition to perchlorate, many other unregulated drinking water contaminants are ripe for EPA regulation, like algal toxins (from hazardous blooms of algae), the widespread Teflon-related toxic chemicals PFOA and PFOS, the carcinogen hexavalent chromium, and the pathogen Legionella (which causes Legionnaire's disease).

Unfortunately, some lawmakers on Capitol Hill are working to make it more difficult—if not impossible—for the EPA and other agencies to set new rules and strengthen the existing ones. The House of Representatives passed the Regulatory Accountability Act (see sidebar) and other, similar legislation in January 2017 that tilts the regulatory system in favor of industry interests and erects new barriers (some of which are insurmountable) to developing rules to protect health and safety. If this legislation passes in the Senate and is enacted, drinking water regulations will stagnate and the public will be at risk from drinking water contamination.

The **Regulatory Accountability Act** (RAA) would make it harder to create regulations to protect the public—like the regulations establishing standards for contaminants under the Safe Drinking Water Act. The bill would create new barriers to developing regulations and could make them impossible to uphold in court. The bill also would require agencies to consider factors other than impacts on human health when setting health standards.

The RAA would harm health protections, like the rules promulgated under the Safe Drinking Water Act, in the following ways:

- Current health statutes require some health standards to be based on science and the limits of feasible technologies. The RAA would amend current law to overturn this requirement, elevating costs to industry over ensuring health protection.
- The bill would give industry interests more power to delay and complicate rulemakings under the Safe Drinking Water Act. It would require the EPA (and other agencies) to analyze "any substantial alternatives" submitted to them by opponents of the rule. Industry could also petition for time-consuming hearings on proposed rules for unregulated contaminants, and it would be difficult for the EPA to reject those petitions.
- The RAA requires agencies to adopt the "least costly rule" even if that is not the most health-protective. The language could also make it impossible for a court to uphold a rule because the language effectively makes an agency review an almost unlimited number of alternatives to show a rule is the "least costly."
- The bill could sidetrack the EPA with new and unnecessary analytic tasks, many of which are purposely beyond the ability of economists to complete or satisfy. These hurdles are in addition to the already existing plethora of laws and executive orders that require substantial analysis.
- The RAA would prevent high-cost public protections, such as regulations under the Safe Drinking Act, from moving ahead until all actions seeking judicial review of the public protection are decided.
- The bill creates a catch-22 that could prevent rulemakings from ever being completed. It imposes additional, time-consuming requirements but then says a rulemaking has to begin all over again if it lasts more than two years. This also creates an incentive for industry to drag out rulemakings to restart the clock repeatedly.

c The Safe Drinking Water Act became law in 1974. Refer to Appendixes 1–12 for further descriptions of these 12 rules.

MONITORING AND REPORTING VIOLATIONS MAY BE MASKING SERIOUS HEALTH RISKS

Across the country, the tens of thousands of monitoring and reporting violations could be hiding more health threats. Nearly 25 years ago, NRDC first documented underreporting problems in the EPA's drinking water database.[6] More recently, in a 2013 report, the EPA admitted that "audits and assessments have shown that violation data are substantially incomplete."[7]

There are many ways public water systems can violate SDWA rules, including violating health-based standards, improperly treating water, or failing to monitor and report violations to the state or to their customers. Violations of health-based standards are especially concerning because they mean the water system has exceeded permissible levels or has not applied required treatment. But violating the rules' monitoring and reporting requirements can also pose serious health risks by masking a potentially dangerous situation.

Sometimes, public water systems fail to properly sample their water so health-based violations are not discovered. In other cases, states fail to correctly document violations. States also sometimes fail to report known violations to the EPA's database as required by federal law. These kinds of monitoring and reporting failures can hide serious health threats. In one stark example, as of January 2017, Flint actually had no reported violations of the Lead and Copper Rule (though NRDC strongly believes Flint was in violation of that rule).[8] Given these failures, it is likely that the widespread violations documented and mapped in this report reflect only a subset of a serious problem.

ARE THE STATES ASLEEP AT THE SWITCH?

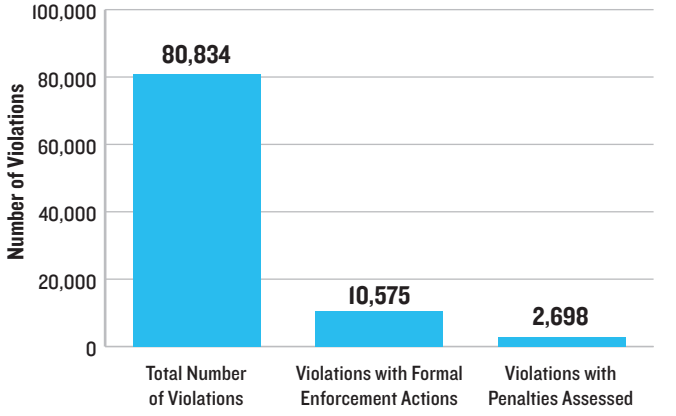
Under the SDWA, the EPA is ultimately responsible for setting and enforcing rules for all public water systems.[d] However, the act allows states and Native American tribes to apply for primary enforcement responsibility, or "primacy," which grants them substantial federal funding and imposes legal obligations. The EPA grants primacy if the state or tribe's regulations are at least as stringent as the EPA's own rules, and if it has demonstrated the authority to adequately compel compliance. Public water systems are required to report results from sampling and report violations to state authorities, which then relay the information to the EPA. The state takes the lead in bringing noncompliant systems back into compliance, while the EPA acts as a backup if the state fails to resolve violations. This system of self-reporting relies heavily on the honor code, blowing the margin for error wide open. Past EPA audits have found widespread underreporting of violations.

NEARLY 9 IN 10 DRINKING WATER VIOLATIONS WERE NOT SUBJECT TO FORMAL ENFORCEMENT

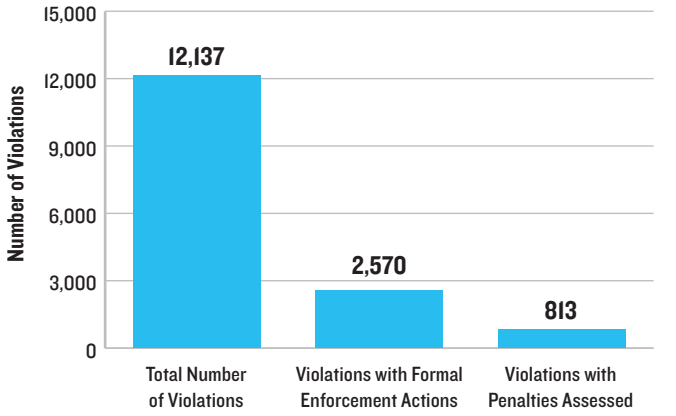
Even when violations are known, they're not necessarily corrected. According to the EPA's Safe Drinking Water Information System (SDWIS) data, of the more than 80,000 reported violations that occurred in 2015, the agency and states took formal enforcement action against a mere 13.1 percent.[9] Nearly 9 out of 10 violations were subject to no formal action by the state or the EPA, such as the issuance of a notice of violation, a site visit, or the filing of a civil or criminal filing of a civil or criminal action. Even fewer of those reported violations—an abysmal 3.3 percent—received penalties.

Health-based violations barely fared better. Agencies took formal enforcement actions against 21.2 percent of health-based violations. Furthermore, penalties (either criminal punishment or civil fines) were sought or assessed for only a tiny fraction (6.7 percent) of violations.[e]

FORMAL ENFORCEMENT ACTIONS FOR VIOLATIONS OF THE SAFE DRINKING WATER ACT



FORMAL ENFORCMENT ACTIONS FOR HEALTH-BASED VIOLATIONS OF THE SAFE DRINKING WATER ACT



d A public water system is defined by the Safe Drinking Water Act as a system that provides water for human consumption "that has at least 15 service connections or regularly serves at least 25 individuals." 42 U.S.C. §300f(4)(A). Systems that service fewer people, and people who receive water from private wells, are not covered by the Safe Drinking Water Act.

e It should be noted that often states (or in rare cases the EPA) will take what they call "informal enforcement" actions, such as sending a letter or calling an offending water system. According to NRDC analysis of EPA data, in 86.0 percent of all violations in 2015 and in 95.4 percent of health-based violations, at least an informal action such as a call or letter occurred. However, in thousands of cases not even informal action was taken. Importantly, as is discussed above, such "informal" actions often failed to bring systems back into compliance, and the lack of formal enforcement sends a clear signal that breaking the law is unlikely to result in meaningful enforcement or penalties. 42 U.S.C. §300g-3.

Nearly 9 out of 10 violations were subject to no formal action by the state or the EPA.... Even fewer of those reported violations—an abysmal 3.3 percent—received penalties.

This lack of accountability tells water systems that are knowingly violating the SDWA, with state and federal complicity, that their wrongdoing will go unpunished. The data highlight the need for a culture change at the EPA and state regulatory bodies to ensure that violations are taken seriously and that public health threats are addressed promptly.

WHAT NOW? INVEST IN AND IMPROVE INFRASTRUCTURE AND ENFORCE THE LAW

While the problem is vast, there are solutions. And those solutions could even solve other problems at the same time.

1. Improve water infrastructure and modernize our drinking water treatment plants.

The widespread SDWA violations are too often caused by deteriorating and outdated water collection, treatment, and distribution infrastructure. Every year, there are approximately 240,000 water main breaks due to old, often poorly maintained water lines that have outlived their useful lives.[10] There are also 6 million to 10 million service lines across the country that are at least partly made of lead.[11] In many communities, the outdated treatment plants that are supposed to purify our tap water continue to rely on century-old technologies that simply cannot remove many of today's toxic chemicals and pathogens.[12] Sewage collection and treatment facilities, too, often cannot get rid of dangerous microbes and toxic chemicals. Instead they discharge raw or poorly treated sewage into our drinking water sources. This is especially frequent after rain events, which can overload outdated systems.

These fundamental components of our water infrastructure need major upgrades. Lead service lines need to be fully replaced. Drinking water facilities need to be updated with modern water treatment technologies. Leaking pipes and deteriorating mains need to be fixed or replaced. Nineteenth- and early 20th-century sewer systems in cities across the country must be modernized to be able to absorb excess water from extreme rain events, which are becoming more frequent. Implementing these fixes not only will improve public health, but could also create millions of jobs across the country.

2. Increase funding for water infrastructure to protect health and create good jobs.

There are almost a trillion dollars' worth of upgrade and maintenance projects across the country for drinking water infrastructure. Paying for these projects will be no small feat. Under the SDWA, the Drinking Water State Revolving Fund (DWSRF) allocates congressional funds for utilities to use to achieve or maintain SDWA compliance.[13] The fund also supports source water protection and operator certification. States are authorized to distribute DWSRF resources in the form of low- and no-interest loans, grants (in limited cases), and other types of financial assistance. States are responsible for matching a percentage of DWSRF allocations. From 1998 to 2016, the federal government invested about $19 billion in the DWSRF, which has translated to more than $32.5 billion in total allocations to water system projects across the United States.[14]

This investment, while helpful, is significantly less than we need it to be. Congress must increase funding for drinking water infrastructure to at least $8 billion per year, roughly triple the current amount of $2.3 billion. Fortunately, during his campaign, President Trump outlined a vision for the future of infrastructure that promised to do just that.[15] In the bipartisan Water Resources Development Act, the U.S. Senate noted that for every $1 million in state revolving loan fund spending, 16.5 jobs were created.[16] It further observed that $34.7 billion in federal capitalization grants for the DWSRF would create 506,000 jobs.[17] These investments can create millions of well-paid jobs in construction, steel mills, and other trades all over the country.[18]

3. Strengthen existing regulations and establish new ones.

Current SDWA rules such as the Lead and Copper Rule have weaknesses that leave many people's drinking water susceptible to contamination. In addition, many contaminants found in drinking water are not regulated. The EPA must establish rules for many of these unregulated contaminants—starting with a health-based standard for perchlorate, as EPA formally promised to do six years ago. Congress must not hinder the EPA's ability to improve existing regulations or to promulgate new ones. Congress must not pass the Regulatory Accountability Act or similar legislation, which would harm public health and leave everyone with potentially unsafe drinking water.

4. Develop a more robust testing system for drinking water contaminants.

We need a monitoring program that can quickly and accurately identify problems in a drinking water system. The EPA should strengthen its rules to require more frequent—and more targeted—testing. In the absence of federal action, states and public water systems can also implement their own stronger monitoring programs that include things like required lead testing at schools and day care facilities. Finally, more research into and development

of sensors and other methods to continuously test for contaminants at the tap would empower citizens to check the quality of their drinking water, rather than relying on public water systems to do so.

5. Strengthen all drinking water enforcement mechanisms.

The EPA and the states should make SDWA compliance a top priority. Substantially increased funding for implementation, investigation, and enforcement is critical, as is funding for audits of water system records and state files to ensure that violations are being properly recorded and reported.

6. Allow citizens to act immediately in cases of imminent and substantial health threats.

Currently, if there is a threat of imminent danger to public health from contaminated drinking water, citizens have no immediate recourse through the court system. Instead, at most they can petition the EPA to exercise its emergency authority to take action—as they did in Flint. If citizens want to file their own action, they have to wait for months after formally notifying the EPA and the State that there is a violation.

Many sewage treatment plants are unable to fully remove pollutants and can contaminate drinking water sources, especially after major storms when their treatment capacity may be overwhelmed.

Introduction to the Safe Drinking Water Act

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The introduction of filtration and chlorination of drinking water in the United States in the early 20th century significantly improved public health. In major U.S. cities, clean drinking water reduced infant deaths by three-quarters, child deaths by two-thirds, and adult deaths by half.[19] But in the 1960s there were still 130 known disease outbreaks or poisonings, generally linked to dangerous pathogen contamination of water.[20] At the same time, the influx of new industrial and agricultural chemicals into the water supply began to raise concerns. A 1974 government study found that 36 percent of national tap water samples contained unsafe levels of bacteria or chemicals.[21] Other studies showed that drinking water systems were severely ill equipped to treat and deliver safe drinking water. Scientific evaluations showing chemicals in treated drinking water—like asbestos in Duluth, Minnesota, and other carcinogens in New Orleans—prompted Congress to act.

In 1974, Congress overwhelmingly passed, and President Gerald Ford signed into law, the Safe Drinking Water Act (SDWA).[22] This law required the newly established U.S. Environmental Protection Agency (EPA) to develop health standards for drinking water from "public water systems."[f] These systems are defined as water suppliers (private or public) that serve piped drinking water to 15 service connections or at least 25 people.[23] Importantly, it does not protect tap water from very small water suppliers or private wells, nor does it cover bottled water (which is separately regulated by the Food and Drug Administration).

Under the SDWA, the EPA sets health-based standards for contaminants that appear in drinking water. For some contaminants, the EPA requires treatment to reduce hazards from waterborne pathogens, like *Giardia* and *Cryptosporidium* (two parasites that can cause gastrointestinal distress, nausea, and diarrhea). For toxic chemicals like arsenic or industrial chemicals that can cause cancer or other serious diseases, the EPA has established maximum allowable levels in water. Over the decades, modern treatment technologies and SDWA regulations have substantially reduced the number of deaths and serious illnesses caused by contaminated tap water, including cancer, miscarriages, and impaired development.[24]

f In its Public Water System Supervision Program, authorized under the 1974 SDWA, the EPA covers two types of public water supplies: (1) community water systems, which regularly serve the same customers year-round, and (2) noncommunity water systems, which serve different people at different times or serve people for only part of the year (such as factory, school, or campground water systems). In this report, we focus on violations by community water systems, since that is where most people get most of their drinking water most of the time. This limitation also avoids double-counting people who may get water from both community and noncommunity water systems that are in violation.

Safe Drinking Water Act Rules

Primarily, the SDWA requires the EPA to establish regulations to restrict the levels of contaminants in drinking water. A "contaminant" is defined as "any physical, chemical, biological, or radiological substance or matter in water." The EPA must set a maximum contaminant level goal (MCLG) that is fully protective of health for drinking water contaminants. At the same time, the agency must establish maximum contaminant levels (MCLs) as close to the MCLG as is "feasible," considering technological limitations and costs. In other words, the EPA sets a contaminant limit for completely safe drinking water, and then sets a looser standard for tap water that accounts for feasibility and costs—and isn't necessarily safe. For example, the EPA's MCLG for arsenic, a known human carcinogen, is zero because no level of arsenic is safe. Because of costs, however it set the enforceable arsenic MCL at 10 parts per billion (ppb). Even at that level, according to the National Academy of Sciences, substantial cancer risks remain.[25]

Water systems are required to provide public warnings of contamination to their customers only if they violate the MCL or the prescribed treatment technique, so a system with as much as 10 ppb arsenic, for example, would not be required to issue a public notification. But if compliance with MCLs is not fully health-protective, MCL violations are even more worrisome. Water systems are supposed to provide annual water quality reports (sometimes called consumer confidence reports) to their customers summarizing the results of testing for contaminants in their water; larger systems are required to post those reports on the web.[26]

If the EPA finds it is not technologically or economically feasible to ascertain the level of a contaminant in drinking water, it is required to establish a treatment technique instead of an MCL. For example, the EPA has found that it is not feasible to ascertain the level of *Cryptosporidium* (which causes intestinal disease) in drinking water, so it has established a treatment technique that requires filtration and disinfection (see Appendix 3: Surface Water Treatment Rules and Groundwater Rule). Public water systems are responsible for satisfying an MCL or treatment technique, under the supervision of state drinking water officials and with ultimate oversight by the EPA.

Overall, the EPA has established primary drinking water regulations for about 100 of the many thousands of known or anticipated contaminants that appear in tap water.[27] They are classified under individual rules that establish specific MCLGs and MCLs or treatment techniques (see Table 1 and appendices). These rules cover a wide array of health impacts that range from gastrointestinal illness to cancer to birth defects to nervous system problems.

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Health and environmental experts have criticized the EPA for the low number of regulated contaminants and for its failure to adopt a single new standard since the provisions for setting new drinking water standards passed in 1996.[28] There are two main reasons for the slow progress. First, the law is complex and the EPA has limited resources to complete all the steps legally required to adopt a new standard. The EPA must, for example, convene an advisory council, make scientific determinations about the toxicity of the contaminant, and create and evaluate a national database on the extent of its occurrence. It must make findings on its likely occurrence in drinking water, evaluate peer-reviewed studies, and publish a proposed list of contaminants for consideration. Further, it must complete a "health risk reduction and cost analysis"[29] and determine that "regulation of such contaminant presents a meaningful opportunity for health risk reduction."[30] Only then can the EPA propose a standard, take public comment, and then finalize it. Each of these requirements (and there are more) strains an agency already constrained with staff restrictions and a diminishing budget.

Second, the EPA has lacked the will to adopt standards in the face of political opposition from the water industry and other industries, local governments, antiregulatory members of Congress, and even other federal agencies reluctant to assume greater liability. Because drinking water standards generally become minimum cleanup standards for Superfund and other hazardous waste sites, a tough MCL can cost polluting industries (or government agencies like the Department of Defense) a lot of money for cleanup. This creates incentives for them to fight the EPA's adoption of strong MCLs.

TABLE 1: RULE DESCRIPTIONS		
RULE NAME	**DESCRIPTION**	**RANGE OF MAJOR HEALTH IMPACTS**
Combined Disinfectants and Disinfection Byproducts Rules	Establish health standards for disinfection byproducts that apply to community water systems that add disinfectants to their water. While adding chlorine or other chemical disinfectants to water has benefits, these disinfectants can react with organic matter in the water to create byproducts that can adversely impact human health.	Exposure can lead to cancer and potentially to reproductive impacts such as miscarriages and birth defects.
Total Coliform Rule	Sets an MCLG and MCL for the presence of total coliforms in drinking water. "Coliforms" refers to a family of bacteria common in soils, plants, and the guts of animals. (Note: This rule was revised in 2013 but didn't go into effect until 2016. This report focuses on 2015, and therefore on the earlier rule before it was revised.)	Coliforms indicate that disinfection may not be working and that disease-causing organisms may be present. These organisms can cause diarrhea, cramps, nausea, and headaches and pose potentially more serious health threats for children, the elderly, and immune-compromised people.
Combined Surface, Ground Water, and Filter Backwash Rules[g]	Establish treatment requirements to protect people from potential pathogens from ground water or surface water sources.	Some of the pathogens covered, such as *Cryptosporidium* and Giardia, can cause severe gastrointestinal distress, nausea, and diarrhea. In the very young, the elderly, and immune-compromised people, they can cause serious, life-threatening infections.
Nitrate and Nitrite Rule[h]	Sets an MCLG and MCL for nitrates and nitrites in drinking water. These contaminants commonly come from runoff carrying synthetic fertilizer or waste from large animal agriculture operations, or from human sewage or septic systems.	Exposure can lead to blue baby syndrome in infants, developmental defects, and in extreme cases infant death. Long-term exposure above the MCL can lead to impaired thyroid function and damaged cardiovascular health. These chemicals may also cause cancer.[31]
Lead and Copper Rule	Mandates a complex treatment technique to control lead levels in tap water. All water systems serving more than 50,000 people must either treat their water to "optimize corrosion control" or demonstrate that their water isn't corrosive and no lead problems exist. Additional requirements also apply.	Lead exposure is particularly toxic to children and can cause serious, irreversible damage to developing brains and other parts of the nervous system. Exposure can also cause miscarriages and stillbirths, fertility issues, cardiovascular and kidney impacts, cognitive dysfunction, and elevated blood pressure in healthy adults.
Radionuclides Rule	Regulates combined radium-226/228; (adjusted) gross alpha, beta particle and photon radioactivity; and uranium.	Exposure can lead to cancers and in some cases impaired kidney function.
Arsenic Rule	Sets an MCLG and MCL for arsenic in drinking water.	Exposure to arsenic, a known human carcinogen, can lead to cancers, developmental defects, pulmonary disease, and skin or cardiovascular disease.
Synthetic Organic Contaminants Rule	Sets an MCLG and MCL for 34 synthetic organic (man-made) chemicals that do not exist in nature.	Exposure can lead to cancers, developmental defects, central nervous system and reproductive difficulties, endocrine issues, and liver and kidney problems.
Inorganic Contaminants Rule	Sets an MCLG and MCL for 12 inorganic contaminants (excluding nitrate and nitrite), materials of mineral origin that may be present in water due to human activity, such as mining.	Exposure risks vary by chemical but can include increased cholesterol, kidney damage, hair loss, skin irritation, and cancer.
Volatile Organic Contaminants Rule	Sets an MCLG and MCL for 21 volatile organic contaminates (VOCs), which are gases at room temperature.	Exposure can lead to cancers; developmental, skin, and reproductive issues; and cardiovascular problems. Exposure can also have adverse effects on the liver, kidneys, and immune and nervous systems.

g Includes the Ground Water, Surface Water, Filter Backwash, Long Term 1 Enhanced Surface Water Treatment, and Long Term 2 Enhanced Surface Water Treatment Rules.
h Regulated under Phase II of the Inorganic Contaminants Rule. EPA classifies these contaminants independently in the Safe Drinking Water Information System.

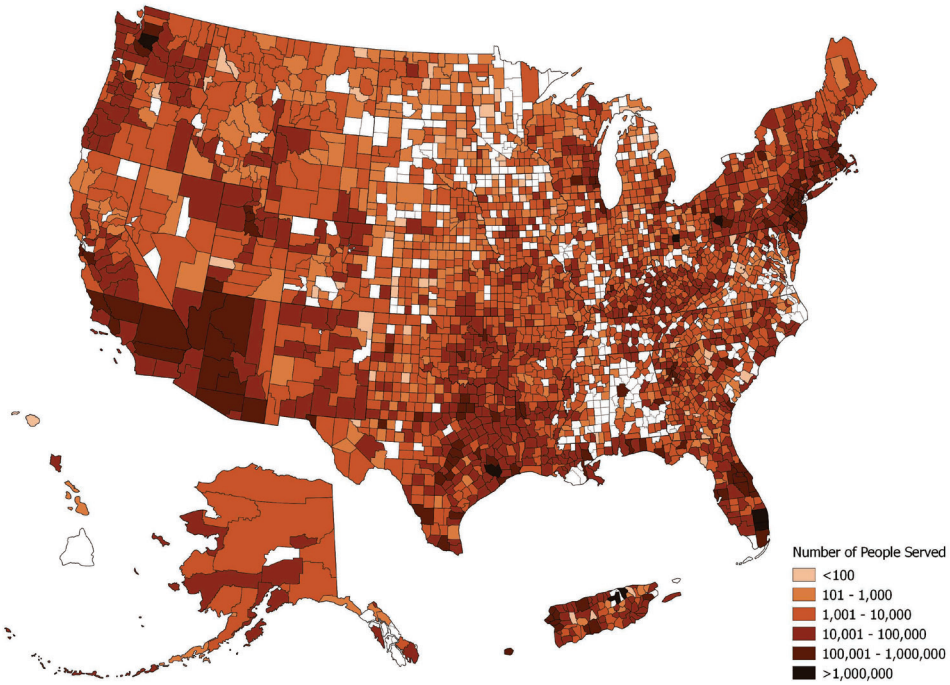
Violating the Drinking Water Rules

SDWA violations generally fall into two categories: health-based violations, and monitoring and reporting violations. Health-based violations occur when the drinking water contains chemicals in excess of the MCL or when the system fails to properly treat water to prevent contamination.[i] Monitoring and reporting violations include a water system's failure to take samples and test the quality of its drinking water according to the schedule established by the EPA, or its failure to report results to the state, the EPA, or its customers (when required) in a timely manner. While monitoring and reporting violations are not technically health based, these violations can mask serious underlying issues such as contamination. Without proper monitoring and reporting, it is impossible to determine whether health-based standards have been met.

ALL VIOLATIONS

In 2015, there were 80,834 reported SDWA violations (including health-based violations and monitoring and reporting violations) at 18,094 community water systems across the country.[j,k] That means that roughly one out of three of the approximately 52,000 community water systems in the United States had a reported violation. These water systems served 76,922,570 people, or nearly one-fourth of the U.S. population (see Table 2).[l] As discussed in greater detail below, the actual number of violations and systems breaking the law is likely substantially higher because of probable widespread underreporting.

FIGURE I: 76.9 MILLION PEOPLE SERVED BY COMMUNITY WATER SYSTEMS WITH AT LEAST ONE REPORTED VIOLATION OF THE SAFE DRINKING WATER ACT (2015). POPULATIONS ARE SHADED AT THE COUNTY LEVEL TO SHOW THE NUMBER OF RESIDENTS SERVED BY COMMUNITY WATER SYSTEMS WITH VIOLATION(S) IN 2015.



i These latter violations include Maximum Residual Disinfectant Level (MRDL) violations, which occur when a disinfectant exceeds the highest level allowed in drinking water. Disinfection is important for limiting microbial contamination but can have harmful impacts if levels are too high.

j We used EPA data for all violations during calendar year 2015, using the most up-to-date data available (released in October 2016, the "2016 quarter 3 data set"), from the Safe Drinking Water Information System.

k As noted earlier, in this report we track only violations by community water systems. We do not summarize the violations by the approximately 100,000 noncommunity water systems (such as school, factory, or commercial facility drinking water systems that don't supply the same customers full time year-round) because this could result in double counting of people served by both types of systems in violation.

l Total U.S. population (estimated) on January 1, 2015, was 321,418,820. Data from the Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010, to July 1, 2015 (NST-EST2015-01), U.S. Census Bureau, Population Division.

TABLE 2: VIOLATIONS OF THE SAFE DRINKING WATER ACT IN CALENDAR YEAR 2015 RANKED BY POPULATION SERVED[m]			
RULE NAME	**POPULATION SERVED**	**NUMBER OF VIOLATIONS**	**NUMBER OF SYSTEMS**
All Violations	76,922,570	80,834	18,094
Combined Disinfectants and Disinfection Byproducts Rules[n]	25,173,431	11,311	4,433
Lead and Copper Rule	18,350,633	8,044	5,367
Total Coliform Rule	17,768,807	10,261	5,233
Combined Surface, Ground Water, and Filter Backwash Rules[o]	17,312,604	5,979	2,697
Right-to-Know ("Consumer Confidence") Rule	14,422,712	7,906	5,030
Public Notification Rule	8,381,050	13,202	3,394
Nitrates and Nitrites Rule	3,867,431	1,529	971
Volatile Organic Contaminants Rule	3,451,072	10,383	406
Synthetic Organic Contaminants Rule	2,669,594	6,864	311
Arsenic Rule	1,842,594	1,537	573
Radionuclides Rule	1,471,364	2,297	523
Inorganic Contaminants Rule	1,312,643	1,505	224
Miscellaneous Rules	3,718	16	10

By population served, the top five SDWA rules violated by community water systems in 2015 were those addressing:

1. disinfectants and disinfection byproducts
2. lead and copper
3. total coliform
4. surface water and ground water quality (i.e., pathogens)
5. the "consumer confidence" rule, which seeks to ensure the public's right to know about possible violations by requiring annual water quality reports to be provided to consumers.

Table 1 describes each drinking water rule, common sources of the regulated contaminants, and the health risks. The appendices provide more information about each rule and a detailed breakdown of the violations.

In 2015, violations were reported in all 50 states, the District of Columbia, Puerto Rico, and other territories covered by the SDWA (including Guam, American Samoa, the U.S. Virgin Islands, and the Northern Mariana Islands). When ranked by population served by systems with SDWA violations, the top five states were:

1. Texas (12,066,920 people served[p])
2. Florida (7,540,465 people served)
3. Pennsylvania (5,645,903 people served)
4. New Jersey (4,487,703 people served)
5. Georgia (3,846,734 people served)

When ranking by percentage of total population served, Puerto Rico had the highest percentage of any state or territory, with a whopping 99.5 percent of its population served by community water systems in violation of the SDWA.[q]

While monitoring and reporting violations are not technically health based, these violations can mask serious underlying issues such as contamination. Without proper monitoring and reporting, it is impossible to determine whether health-based standards have been met.

m Data from the 2016 quarter 3 data set of the Safe Drinking Water Information System, https://ofmpub.epa.gov/apex/sfdw/f?p=108:200.
n Includes the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules.
o Includes the Surface Water, Ground Water, Filter Backwash, Long-Term 1 Enhanced Surface Water Treatment, and Long-Term 2 Enhanced Surface Water Treatment Rules.
p "People" refers to individuals served by community water systems in the given time frame and location. It does not equate with households.
q In 2015, the estimated population of Puerto Rico was 3,474,182 people (from the Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010, to July 1, 2015 (NST-EST2015-01), U.S. Census Bureau, Population Division.

The data also show that very small systems, such as those in rural and more sparsely populated areas, had a higher percentage of violations of the health standards and a substantially higher percentage of total violations compared with larger systems. Systems serving less than 500 people accounted for nearly 70 percent of all violations and a little over half of all health-based violations.[r] This is not especially surprising, for as EPA has noted in discussing the serious problem of noncompliance in many small systems:

> In general, large [systems] have greater capacity to maintain compliance than small systems and can return to compliance more quickly than small systems. This disparity is often the result of differences in financial, administrative and technical capacity between large and small systems. Small [systems] have a smaller customer base to support purchase and installation of needed infrastructure and to operate and maintain the system. Similarly, small PWSs [public water systems] may be unable or unwilling to charge consumers rates sufficient to cover the true cost of collecting, treating and distributing the water. Lack of funding may cause small PWSs to delay needed capital improvements. Small PWSs . . . are often overseen by part-time administrators who are not environmental professionals, and the pay for the system operators may not be adequate to attract and keep someone with the necessary training and skills. If there are violations, small PWSs may not have the technical capabilities to correct the underlying problems.[32]

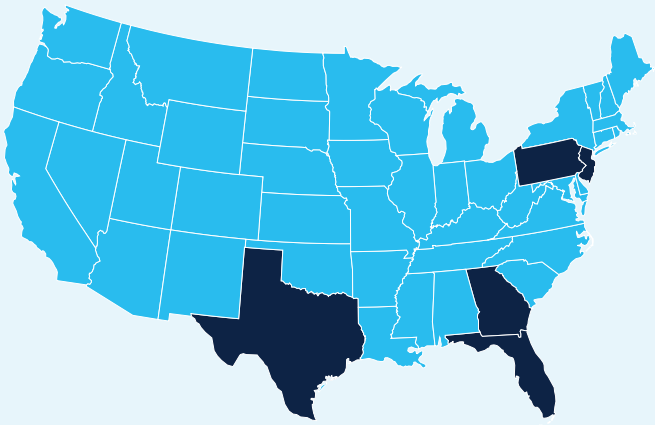
Because monitoring and reporting violations could hide more serious health-based violations, we should invest in these very small systems or restructure or consolidate them with other water systems to help them build the capacity to properly monitor and report on drinking water quality.

HEALTH-BASED VIOLATIONS

In 2015, 12,137 health-based SDWA violations were reported at 5,009 community water systems across the country. These systems served 27,412,987 people, or nearly 1 out of every 12 Americans (see Table 3).[s] By populations served, the top five SDWA rules with health-based violations by community water systems in 2015 addressed:

1. disinfection byproducts
2. coliform bacteria
3. surface water and groundwater quality (i.e. pathogens)
4. nitrates and nitrites
5. lead and copper

IN 2015, THERE WERE 80,834 REPORTED SDWA VIOLATIONS AT 18,094 COMMUNITY WATER SYSTEMS ACROSS THE COUNTRY



TOP FIVE STATES WITH SDWA VIOLATIONS BY POPULATION:

1. TEXAS: **12,066,920** PEOPLE SERVED
2. FLORIDA: **7,540,465** PEOPLE SERVED
3. PENNSYLVANIA: **5,645,903** PEOPLE SERVED
4. NEW JERSEY: **4,487,703** PEOPLE SERVED
5. GEORGIA: **3,846,734** PEOPLE SERVED

PUERTO RICO

99.5% IN VIOLATION

When ranking by percentage of total population served, Puerto Rico had the highest percentage of any state or territory, with a whopping 99.5 percent of its population served by community water systems in violation of the SDWA.

r According to NRDC analysis of SDWIS data, very small water systems (those serving less than 500 people) had 54,428 violations out of the total 80,834 total violations (67.3 percent) in 2015. For health-based violations, very small systems had 6,238 violations out of the total 12,137 health-based violations (51.4 percent).

s Total U.S. population (estimated) on January 1, 2015, was 321,418,820. Data from the Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010, to July 1, 2015 (NST-EST2015-01, U.S. Census Bureau, Population Division.

FIGURE 2: 27.4 MILLION PEOPLE SERVED BY COMMUNITY WATER SYSTEMS WITH AT LEAST ONE REPORTED HEALTH-BASED VIOLATION OF THE SAFE DRINKING WATER ACT (2015). POPULATIONS ARE SHADED AT THE COUNTY LEVEL TO SHOW THE NUMBER OF RESIDENTS SERVED BY COMMUNITY WATER SYSTEMS WITH VIOLATION(S) IN 2015.

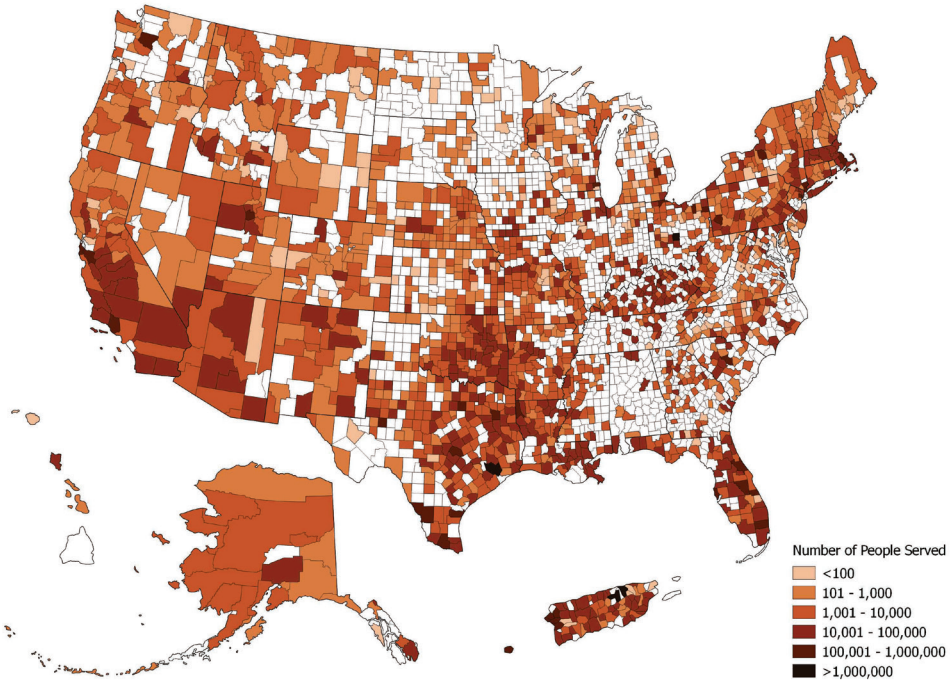


TABLE 3: HEALTH-BASED VIOLATIONS OF THE SAFE DRINKING WATER ACT IN CALENDAR YEAR 2015 RANKED BY POPULATION SERVED[t]

RULE NAME	POPULATION SERVED	NUMBER OF VIOLATIONS	NUMBER OF SYSTEMS
All Violations	27,412,987	12,137	5,009
Combined Disinfectants and Disinfection Byproducts Rules[u]	12,584,936	4,591	1,552
Total Coliform Rule	10,118,586	2,574	1,909
Combined Surface, Ground Water, and Filter Backwash Rules[v]	5,336,435	1,790	813
Nitrates and Nitrites Rule	1,364,494	459	192
Lead and Copper Rule	582,302	303	233
Radionuclides Rule	445,969	962	258
Arsenic Rule	358,323	1,135	352
Synthetic Organic Contaminants Rule	301,099	17	13
Inorganic Contaminants Rule	83,033	291	77
Volatile Organic Contaminants Rule	5,276	15	6

t Data from the 2016 quarter 2 data set of the Safe Drinking Water Information System.
u Includes the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules.
v Includes the Surface Water, Ground Water, Filter Backwash, Long-Term 1 Enhanced Surface Water Treatment, and Long-Term 2 Enhanced Surface Water Treatment Rules.

Health-based SDWA violations were seen in all 50 states as well as Puerto Rico and other territories (excluding Guam and the District of Columbia). When ranked by population served by systems with health-based violations, the top five states or territories were:

1. Texas (4,970,249 people served)
2. Puerto Rico (2,410,809 people served)
3. Ohio (2,315,260 people served)
4. Maryland (1,754,409 people served)
5. Kentucky (1,513,617 people served)

When ranked by percentage of total population served, Puerto Rico again had the highest percentage of any state or territory, with 69.4 percent of its population served by community water systems with health-based SDWA violations.[w]

UNDERESTIMATING THE PROBLEM

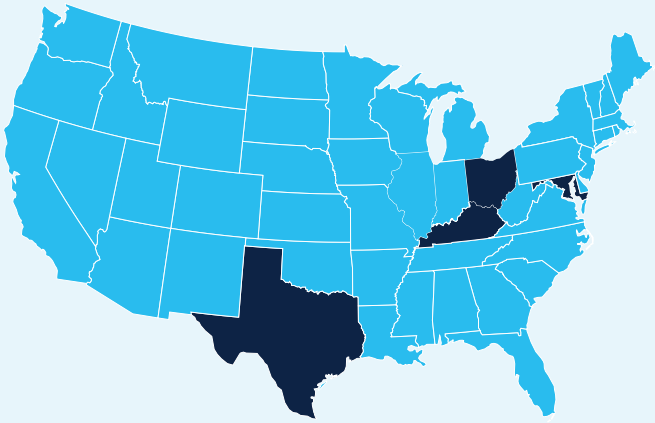
There are at least five major reasons the data included in this report understate the extent of drinking water contamination in the United States.

First, the EPA regulates around 100 of the many thousands of contaminants found in tap water. As noted earlier, the EPA has not established a standard for a single new contaminant since the 1996 amendments to the SDWA were enacted, even though it has a list of scores of currently unregulated contaminants.

For example, polyfluoroalkyl and perfluoroalkyl substances (PFASs) have been associated with myriad negative health impacts, including cancer, endocrine disruption, neonatal death, and adverse neurobehavioral effects. These toxic chemicals are released from industrial, firefighting, and military operations.[33] They were recently identified by Harvard researchers in the tap water of more than six million Americans.[34] But they are not included in this analysis because they are not currently regulated under the SDWA, even though the EPA has expressed concern about them. In lieu of a rule to regulate these toxic chemicals, the EPA has issued a "health advisory," a nonbinding warning that establishes an unenforceable safe level. These advisories merely inform federal, state, and water system officials about how much of the chemicals are safe in water and are not federal regulatory standards.[35]

Similarly, algal toxins are not regulated. Instead, the EPA has established a nonenforceable health advisory establishing the levels at which adverse health impacts are anticipated from drinking water containing these cyanotoxins. These specific toxins are created in polluted water bodies by particular algae that are becoming more widespread. For example, in 2014, Toledo, Ohio, issued a "do not drink" order for 400,000 people during a toxic algal bloom.[36] As waters continue to warm due to climate change, and as nitrates and phosphorus continue to inundate drinking water sources, these harmful algal blooms will continue to increase.[37]

IN 2015, 12,137 HEALTH-BASED SDWA VIOLATIONS WERE REPORTED AT 5,009 COMMUNITY WATER SYSTEMS ACROSS THE COUNTRY. THESE SYSTEMS SERVED 27,412,987 PEOPLE, OR NEARLY 1 OUT OF EVERY 12 AMERICANS.



TOP FIVE SYSTEMS WITH HEALTH-BASED VIOLATIONS:

1. TEXAS: **4,970,249** PEOPLE SERVED
2. PUERTO RICO: **2,410,809** PEOPLE SERVED
3. OHIO: **2,315,260** PEOPLE SERVED
4. MARYLAND: **1,754,409** PEOPLE SERVED
5. KENTUCKY: **1,513,617** PEOPLE SERVED

PUERTO RICO

69.4% IN VIOLATION

When ranked by percentage of total population served, Puerto Rico again had the highest percentage of any state or territory, with 69.4 percent of its population served by community water systems with health-based SDWA violations.

w In 2015, the estimated population of Puerto Rico was 3,474,182 people (from the Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010, to July 1, 2015 (NST-EST2015-01); U.S. Census Bureau, Population Division.

Second, even when contaminants are regulated, the EPA's monitoring rules often allow water utilities to intentionally or unintentionally avoid detecting exceedances and recording a violation. In the report "What's in Your Water: Flint and Beyond," for example, we detailed water systems' many methods of avoiding detection of excessive lead levels in their water and thus avoiding a violation or exceedance of the lead action level.[38,x] Similarly, the monitoring rules for most pesticides and other chemicals require only quarterly (and sometimes even less-frequent) monitoring. The contamination levels of the pesticide atrazine or other seasonally applied chemicals, for example, can peak in streams shortly after they are applied to crops.[39] According to the U.S. Geological Survey, overall variation in pesticide levels in a stream "sometimes exceed[s] four orders of magnitude," depending on when the sample is taken, and varies seasonally and according to hydrologic conditions.[40] A water system, therefore, would not be likely to detect an exceedance if the water was tested shortly before seasonal pesticide application. In ways like this, the EPA's monitoring rules can allow problematic water contamination to go undetected and unreported without violations of the letter of the law.

Third, numerous EPA data audits confirm that states often fail to report all violations to the agency's database, as is legally required.[y] For example, the EPA's inspector general reported in 2004 that the EPA's internal audits found states reporting just 65 percent of all health-based violations and only 23 percent of the monitoring and reporting violations.[41] The inspector general's own audit also found that while data quality may have improved, it was still problematic and underreporting was widespread. (More recent comprehensive data audits, if they exist, have not been made public.) Thus, it is clear that many violations are not captured in the data and maps included in this report. Indeed, the EPA's latest annual compliance report (issued in 2015 and reflective of 2013) confirmed that state violations data reported to the EPA (and the basis of the figures in this study) are "substantially incomplete."[42] Even a cursory review of the data that have been submitted shows that many states suspiciously had zero violations of entire classes of standards.[43] For example, many states had no reported violations of the various rules related to microbial contamination in surface water and groundwater, even though they have about as many water systems as neighboring states that reported significant numbers of such violations.

The inspector general's own audit also found that while data quality may have improved, it was still problematic and underreporting was widespread.

The fourth reason we can assume that the extent of drinking water contamination is understated is that the EPA and its inspector general have raised the specter of water systems falsifying data to hide violations.[44] The EPA's entire drinking water program relies heavily on information submitted by the water systems themselves. States are not required to have programs to detect falsified data, and very few states have such programs. More than a decade ago, the inspector general conducted an audit, which has not been publicly updated, that found that of all the data public water systems reported to the audited states, 18 percent was questionable and 12 percent was invalid or potentially falsified.[45]

Finally, most of the EPA's rules require that monitoring for most chemicals be conducted at the water treatment plant or at the "point of entry" into the distribution system (such as at a wellhead). This is fine for contaminants that come from the source water. However, it doesn't catch contaminants that enter the water through the pipes. While EPA rules require at-the-tap testing for certain contaminants (lead, copper, coliform, disinfectants, and disinfection byproducts), it is not required for others that can come from pipes such as asbestos and vinyl chloride, which are known carcinogens. It is estimated that across America, hundreds of thousands of miles of asbestos cement pipe have been used for carrying water, much of it for water mains (though also for sewage pipes and storm drains).[46] Much of this pipe may now be deteriorating and releasing asbestos into tap water.[47] Similarly, polyvinyl chloride (PVC) plastic has often been used in water pipes. Vinyl chloride, the cancer-causing component of PVC, can leach from these pipes, especially those made before 1977.[48]

x EPA did issue a memorandum on February 29, 2015, asking water systems not to use three of the most widely known testing methods that can avoid detecting elevated lead levels in tap water. The Lead and Copper Rule requires a system to control the corrosivity of water and to monitor tap water. If lead concentrations in more than 10 percent of the taps exceed the "action level" (which is not health-based), then the water system has to take additional steps to control the corrosion.

y In the EPA's euphemistic words, the state reporting of violations is said to be "incomplete." As the agency's most recent annual compliance report admits, EPA has evaluated state and EPA regional program data quality by conducting data verification audits and national data quality assessments, comparing primacy agencies' files and records with information in SDWIS/FED to verify accuracy, completeness and whether appropriate compliance determinations are made (that is, in accordance with federal regulations). These audits and assessments have shown that violation data are incomplete. EPA, "Providing Safe Drinking Water in America: 2013 National Public Water Systems Compliance Report," 2015, https://www.epa.gov/sites/production/files/2015-06/documents/sdwacom2013.pdf.

Enforcement Provisions of the Safe Drinking Water Act

Under the SDWA, states, territories, and federally recognized Native American tribes can apply for "primary enforcement responsibility," or primacy. This designation essentially means that the EPA has determined that the state, territory, or tribe's rules are at least as strict as the federal standards and that the entity in question can and will enforce the law. Once a state is granted primacy, it receives substantial federal funding to carry out the law. All 50 states have primacy under the Safe Drinking Water Act, except Wyoming (which has chosen not to apply for it). The Navajo Nation is the only Indian tribe to have sought and received primacy; Puerto Rico and some other U.S. territories also have been approved for primacy. The District of Columbia does not have primacy.

Once the EPA establishes health standards and monitoring and reporting rules, primacy states are supposed to enforce them and to report any violations and related information to the EPA every quarter. When a violation occurs, the state is required to bring the system back into compliance. This tends to begin with informal enforcement steps, such as warning letters, phone calls, or field visits. If the violation continues or recurs, the state is supposed to initiate a formal enforcement process to bring the system into compliance. Actions could include issuing an administrative order, seeking administrative fines, referring a civil case to the state attorney general, or even requesting the filing of criminal charges. Public water systems must also notify their customers of violations or potential risks to their health (see more on the Public Notification Rule in Appendix 12). If the EPA finds that a public water system in a primacy state violates a rule, the agency must notify both the system and the state and assist in bringing the system back into compliance. If the state fails to take enforcement action within 30 days of notice, the EPA is legally obligated to issue an administrative order or file an enforcement case against the violator.[49]

The EPA retains enforcement authority and responsibility in primacy states if state officials fail to ensure that the law is adequately enforced, or if there is an "imminent and substantial endangerment to the health of persons."[50]

It is important to note that while the EPA has this authority to act in the case of an "imminent and substantial" harm to health, it often does not act. For example, as the Flint disaster festered for months, NRDC and the American Civil Liberties Union of Michigan (ACLU-MI), representing local citizens and organizations, formally petitioned the EPA to act in light of the imminent and substantial danger posed by the lead contamination. Despite the mounting evidence, the EPA took 112 days after the citizen petition was filed (and nearly a year

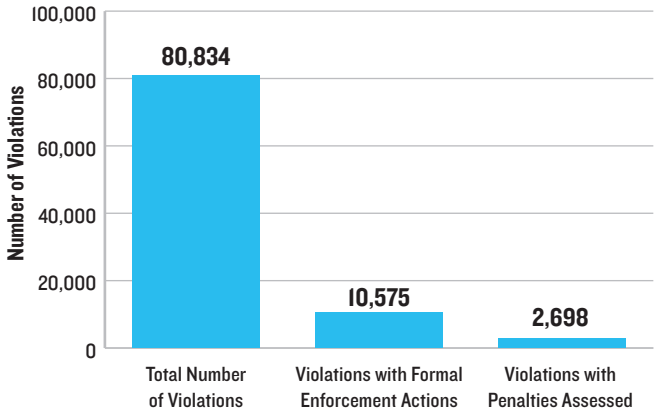
after it learned of Flint's lead problems) before issuing an emergency order.[51] It did so only after Flint sparked a national media firestorm and became a major public controversy. In fact, the Office of the Inspector General (OIG)—an independent office within the EPA tasked with investigating the agency to prevent fraud, waste, and abuse—recently criticized the agency's response to Flint. It also emphasized the EPA's authority to immediately issue an administrative order or to bring a case in court if a contaminant "may present an imminent and substantial endangerment to the health of persons," even if no violation of the law is proven.[52]

But both state agencies and the EPA have failed to enforce the SDWA. Sometimes the agencies argue that they would rather work with water utilities as partners as opposed to adversaries. Other times they cite insufficient resources for additional enforcement. While the EPA is under-resourced and could use additional staff and funding, it certainly has the capacity and authority to take substantially more enforcement actions.

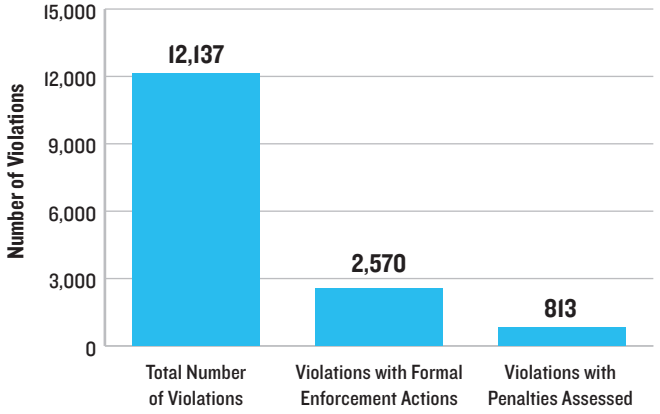
NRDC's analysis of EPA Safe Drinking Water Information System (SDWIS) data reveals that the EPA or states took formal enforcement action in only 13.1 percent of the 80,834 reported SDWA violations in 2015.[z] A little less than one out of every four violations (23.0 percent, or 18,567 violations) returned to compliance by the end of the year. In other words, almost nine out of ten violations faced no formal federal or state enforcement, and more than three-fourths of violations were not returned to compliance by the end of the year. Only 3.3 percent of all violations (2,698) faced any penalties from states or the federal government.

The EPA and states took formal enforcement action in 21.2 percent of the 12,137 health-based violations reported in 2015.[aa] A little more than one out of every three cases (20.5 percent or 2,488 violations) returned to compliance by the end of the year. An even smaller number of violations (813, or 6.7 percent) of heath-based violations faced any penalties.

FORMAL ENFORCEMENT ACTIONS FOR VIOLATIONS OF THE SAFE DRINKING WATER ACT



FORMAL ENFORCMENT ACTIONS FOR HEALTH-BASED VIOLATIONS OF THE SAFE DRINKING WATER ACT



z Formal enforcement action was taken for 10,575 violations to the Safe Drinking Water Act in 2015). The federal government was responsible for 4.9 percent of formal enforcement actions (520 violations), and states were responsible for 95.1 percent (10,055 violations). Any enforcement action (including formal and informal actions) was taken in 86.0 percent of cases (69,546 violations).

aa Formal enforcement action was taken for 2,570 health-based violations of the Safe Drinking Water Act in 2015. The federal government was responsible for 11.9 percent of formal enforcement actions (307 violations), and states were responsible for 88.1 percent (2,261 violations). Any enforcement action (including formal and informal actions) was taken in 95.4 percent (11,577 violations) of cases.

Citizen Suit Provision of the Safe Drinking Water Act

Citizens have some recourse, but it is limited. The SDWA allows citizens to bring lawsuits against the EPA, the state, or the public water system for a violation or against the EPA for failure to perform a mandatory duty.[53] However, the law imposes a 60-day waiting period before such a suit can be brought. Unfortunately, this can mean substantial delays during an ongoing health threat. For example, in Flint, in the face of the state's and the EPA's failure to take enforcement action, NRDC and the ACLU-MI had to wait two months after notifying the EPA, the state of Michigan, and the water system before filing a case.[54] In the meantime, thousands of residents continued to receive toxic water that posed both long- and short-term risks.[55]

Another problem is that the citizen suit provision does not impose penalties on violators. Other statutes, like the Clean Air Act and the Clean Water Act, have citizen suit provisions that include such penalties. These penalties incentivize compliance because they accrue from the first day of the violation. The sooner a violation is resolved, the lower the penalty. Without these penalties, public drinking water systems can drag out cases for years, further prolonging public health threats.

Some laws designed to protect public health allow citizens to bring lawsuits when a contaminant "may present an imminent and substantial endangerment to the health of persons" even if they cannot prove a legal violation (e.g., the Resource Conservation and Recovery Act (RCRA), which covers solid and hazardous waste disposal).[56] The SDWA stipulates that if the EPA finds an imminent and substantial danger, the agency may (but is not required to) take legal action, but citizens lack that power. The weaknesses of the SDWA citizen suit section and in the act's imminent and substantial endangerment provision leave the EPA responsible for taking proactive and prompt action to protect vulnerable people from contaminated drinking water if states fail to do so.

Recommendations

FIX, UPGRADE, AND MAINTAIN OUR DRINKING WATER DISTRIBUTION SYSTEMS AND MODERNIZE DRINKING WATER TREATMENT

The majority of the violations detailed in this report can be attributed, at least in part, to America's aging or inadequate drinking water infrastructure. Leaking pipes and lead service lines as well as unprotected sources, water tanks, and reservoirs are just some of the problems that can introduce bacterial and chemical contamination and violate drinking water rules. Outdated or inadequate water treatment plants can allow contaminants like pathogens, arsenic, pesticides, and industrial chemicals to slip past treatment and travel straight to customers. In some cases, inadequate treatment can actually cause contamination; for example, outdated disinfection equipment can contaminate water with cancer-causing disinfection byproducts. These problems afflict water systems large and small, but as noted, violations of health and treatment standards are more common in small systems than they are in larger ones.

In 2017, the American Society of Civil Engineers (ASCE) gave U.S. drinking water infrastructure a D grade.[57] Clearly we need to replace or repair decaying or outdated parts of the distribution system, such as leaking and crumbling water mains. These old pipes are prone to breaks and significant leakage, wasting water and money and allowing pathogens to penetrate the system or multiply in areas of decay. In many cities, the drinking water infrastructure is 80 to 100 years old—at or near the end of its life cycle. The U.S. Geologic Survey estimates that leaking pipes lose 6 billion gallons of clean drinking water every day.[58] The ASCE estimates that there are 240,000 main breaks every year.[59] There are 6 million to 10 million lead service lines around the United States, contributing to lead-contaminated drinking water.[60] These must be completely replaced.

There are 6 million to 10 million lead service lines around the United States, contributing to lead-contaminated drinking water.

Upgrading and properly maintaining our treatment systems can also help dramatically reduce the number of violations. The EPA estimates that we need $384.2 billion to upgrade drinking water infrastructure; other estimates are far higher.[61] The American Water Works Association, for example, pegs needed investments at more than $1 trillion over the next 25 years.[62] NRDC studies have found that most U.S. drinking water plants still use 100-year-old treatment technologies, such as sand filtration and chlorination. These technologies work fairly well to remove some basic contaminants, such as mud and some bacteria. They cannot, however, effectively remove many of today's widespread regulated and unregulated contaminants such as pesticides, industrial chemicals, pharmaceuticals, and other chemicals.[63] We need to invest in modernizing our treatment plants, as has been done in places like Cincinnati (see sidebar).[64]

The Greater Cincinnati Water Works provides water to more than 700,000 people. In 1992 it became the first major U.S. utility to install granular activated carbon to remove chemical contaminants from the water. In 2013 it completed a $30 million project to install ultraviolet (UV) reactors to kill microorganisms, since UV was found to be one of the most cost-effective means of treating drinking water. UV can kill microorganisms that chlorine disinfection cannot kill, like *Cryptosporidium*. Furthermore, there was concern that the Ohio River watershed was vulnerable to contamination from microorganisms, including those that are naturally resistant to chlorine. The facility can disinfect up to 240 million gallons of drinking water each day.[65]

INVEST IN REPAIRING OUR NATIONAL WATER INFRASTRUCTURE, PRIORITIZING DISPROPORTIONATELY AFFECTED COMMUNITIES AND SUPPLYING MUCH-NEEDED JOBS

Investing in our water infrastructure not only protects public health but strengthens our economy. Industry, commercial development, and robust residential growth all need a safe and dependable source of water.[66] Moreover, major investment in water infrastructure will create hundreds of thousands or even millions of well-paid jobs. The U.S. Senate's bipartisan Water Resources Development Act of 2016 noted that 16.5 jobs are created for every $1 million spent from the state revolving fund.[67] And 506,000 jobs would be created through a $34.7 billion federal capitalization grant to that revolving fund. A recent study found that $188.4 billion in wastewater-related infrastructure alone (including pipe repair and new pipes) spread evenly over the next five years would generate $265.6 billion in economic activity and create close to 1.9 million jobs.[68] The study also found that such infrastructure investments "create over 16 percent more jobs dollar-for-dollar than a payroll tax holiday, nearly 40 percent more jobs than an across-the-board tax cut, and more than five times as many jobs as temporary business tax cuts."[69] The report also estimated job creation by state. In Ohio, for example, this investment could create between 72,000 and 127,000 jobs. In Texas it could create between 74,000 and 147,000 jobs, and in Florida between 90,000 and 102,000.

Major investment in water infrastructure will create hundreds of thousands or even millions of well-paid jobs.

Drinking water infrastructure investments are expected to create jobs at similar levels. The current congressional funding of $2.37 billion per year for water infrastructure must be substantially increased—at least to the approximately $8 billion per year stipulated by the American Recovery and Reinvestment Act of 2009.[70]

Polluting facilities—bringing contaminated drinking water and various adverse health impacts—are routinely sited near communities where people of color and low-income people live, work, and play. Therefore, the EPA and state agencies should better leverage and prioritize funding (including grants) for water infrastructure improvements in these communities.

For smaller water systems struggling to provide safe and reliable drinking water, states should prioritize long-term solutions, such as consolidation or regionalization. Physical consolidation of water systems is particularly feasible when small systems are located near larger ones that can absorb them. Regionalization, where management, technical expertise, purchasing power, and more can be pooled among two or more systems, can be used locally or across larger areas. Sometimes, physical consolidation may be encouraged if the larger partnering system that takes over a smaller, troubled system is indemnified against enforcement action related to the smaller system's previous problems. Because larger systems typically have more technical expertise, economies of scale that enable more advanced treatment, and more purchasing power, the smaller system's customers can gain access to safer, more affordable water. Alternatively, a group of nearby small systems can join together to achieve economies of scale.

For example, installing expensive treatment technologies for a system with only 300 ratepayers would impose great costs for each individual ratepayer. If several small systems consolidated, however, the cost of installation would be spread across a larger number of customers.

STRENGTHEN EXISTING DRINKING WATER REGULATIONS AND ESTABLISH NEW ONES.

Current drinking water regulations have some weaknesses. For example, the Lead and Copper Rule's sampling requirements have allowed some systems to minimize the likelihood of finding lead, and the rules for atrazine testing allow monitoring that could be timed to avoid finding a problem. These weaknesses, and others, must be addressed by the EPA.

In addition, there are untold numbers of unregulated contaminants in drinking water that pose health risks. The EPA must establish regulations for these contaminants, starting with perchlorate. Even though the EPA found that perchlorate can cause adverse health impacts—particularly on fetuses—and that it occurs in drinking water, the agency has not even proposed (much less finalized) a standard for this contaminant. Many more contaminants should be regulated, including perfluorinated compounds, cyanotoxins from harmful algal blooms, and Legionella.

Furthermore, the EPA must be allowed to improve and develop these regulations without unnecessary hurdles. Congressional Republicans, through the Regulatory Accountability Act (see below) and other legislation, seek to hinder any efforts to regulate pollution (among other things). This legislation must be stopped. The EPA has already delayed developing regulations; any more barriers and the imposition of a new set of cost-based supermandates would essentially halt the agency's work entirely.

IMPLEMENT A MORE ROBUST SYSTEM FOR DETECTING CONTAMINANTS

The levels of some contaminants will fluctuate with the seasons, so quarterly and annual sampling can miss peak contamination. Continuous monitoring would ensure that exceedances are identified in a timely fashion. Currently, no SDWA rules require continuous monitoring. While some technologies exist to continuously monitor for some chemicals in water, we need to research and develop more tools for monitoring both regulated and unregulated contaminants.

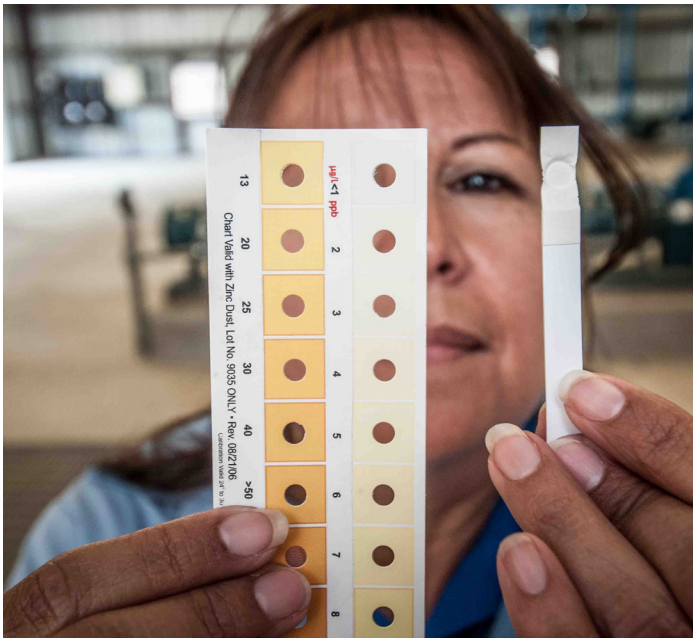
When continuous monitoring is not feasible, sampling should target the periods of time when contamination is most likely. Herbicides used during the spring, for example, should be sampled more frequently *after* they have been applied, not before.

There is currently a big gap in monitoring requirements for community water systems. Infants and children are far more sensitive and vulnerable to toxic chemicals, including those found in drinking water. For example, lead can irreversibly damage the developing brain and nervous system in infants and children. However, there are no requirements to test for lead or other drinking water contaminants in places where children spend much of their time: schools and day care facilities. These locations should be required to test for contaminants that can disproportionately impact children. At a minimum, schools and day care centers should be required to test for lead. Lead-contaminated drinking fountains should be immediately repaired or replaced.

We also need to create a national database of drinking water violations and lead service line locations, with easily accessible geographic information at the most specific scale possible to identify vulnerable areas and populations.

STRENGTHEN ALL DRINKING WATER ENFORCEMENT

Enforcement has been hobbled by poor funding, lack of state and federal management support, and agency officials' fear of political repercussions.[ab] For example, an EPA employee blew the whistle on Flint's lead crisis and urged aggressive action. An investigation by an independent task force established by the Michigan governor revealed that this employee was attacked by state officials for "acting outside of his authority."[71] Similarly, an EPA regional administrator in Chicago was widely reported as having been fired for being too aggressive in enforcing the law against Dow Chemical.[72] These kinds of reverberations are felt across the agency. We need to renew the enforcement culture at the EPA and primacy agencies to reinforce the importance of protecting public health.



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GIVE CITIZENS THE POWER TO MEANINGFULLY AND SWIFTLY RESPOND TO ENDANGERMENT OF THEIR HEALTH

The SDWA's citizen suit provision should be brought in line with those of the Clean Air Act and the Clean Water Act, which both allow citizen suits to seek penalties. Without such penalties, parties have no incentive to comply with the law until after court judgment is issued, something that can take many years. If penalties begin accumulating from the day the infraction first occurs, violators are more willing to quickly resolve the issue and come back into compliance to keep their ultimate costs low.

In addition, citizens whose water may carry an imminent and substantial health threat should be authorized to immediately sue for relief. Unlike the Resource Conservation and Recovery Act (RCRA), the current SDWA gives only the EPA, and not citizens, the authority to act in cases of emergency. For example, NRDC, ACLU-MI, and our clients had to petition the EPA to exercise its emergency authority in Flint. The agency took 112 days to respond, and even then, in the midst of a media and public firestorm, it issued an inadequate emergency order. Because of shortcomings in the SDWA, we could not directly challenge the water system, city, or state through an emergency legal action.[73] SDWA's imminent and substantial endangerment provision should be amended to allow citizens to bring emergency legal actions when they are facing health threats, rather than leaving them at the mercy of the EPA to take action.

ab The EPA's caution is perhaps partially due to the haranguing of the agency by conservative members of Congress over the past several years for supposed overreach or "overly aggressive" enforcement.

ENDNOTES

1 See, for example, Evelyn Mauss, Andrew Kass, and Jacqueline Warren, "The Lead Contamination Control Act: A Study in Non-Compliance, " Natural Resources Defense Council (hereinafter NRDC), 1991; Erik D. Olson, "Think Before You Drink," NRDC, 1993; Brian Cohen and Erik D. Olson, "Victorian Water Treatment Enters the 21st Century: Public Health Threats from Water Utilities' Ancient Treatment and Distribution Systems, " NRDC, 1994; Erik D. Olson and Diane Cameron, "The Dirty Little Secret About Our Drinking Water," NRDC, 1995; Paul Mushak, Matthew McKenzie, and Erik D. Olson, "Arsenic and Old Laws," NRDC, 2000.

2 Ibid.

3 Erik D. Olson and Kristi Pullen Fedinick, "What's in Your Water: Flint and Beyond, " NRDC, June 2016, https://www.nrdc.org/sites/default/files/whats-in-your-water-flint-beyond-report.pdf.

4 Centers for Disease Control and Prevention, "Current Waterborne Disease Burden Estimates," 2008, https://www.cdc.gov/healthywater/burden/current-data.html; citing Kelly A. Reynolds, Kristina D. Mena, Charles P. Gerba, "Risk of Waterborne Illness via Drinking Water in the United States," *Rev Environ Contam Toxicol*. 192 (2008):117-158.

5 U.S. Environmental Protection Agency (hereinafter EPA), "Perchlorate in Drinking Water," https://www.epa.gov/dwstandardsregulations/perchlorate-drinking-water

6 Erik D. Olson, "Think Before You Drink."

7 EPA, "Providing Safe Drinking Water in America: 2013 National Public Water Systems Compliance Report," June 2015, at page 3, https://www.epa.gov/sites/production/files/2015-06/documents/sdwacom2013.pdf.

8 EPA Safe Drinking Water Information System (hereinafter SDWIS), https://oaspub.epa.gov/enviro/sdw_report_v3.first_table?pws_id=MI0002310&state=MI&source=Surface%20water%20purchased&population=99763&sys_num=0.

9 As discussed later in the text of the report, the data in this study are derived from EPA's Safe Drinking Water Information System, The landing page for that EPA database is found at https://ofmpub.epa.gov/apex/sfdw/f?p=108:200.

10 American Society of Civil Engineers (hereinafter ASCE), "2013 Report Card for America's Infrastructure," http://www.infrastructurereportcard.org/water-infrastructure/.

11 EPA, "Lead and Copper Rule Revisions White Paper," https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf.

12 Brian Cohen and Erik D. Olson, NRDC, "Victorian Water Treatment Enters the 21st Century".

13 42 U.S.C. §300j-12.

14 EPA, "How the Drinking Water State Revolving Fund Works," https://www.epa.gov/drinkingwatersrf/how-drinking-water-state-revolving-fund-works#tab-1.

15 Trump-Pence, "Infrastructure: Donald J. Trump's Vision," https://www.donaldjtrump.com/policies/an-americas-infrastructure-first-plan (accessed January 19, 2017).

16 "S. 2848—114th Congress: Water Resources Development Act of 2016." www.GovTrack.us. 2016, January 24, 2017, https://www.govtrack.us/congress/bills/114/s2848,> Section 7002.

17 Ibid.

18 Green for All, "Water Works: Rebuilding Infrastructure, Creating Jobs, Greening the Environment," 2011, http://www.pacinst.org/app/uploads/2013/02/water_works3.pdf.

19 David Cutler and Grant Miller, "The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States," *Demography* 42, no. 1 (2005):1–22. doi:10.1353/dem.2005.0002.

20 Jack Tait, "A Drop to Drink—A Report on the Quality of Our Drinking Water," EPA, June 1973, 3.

21 House Committee on Interstate and Foreign Commerce, "Safe Drinking Water Act," July 10, 1974, House Report No. 93-1185, reprinted in U.S. Code Cong. and Admin. News 1974, v. 4, pp. 6457-58.

22 Safe Drinking Water Act (hereinafter SDWA), codified at 42 U.S.C. §300f et seq.

23 SDWA §1401(4), 42 U.S.C. §300f(4).

24 See Daniel A. Okun, *Identifying Drinking Water Contaminants, Historical Overview of Drinking Water Contaminants and Public Water Utilities* (Washington, D.C.: National Academies Press, 1999), 22, https://www.nap.edu/read/9595/chapter/3.

25 National Academy of Sciences, National Research Council, "Arsenic in Drinking Water: 2001 Update," at 12 and Table S-1, National Academies Press, 2001, http://www.nap.edu/download/10194.

26 SDWA, §1414(c)(4), 42 U.S.C.§300g-3(c)(4); also see EPA, "Safe Drinking Water: Consumer Confidence Reports," https://www.epa.gov/ccr.

27 SDWA, codified at 42 U.S.C. §300f et seq.

28 Safe Drinking Water Amendments of 1996 (Pub.L. No.104-182).

29 SDWA, 42 U.S.C. §300g-1(b)(3)(C).

30 SDWA, 42 U.S.C. §300g-1(b)(1)(A)(iii)

31 Agency for Toxic Substances and Disease Registry (hereinafter ATSDR), Centers for Disease Control and Prevention, "Nitrate/Nitrite Toxicity: What Are the Health Effects from Exposure to Nitrates and Nitrites?" https://www.atsdr.cdc.gov/csem/csem.asp?csem=28&po=10.

32 EPA, "Providing Safe Drinking Water in America: 2013 National Public Water Systems Compliance Report," https://www.epa.gov/sites/production/files/2015-06/documents/sdwacom2013.pdf.

33 Ariene Blum, et al., "The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs)," *Environmental Health Perspectives* 123 (2015):A107–A111, http://dx.doi.org/10.1289/ehp.1509934.

34 Xindi C. Hu et al., "Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas and Wastewater Treatment Plants," *Environmental Science & Technology Letters* 3, no. 10 (2016).

35 42 U.S.C. §300g-1.

36 Beth Dalbey, "Lake Erie Algae Blooms Spawn 'Impaired Waterway' Designation," *Detroit Patch*, November 10, 2016, http://patch.com/michigan/detroit/lake-erie-algae-blooms-spawn-impaired-waterway-designation.

37 G. Luber, et al., 2014, "Human Health," chapter 9 in *Climate Change Impacts in the United States: The Third National Climate Assessment,* J. M. Melillo, T.C. Richmond, and G. W. Yohe, eds., U.S. Global Change Research Program, 2014, 220-256. doi:10.7930/J0PN93H5.

38 Erik Olson and Kristi Pullen Fedinick, "What's in Your Water."

39 See, for example, John K. Stamer, Kathryn D. Gunderson, and Barbara J. Ryan, "Atrazine Concentrations in the Delaware River, Kansas," USGS Fact Sheet 001-94, April 1995, http://ks.water.usgs.gov/pubs/fact-sheets/fs.001-94.stamer.html.

40 Matthew J. Ferrari et al., "Pesticides in Surface Water of the Mid-Atlantic Region," 1997, U.S. Geological Survey, WRIR 97-4280, http://md.water.usgs.gov/publications/wrir-97-4280/wrir_97_4280_html.html. *See also:* M. Wu et al., "Poisoning the Well: How the EPA Is Ignoring Atrazine Contamination in Surface and Drinking Water in the Central United States," NRDC, 2009.

41 EPA Inspector General, "Memorandum Report: EPA Claims to Meet Drinking Water Goals Despite Persistent Data Quality Shortcomings," Report No. 2004-P-0008, March 05, 2004, https://www.epa.gov/sites/production/files/2015-12/documents/20040305-2004-p-0008.pdf.

42 EPA, "Providing Safe Drinking Water in America: 2013 National Public Water Systems Compliance Report," at 5-6.

43 Ibid.

44 EPA Inspector General, "EPA Procedures to Ensure Drinking Water Data Integrity," https://www.epa.gov/sites/production/files/2015-10/documents/report5_0.pdf.

45 Ibid.

46 Michael Davison, "Got Deteriorating Asbestos Cement Water Mains? Pipe Relining Guide 2014 of Trenchless Technology—Special Supplement," 26-27, http://www.aqua-pipe.com/DATA/NOUVELLE/51_en~v~got-deteriorating-asbestos-cement-water-mains.pdf.

47 Ibid.

48 EPA, "How Does Vinyl Chloride Get into My Drinking Water?" https://safewater.zendesk.com/hc/en-us/articles/212075267-5-How-does-vinyl-chloride-get-into-my-drinking-water-; EPA, "Permeation and Leaching," 2002, https://safewater.zendesk.com/hc/en-us/articles/212075267-5-How-does-vinyl-chloride-get-into-my-drinking-water-.

49 SDWA §1414(a), 42 U.S.C. §300g-3(a).

50 SDWA subsection 1431(a), 42 U.S.C. §300i(a).

51 Flint Water Advisory Task Force, "Final Report," March 2016, at 18 (stating that EPA was advised of elevated lead levels in February, 2015), http://www.michigan.gov/documents/snyder/FWATF_FINAL_REPORT_21March2016_517805_7.pdf.

52 EPA, Office of Inspector General, Management Alert: Drinking Water Contamination in Flint Michigan, Demonstrates A Need to Clarify EPA Authority to Issue Emergency Orders to Protect the Public, October 20, 206, https://www.epa.gov/sites/production/files/2016-10/documents/_epaoig_20161020-17-p-0004.pdf.

53 SDWA subsection 1449(a), 42 U.S.C. §300j-8.

54 NRDC, "Residents of Flint, Michigan, to Sue City, State over Lead in Drinking Water," https://www.nrdc.org/media/2015/151116-0.

55 Erik Olson and Kristi Pullen, "What's in Your Water."

56 42 U.S.C. §6972(a)(1)(B).

57 ASCE, "2017 Report Card for America's Infrastructure."

58 K. Najjar, "Water System Audits and Water Loss Control," presentation by Delaware River Basin Commission, April 13, 2011.

59 ASCE, "2013 Report Card for America's Infrastructure."

60 David A. Cornwell, Richard A. Brown, and Steve H. Via, "National Survey of Lead Service Line Occurrence," *Journal of the American Water Works Association* 108, no. 4 (April 2016):E182-E191, dx.doi.org/10.5942/jawwa.2016.108.0086.

61 EPA, "Drinking Water Infrastructure Needs Survey and Assessment Fifth Report to Congress," 2013, https://www.epa.gov/sites/production/files/2015-07/documents/epa816r13006.pdf.

62 American Water Works Association, *Buried No Longer: Confronting America's Water Infrastructure Challenge, 2012*, http://www.awwa.org/Portals/0/files/legreg/documents/BuriedNoLonger.pdf.

63 NRDC, "Report Finds Deteriorating Infrastructure, Pollution Threaten Municipal Drinking Water Supplies," 2003, https://www.nrdc.org/media/2003/030611; Erik Olson et al., "What's on Tap?" NRDC, 2003, https://www.nrdc.org/sites/default/files/whatsontap.pdf; Brian Cohen and Erik Olson, "Victorian Water Treatment Enters the 21st Century."

64 Jeff Swetfeger et al., "Cincinnati's Richard Miller Treatment Plant: Setting the Foundations for the Future," *AWWA Journal* 107, no. 12 (December 2015), http://www.cincinnati-oh.gov/water/assets/File/RMTP%20Setting%20the%20Foundations%20for%20the%20Future.pdf; Brian Cohen and Erik Olson, "Victorian Water Treatment Enters the 21st Century."

65 Ann Thompson, "Liquid Assets: How Cincinnati Became a World Water Leader," WVXU radio report, September 24, 2013, http://wvxu.org/post/liquid-assets-how-cincinnati-became-world-water-leader#stream/0.

66 See, for example, Melissa Kearney et al., "In Times of Drought: Nine Economic Facts About Water in the United States," The Hamilton Project, October 2014, http://www.who.int/water_sanitation_health/waterandmacroecon.pdf?ua=1; World Health Organization, "Making Water a Part of Economic Development," http://www.who.int/water_sanitation_health/waterandmacroeconomics/en/.

67 "S. 2848—114th Congress: Water Resources Development Act of 2016."

68 Emily Gordon et al., "Water Works: Rebuilding Infrastructure, Creating Jobs, Greening the Environment," Green for All, American Rivers, Economic Policy Institute, and Pacific Institute, 2011, at 1, http://pacinst.org/wp-content/uploads/sites/21/2013/02/water_works3.pdf.

69 Ibid at 3.

70 American Recovery and Reinvestment Act of 2009, Pub.L. 111–5 (February 17, 2009); for historic funding levels, see Claudia Copeland, "Funding for EPA Water Infrastructure: A Fact Sheet," Congressional Research Service, June 19, 2015, nationalaglawcenter.org/wp-content/uploads/assets/crs/R43871.pdf.

71 See Flint Water Advisory Task Force, "Final Report," at 6, 19-20 (noting that Michigan officials were "dismissive" of EPA employees' efforts to help fix the Flint problem, and that they complained about an EPA employee who sought to address the lead crisis as being too aggressive and as having "acted outside of his authority" (these are MDEQ talking points).

72 Michael Hawthorne, "Gade's Work Had Won Praise," *Chicago Tribune*, May 2, 2008, http://articles.chicagotribune.com/2008-05-02/news/0805011041_1_mary-gade-epa-official-bp; see also Associated Press, "EPA Official Resigns, Cites Dow Chemical, Activists: Head of Midwest Office Was Muzzled over Dioxin Contamination," NBC News, May 2, 2008m http://www.nbcnews.com/id/24428213/ns/us_news-environment/t/epa-official-resigns-cites-dow-chemical/#.WHB8YlMrK00.

73 NRDC, "Groups Petition EPA for Emergency Response to Flint, MI Drinking Water Contamination," October 1, 2015, https://www.nrdc.org/media/2015/151001-0.