The Safe Drinking Water Act and Flint, Michigan: How We Can Update Our Standards for Safe Drinking Water

Edited by Lillian Gabreski

Introduction

Standards for safe drinking water in the United States were first developed in 1914 when the federal government authorized the U.S. Public Health Service (USPHS) to regulate maximum allowable levels of coliform bacteria in the drinking water that was provided through interstate commercial industry. States themselves were not expected to uphold USPHS regulations, but as the list of controlled contaminants expanded over the subsequent fifty years, many agencies adopted the regulations as general industry standards. In December of 1974, the Safe Drinking Water Act (SDWA) passed successfully through congress, giving regulatory control to the newly formed Environmental Protection Agency (EPA), and for the first time states were responsible for upholding standards in public drinking water. 1996 brought in amendments to the SDWA which required that states develop consistent monitoring of source waters, as well as EPA-backed funds for states to develop partnerships against water pollution and consumer notification stipulations should the state fail to meet SDWA standards.

The SDWA established a two-tiered system of standards, with the first tier being enforceable standards that protect against contaminants, and the second tier being recommendations involving odors or tastes in the water that are unpleasant but not dangerous. Clean water must meet criteria to be considered safe to drink. While the SDWA intended its criteria for safe water to be motivated by scientific testing, the definition of safety creates a far more complex series of scientific inquiries than current standards of medical technology can meet. There is no clear way to test how much radon is safe to ingest over a given period of time, or how much lead can be tolerated in a child before it begins to affect brain function. In truth, there are no known safe levels of contaminants, but a zero-tolerance policy of all contaminants would be nearly impossible to achieve and too costly to enforce. To attempt a balance of reasonable restrictions and cost effectiveness, the EPA set levels of maximum allowable presence of pollutants in drinking water paired with recommended levels, with requirements to reassess the known contaminant list and maximum levels every five years. The maximum allowed amounts are called “action levels,” and exceeding these levels requires states to take action.

In order to err on the side of safety, action levels are set relatively low, though depending on the contaminant are an outdated form of regulation. Heavy metals like lead and mercury, for example, are never processed out of the body, and thus have a cumulative negative effect. Current regulations on lead allow no more than 14 parts per billion (ppb) to be
present in drinking water, but after a lead crisis in a city water supply, even when the state drops the lead levels below 15 ppb, those minute traces of lead still contribute to a permanent excess in human bodies that can cause irreparable harm and death.  

The contaminant list itself has been found insufficient by the Government Accountability Office’s 2011 report, which noted the contaminants were chosen by the EPA because the data on these substances was available, not because they were necessarily the greatest public health concerns.  

There are potentially dangerous substances that go unregulated simply because their presence in U.S. drinking water is assumed to be rare, and some decisions made by the EPA have been based on testing practices that are known to be insufficiently sensitive for detecting contaminants at the regulated levels.  

Finally, monitoring and enforcement methods need to be updated to ensure public safety against conspiracy, fraud, and insufficient effort from state agencies. If more stringent standards are enforced upon state water systems that have failed, state officials may be tempted to avoid reporting noncompliance to the EPA and to consumers in order to avoid the increasingly costly updates and mitigation procedures they would be required to make.

**Implementation and Enforcement**

States have primary enforcement responsibility for water regulations. While the EPA oversees the regulations of water and sets the standards for the maximum allowable levels of contaminants, the state level administrators are the first enforcers. That is, the governor’s office or relevant appointees can bring civil action to the owner or operator of a noncompliant public water company, and must also circulate the information to the public and the media. The state is then responsible for providing clean water to the population, which generally would be in the form of bottled water deliveries and pickup locations. States are also capable of adopting stricter regulations and laws regarding safe drinking water, and enforcing those laws on a state level.  

Should the state administrators fail to oversee the water companies, or if they are complicit in a failure to comply with clean water standards, the EPA is given the power to level civil action against responsible parties and disseminate the necessary information to the population affected and the media. Depending upon the level of contaminants in the water and the danger the population may be in, the office of the President can decree a state of emergency, which then allows for the federal government to deploy available armed forces such as the National Guard to distribute clean water and support the infrastructure efforts necessary for creating a clean water supply.
A federal $9.6 billion-dollar State Revolving Fund was instigated to bolster drinking water infrastructure as needed by states, and as of 2016 there is $34 billion of available funds that can be used for different state programs. While states are responsible for financing their own infrastructure, should the state be incapable of affording compliance, it can apply for a needs-based grant from the EPA. The EPA also has the power to withhold 5% of federal funds distributed to the state for program grants if the lead specific regulations are not met.

The EPA details criminal enforcement separately from civil enforcement, and has different legal standards for each. Criminal tampering with the water supply is defined by intent to harm, and criminal guilt must be established in a court of law beyond reasonable doubt. Civil suits are proven through a review of the evidence and establish only liability, not criminal charges. The only criminal provisions listed by the EPA involve tampering with public water systems. The agency defines this as a situation in which “[a] Person tampers (with an intention to harm), attempts to tamper, or threatens to tamper with a public drinking water system.” There is also a provision for failure to comply with Underground Injection Control regulations.

**Current Status**

**General Standards**

The EPA controls for 89 known contaminants that can show up in water, including microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, and organic chemicals. Contaminant inclusion and action levels are determined by the available scientific information, and the EPA reviews the estimated danger of the contaminants against the cost effectiveness of treatments. If there is a low danger, and the cost of treating the water to remove the offending substance is high, the EPA will allow for a higher action level than that which consumers might have preferred. Dangerous or controlled substances that are unlikely to appear in public water supplies are not included in the EPA regulations, since the cost and amount of work involved in testing every single water supply across the country for every single known danger is infeasible and would strain limited oversight resources for local, state, and federal governments.

An enormous amount of criticism surrounds the methods the EPA utilizes to set the standards for clean water. This criticism is summed up well by the Government Accountability Office (GAO) in their 2011 report *SAFE DRINKING WATER ACT: EPA Should Improve Implementation of Requirements on Whether to Regulate Additional Contaminants.*
The GAO outlined six programmatic failures in the EPA that revolve around determining which contaminants at which levels are acceptable for public health.

1/ **Failure to pioneer contaminant identification.**

Contaminant identification is driven by data availability, which is inconsistent and not necessarily organized by potential presence of a substance in a public water supply. The available data on chemicals are developed by a global community of scientists and researchers that may not be directly concerned with clean water.

2/ **No criteria for ranking contaminants by greatest public health concern.**

The contaminant list provided by the EPA lacks any information on hierarchy of danger or ranking of probability of contamination. The 1996 amendments to the SDWA require that the EPA organize contaminants by greatest public health concern, and while there has been some progress, there still is a lack of information both available to the EPA and created by the EPA to fulfill this requisite.

3/ **Contaminants are unregulated because they are determined “unlikely.”**

Since the EPA uses available to data to make their determinations, combined with the fact that the scarcity of certain contaminants means that they generally accrue little public health data, a number of contaminants are unregulated by the EPA.

4/ **The processes for the EPA’s unregulated contaminant testing exhibit managerial barriers.**

Programmatic decision-making in the EPA’s research and development division has suspended testing on identified potentially common and dangerous contaminants, and has excluded potentially dangerous contaminants on its assessments lists. The authority of the EPA to collect pertinent data at will has not been utilized.

5/ **No defined policies for interpretation of SDWA statute.**

Like many pieces of legislation, the Safe Drinking Water Act is long, complicated, and—in spite of its length—quite vague when it comes to the specific mechanics of determining what constitutes a dangerous contaminant. The role of the EPA is to interpret and implement the legislation, but there is no programmatic structure in place to determine consistently which contaminants ought to be regulated.
6/ Some of the EPA’s regulation decisions fail to stand under scrutiny.

The GAO’s findings included troubling issues with a lack of transparency and credibility in the determination of contaminants. For example, there was no disclosure of the fact that the EPA “made decisions on nine contaminants relying on tests that were not sensitive enough to detect them at the agency’s health risk benchmarks.”

Several of these criticisms are addressed in the Safe Drinking Water Act Amendments of 2017 proposed by Representative Frank J. Pallone of New Jersey, but the bill is still in review in the House of Representatives.

Six of the regulated contaminants that are discussed regarding Flint are as follows:
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### Table 1 - Relevant Contaminant List

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Lead</strong> – Zero parts per billion recommended. If 10% of samples from a system test positive for over 15 parts per billion, the agency in charge of the systems must respond. Lead is a powerful neurotoxin, and ingestion causes developmental delays in children, kidney problems, and high blood pressure. The presence of lead indicates water is corrosive and breaking down the pipes. Water with 5,000 ppb of lead is considered hazardous waste.</td>
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<tr>
<td><strong>Radium 226 and Radium 228</strong> – These radioactive elements decay into Radon and are both water soluble and gaseous. Radon is strongly linked to lung cancer, and a presence of $10^4$ picocuries per liter in water can increase the airborne radon of a room by one picocurie per liter. The action level established by the SDWA is a presence of 5 picocuries per liter.</td>
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<tr>
<td><strong>Copper</strong> – 1.3 milligrams per liter is the ceiling for allowable copper presence in water. As with lead, if 10% of water samples exceed this action level, the agency must take steps to treat the water. Short term copper intake can cause gastrointestinal distress, and long term intake in kidney and liver failure. The presence of copper can also indicate corrosive water.</td>
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<tr>
<td><strong>Chlorine</strong> – The Maximum Contaminant Level Goal is 4 milligrams per liter. Chlorine, as a detergent, often combines with organic compounds to form carcinogenic byproducts. High levels of chlorine can cause corrosion in pipes, which can cause increased lead and copper contamination if the pipes are made of copper and/or have lead soldering.</td>
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<tr>
<td><strong>Total Coliforms</strong> – Not dangerous in themselves, but are indicators that harmful bacteria is present and must be treated. Levels of 5% are considered the maximum.</td>
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<tr>
<td><strong>Legionella</strong> – A microorganism that causes Legionnaires’ disease, a type of pneumonia. Zero levels are tolerated.</td>
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### Failure to Provide Clean Water

#### Flint Michigan’s Water Crisis

Flint, Michigan, a city of 100,000 people northwest of Detroit, has experienced several economic downturns and depressions in the last fifty years. Over 50% of the Flint population is African American, and over 40% of its residents live below the poverty line. Since the city is nearly two hundred years old, many of its homes and much of its water infrastructure
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predate the statute of the SDWA that prohibits the use of lead soldering in pipes. This case is not unusual for American infrastructure, and updating procedures are slow and costly construction efforts. Until 2014, the city had sourced its water through the Detroit Water and Sewage Department (DWSD), which sources fresh water from Lake Huron. Lake Huron has proven to be a consistently clean and dependable water source, but contracting with the DWSD was an expensive option for an economically depressed city. In April 2015, state and city administrators decided to build a pipeline to Lake Huron that connected to a more local water authority, which would save Flint an estimated $200 million over the next quarter of a century. During construction, authorities decided to connect Flint to the nearby Flint River until the pipeline was ready. Flint River was verified by the Michigan Department of Environmental Quality to be safe to drink, and in April of 2014, the sourcing switch was made.

Immediately, Flint residents began to complain about the taste and appearance of the water, but these negative reviews were attributed to the fact that the Flint River water was harder than the Lake Huron water. Four months later in August, and again in September, fecal coliform, legionella, and total coliform bacteria were discovered in Flint’s water. Standard treatment for these bacteria is to treat the water with chlorine, which was repeatedly used and increased in this time. Chlorine, when it reacts with organic compounds, can create carcinogenic byproducts that are dangerous to ingest. It also can make water highly corrosive, and the old lead and copper pipes of Flint’s aging water infrastructure were extremely susceptible to the degrading effects of chlorinated water. Even the local General Motors Plant stopped using Flint water in production because their machines and equipment were showing corrosion. The Detroit Water and Sewage Department, aware of the dangers of microorganism outbreaks and chlorine, offered to reconnect Flint to their water supply and waive the $4 million reconnection fee. City officials refused.

It wasn’t until February 2015 that lead was discovered in private homes, rising steadily over two months before the Flint City Council voted to reconnect to Detroit. Michigan Governor Snyder’s appointee Jerry Ambrose overturned the vote, however, and within two months the lead levels found in private homes were as high as 13,200 parts per billion, which is over 2.5 times the classification of toxic lead waste and 880 times the action level of 15 ppb established by the EPA. In the meantime, an EPA memo that detailed the high lead levels of lead in Flint’s water was leaked to the ACLU. This leak triggered the Flint water crisis’s first major wave of media attention. Finally, in October 2015, the Michigan Department of Environmental Quality tested the water in Flint schools for lead, found the water to be contaminated, and—eight months after the initial discovery of lead in the water of a Flint
home—begun to distribute clean water to children in Flint’s schools. 2016 saw Flint in a state of emergency, with multiple lawsuits and criminal charges levied against government officials, organizations, and water plant managers, including felonies of conspiracy to conceal public health emergency information and criminal negligence.

In January 2017, the Michigan Department of Environmental Quality declared the lead levels in Flint’s water to be below the action level and thereby safe to drink. MDEQ found the water testing at 12 ppb for lead. Two months later in March, the EPA responded to a class action lawsuit for inaction by awarding $100 million to the state of Michigan for water infrastructure upgrades, and in response the state agreed to replace all Flint’s pipes that had lead soldering. The EPA determined that the Michigan DEQ was at fault for failure of oversight and compliance with the Lead and Copper Rule that restricts chlorination procedures, and several of the MDEQ officials are currently undergoing criminal trials.

According to the MDEQ, January 2018 saw lead levels in Flint’s water at 6-7 ppb A Michigan press release stated that these statistics are comparable to many other cities across the state and the country, and, according to the Flint Action Tracker website, over 6,000 leaded pipe structures have been replaced. Because the Action Tracker was developed by Mayor Karen Weaver with Governor Rick Snyder, both of whom are suspect in the failure to act on the Flint water crisis, the city’s residents unwilling to trust the MDEQ’s assessment of the safety of the lead levels in Flint’s water. Public trust is low, and these figures of improvement and safety may not be reflective of Flint’s reality. Governor Snyder was publicly challenged about his knowledge of the legionella contamination that caused over a dozen deaths from Legionnaires disease in Flint, but consistent evidence has not be found. In those communities in which the highest concentrations of lead were found, lead poisoning in children rose from about 5% to 16%. Overall, Flint’s children went from 2.1% suffering from lead poisoning to 4.2% after the 2014 switch from Lake Huron to Flint River.
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Improving the SDWA: Three Parts

The water crisis in Flint, Michigan is not an isolated event. The water infrastructure of many cities across the country still consists of pre-1974 lead soldering and copper piping. The depth of conspiracy in Flint, however, and its fervent media coverage, have catapulted this particular city’s crisis into international conversations about public health and safety reform. An assessment of Flint’s timeline shows multiple failures to act by public officials and by the EPA, revealing programmatic failures in the United States’ development and implementation of clean water standards.

Reassess Contaminant List
The EPA first must develop programmatic criteria to create consistency in regulation determination, and then determine how to create a public health risk hierarchy of contaminants. Existing contaminants must be evaluated with these new risk-management criteria, starting with cumulative contaminants (like mercury and lead), contaminants that could trigger other contaminants (such as chlorine’s creation carcinogens or of corrosion that triggers lead leaching), and those contaminants that are most likely to harm vulnerable
populations (such as children and the chronically ill).

Meanwhile, the EPA has more authority to and opportunities to obtain consistent, better quality data. By utilizing their research department to increase the scope of their assessment of unregulated contaminants and their access to international research efforts, they would be likely to obtain more consistent, better quality data on what contaminants constitute a danger to people, and in what quantities. Even projects such as the development of internships for master’s level chemistry and biology students would expand the EPA’s knowledge base of water contaminants.

The GAO also recommends minimal testing standards for non-regulated contaminants that are considered “unlikely” but could be dangerous in the event of contamination. Minimal testing standards would also provide the data on the true probability of occurrence of unusual contaminants that the EPA currently lacks.

**Enforcement Hierarchy**

Self-monitoring of water quality standards is both difficult to enforce and vulnerable to corruption. States are not rewarded for going above and beyond standards, and yet are penalized for falling beneath them. Forgiveness of fines for those states that take swift action to fix their problems could be a helpful measure, but would work only if the EPA exercises its authority to penalize failures to comply. In the case of Flint, Michigan, the EPA was largely inactive in the distribution of fines and penalties throughout the years of contaminated water.

Indeed, if the EPA is unaware of contaminations, it cannot enforce the rules for compliance with fines. If the EPA were to follow the GAO’s recommendations to increase testing of all water samples to their fullest statutory authority then—that is, by using the robust assessment monitoring program as opposed to casual screenings—their database would be bigger and richer, and they would know when the enforcement of regulations was necessary.

The EPA could utilize external agencies to avoid potential corruption in states’ self-monitoring. Even local law enforcement officials could be recruited to collect water samples, since given the proper training, police officers could access and collect water from most public buildings easily. The law enforcement agencies could enforce a robust monitoring system, and the police departments could obtain departmental bonuses from the EPA for providing this service or finding contaminated water, with the bonuses being paid out after follow-up samples are confirmed positive for contamination.
Three-Tiered Action System
Currently the EPA sets action levels at a static threshold that, when exceeded, triggers requirements for the state to take action or risk possible fines from the federal government, as well as civil action from citizens. Once water tests below that static threshold, even if the pollutant is cumulative, like lead, state action is no longer required, although local governments may continue to take action to rebuild trust with their constituents.

While this proposal uses lead as an illustrative example, each contaminant has a different source and effect, and thus each requires a different interventive method.

Reclassifying contamination in a three-level threat system that uses a color scale would be a first step for more nuanced intervention procedures. In the case of lead, the EPA could set 0-9 ppb as a yellow threat, 9-14 ppb as an orange threat, and 15+ as threat level red. Different levels of action would be required from states when their monitoring system triggers different threat levels. Should an institution like a school find it has lead measured at yellow level parts per billion, the state would be required to increase their lead testing to three times a year. At 10 ppb, the school would have to perform a series of procedures to mitigate the presence of lead; procedures might include an external evaluation of the school’s water pipes to determine if they are degrading to the point of exposing lead. In this scenario, the city’s water provider may also have to test for and mitigate any chlorine treatment.

Once a city experiences red levels of a cumulative contaminant like lead, the water supply cannot be announced as “safe” once it is reduced to an orange action level; efforts must continue with urgency until the contaminant is within the yellow category, and even then, the state is on probation and must continue efforts with higher requirements of monitoring and reporting.

Conclusion
The Flint Water Crisis is a terrifying wake-up call for the American public. In a country that is as advanced and prosperous as the United States, it is shocking that any city might not have clean water, let alone endure toxic waste levels of lead. Parents in Flint were at risk of losing their children, and homeowners were unable to sell their homes and leave because, with contaminated water, they were unable to sell their homes legally. Flint citizens struggled to be heard or helped for years, and are still at risk today, since only one third of the total corroded pipes have been replaced.

The EPA has authority, but there is little in the way of enforcement procedures that can be
wielded swiftly and dramatically enough to deter corrupt government figures putting their populations at risk, or neglectful officials from allowing water to go unmonitored. Developing stronger procedural structures within the EPA’s water division will create stronger foundations from which to act. Rigorously developed systems of data will demonstrate the evidence needed to alert officials to possible contaminations, and will supply the necessary information for the research team to support assessment of unregulated contaminants. Massive infrastructure projects, such as supplying cities with water, are bound to be compromised as a result of the sheer size and complexity of the system, and yet cities like Flint should never have to endure years of poisoned water without swift, decisive interventions by both state and local government. While there is no precise threshold dictating how much is too much, and what is safe, when it comes to possible contaminants, the United States has the power, the money, and the knowledge to make smarter, stronger policy for the health and welfare of its citizens.

**FLINT’S CONTAMINATED WATER TIMELINE**

**April 2012** - Flint’s county Genesee announces a new pipeline will be built to source water from Lake Huron to Flint. During construction, the county switches Flint’s supply to the Flint River.

**April 2014** - The city makes the switch to Flint River, and residents immediately begin reporting strange tastes and colors in the water.

**August 2014** - Fecal coliform bacteria is detected in Flint’s water. The city institutes a boil advisory, treats the water with chlorine.iii

**June 2014** - Legionnaire’s disease is detected in Flint residents.iv

**September 2014** - Total coliform bacteria, a sign of E Coli, is detected. Boil advisory is initiated, and the city water is treated with chlorine.

**October 2014** - Local General Motors Plant stops using Flint water due to the corrosion of factory machinery.

**January 2015** - The city warns its residents that byproducts of disinfectants could cause cancer over time.

**January 2015** - Residents begin campaigns to fight for their right to clean water. Children are reported to have rashes and mysterious symptoms. Detroit Water and Sewage Department offers to waive the $4 million reconnection fee for Flint to source from Lake Huron again, but city officials decline.

**February 2015** - The Michigan Department of Environmental Quality (MDEQ) states the buildup of chlorine-related carcinogens isn’t a public health crisis because it would require years of consumption to cause harm.
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**February 2015** - Lead is discovered in Flint residence of Lee-Ann Walters, mother of four, at 104 parts per billion, seven times the highest action-required level in public water.

**March 2015** - Walter’s lead levels are now 397 ppb. Flint City Council votes 7-1 to return to Lake Huron sourcing. Governor Snyder’s appointee Jerry Ambrose overturns the vote.

**June 2015** - EPA issues a memo titled “High Lead Levels in Flint,” stating that the city had not been performing the obligatory corrosion control treatment to reduce the presence of lead. Tap water from Walters’ home tested as high as 13,200 parts per billion. Walters shares the memo with the ACLU.

**July 2015** - The ACLU creates a video about the crisis. Flint Mayor drinks tap water on camera to prove it is safe to residents. The MDEQ claims the problem is not widespread.

**August 2015** - The MDEQ orders Flint to perform corrosion control.

**September 2015** - Reports from Virginia Tech indicate 40% of Flint homes have high levels of lead. The researchers determine that Flint River water is 19 times more corrosive than Detroit water, and is unsafe for drinking or cooking.

**October 2015** - The Michigan Department of Health and Human Services verifies the findings, tests the water in schools, finds lead, and begins the distribution of clean water in schools. Governor Snyder reports Flint will no longer use river water.

**November 2015** - Legionnaires’ outbreak kills twelve people thus far.

**December 2015** - Flint declares a state of emergency.

**January 2016** - The National Guard is mobilized to distribute clean water. Governor Snyder estimates it will cost $55 million to replace the city’s pipes. President Obama does not declare a disaster in Flint, but instead declares a state of emergency in the city that allows for the Federal Emergency Management Agency to assist, and for development projects intended to fix the problem to skip the lengthy environmental impact assessment process.

**Spring 2016** - Multiple government officials, organizations, and the governors are struck with lawsuits and criminal charges.

**November 2016** - The state of Michigan and the city of Flint are ordered to deliver bottled water to those homes in which the government has not checked if the filters are running properly.

**December 2016** - Two water plant officials and two emergency managers are charged with felonies.

**January 2017** - The MDEQ says lead levels in the city are below the limit. A class action lawsuit is levelled against the EPA for inaction.

**March 2017** - The EPA awards $100 million to Flint for water infrastructure upgrades. The state of Michigan
agrees to replace the water pipes in at least 18,000 Flint homes by 2020.

**June 2017** - State officials are charged with involuntary manslaughter regarding the Legionnaires’ outbreak.

**December 2017** - Michigan is accused of violating terms of its pipe replacement agreement. The Flint Action Tracker released by the government reports that 6,489 lead and galvanized steel lines have replaced.

**References**

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