FACT SHEET

TOXIC DRINKING WATER: THE PFAS CONTAMINATION CRISIS[1]

WHAT ARE PFAS CHEMICALS?

Per- and polyfluoroalkyl substances (PFAS) are a large class of approximately 4,700 synthetic chemicals widely used for their oil and water repellency, temperature resistance, and friction reduction.[2,3] Various industries manufacture and use PFAS in items such as cookware, food packaging, firefighting foam, and textiles.

WHY SHOULD I CARE?

PFAS have grown into a global environmental and public health threat. These chemicals tend to share three problematic properties:

- **PFAS are extremely persistent "forever chemicals"** that do not break down easily and can accumulate in the food that we eat and in our own bodies.[4] Due to their widespread use, they are now found in the bodies of virtually all Americans.[5]
- **PFAS are highly mobile** and spread quickly throughout the environment. They are now found in our drinking water, air, food, and homes.[6]
- **PFAS are toxic** and can be harmful at extremely low doses (at the low parts-per-trillion level). PFAS have been linked to serious health effects such as cancer, hormone disruption, kidney and liver damage, developmental and reproductive harm, and immune system toxicity.[7]

WHAT ARE THE HEALTH RISKS?

PFAS have been linked to a variety of serious health effects including kidney and testicular cancer, thyroid disease, decreased fertility, and decreased response to vaccines.[8] PFAS are chemically similar, and it is reported that the health risks associated with one PFAS are expected to occur for others as well.[9] Because people are often exposed to many of these chemicals at the same time, there is a real concern that different PFAS will target the same biological systems and cause greater effects than any single PFAS on its own.

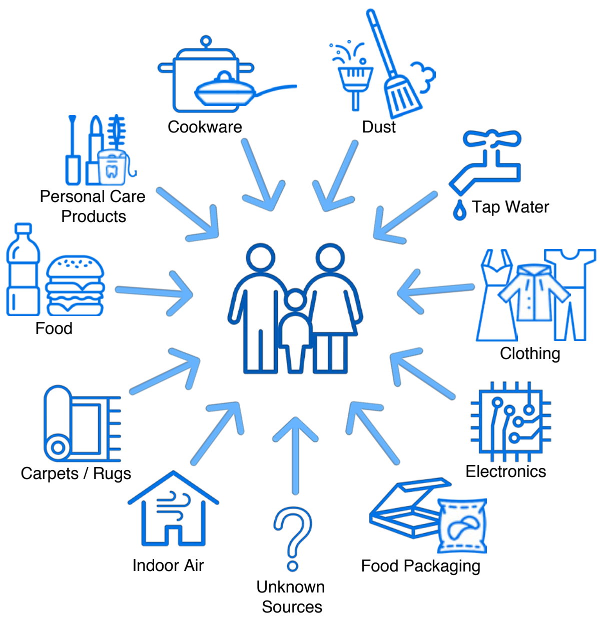
Some PFAS have been shown to build up in people, even before birth.[10] These can take decades to be eliminated from the human body. Almost all fetuses and young children are exposed to PFAS, through fetal exposure during pregnancy and through contaminated infant formula or breast milk. Fetuses, infants, and children are particularly susceptible to the harmful effects of PFAS due to the rapid growth and complex developmental events they undergo.[11]

For more information, please contact:
Anna Reade
areade@nrdc.org

HOW AM I EXPOSED?

The extensive use of PFAS has led to their ubiquitous presence in the environment. They are found virtually everywhere: air, soil, water, food, plants, wildlife, and in the bodies of people.[12] Every day, people can be exposed to mixtures of PFAS chemicals from drinking water, eating food, breathing air, or coming into contact with dust, carpets, paints, waxes, clothing, upholstery, and personal care products like dental floss. Figure 1 displays the wide array of sources that continue to expose us to PFAS every day.

FIGURE 1: COMMON SOURCES OF PFAS EXPOSURE



PFAS ARE IN OUR DRINKING WATER

Millions of people are exposed to PFAS through their drinking water. For these people, drinking water is likely the dominant source of exposure.[13] There are many sources across the nation contributing to PFAS contamination of drinking water, including industrial facilities, landfills, wastewater treatment plants, and fire training sites at airports and military bases.[14]

Despite the known health risks of PFAS and the known contamination of people's homes and the environment, no enforceable national drinking water standards have been set. In 2016 the U.S. Environmental Protection Agency (EPA) issued a Lifetime Health Advisory (a recommendation, but not enforceable under the law) for two of the most widely detected PFAS, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS).[15] Setting an upper limit of 70 parts per trillion (ppt) in drinking water, the health advisory applies to each chemical individually or in combination.

National monitoring for six PFAS chemicals required by the EPA between 2013 and 2015 indicates there are approximately 16.5 million Americans in 33 states, three territories, and an American Indian community served PFAS-contaminated drinking water.[16] Approximately six million of these people are receiving drinking water with PFAS levels that exceed the EPA's health advisory.[17] However, due to limitations in the national survey, including high reporting limits (thresholds), a focus on large public water systems, and a limited number of PFAS chemicals tested for, the actual number of people drinking PFAS-contaminated water is likely much larger than the estimated 16.5 million.

THE TOXIC TREADMILL AND THE NEED TO REGULATE PFAS AS A CLASS

Newer-generation PFAS chemicals have not been as extensively studied as legacy PFAS such as PFOA and PFOS. However, there is growing evidence that newer and legacy PFAS pose similar threats to human health and the environment, often at exceedingly low doses. These toxicity data, combined with concerns over environmental mobility, persistence, and widespread human and environmental exposure, have led hundreds of scientists and public health experts from around the globe to express concern about the continued and increasing production and release of PFAS.[18] Although we do not have health information on all of the thousands of chemicals in the PFAS class, we know:

- Many complex PFAS break down into less complex PFAS called perfluoroalkyl acids (PFAAs), for which there are substantial known health risks.[19] Thus, regardless of the type of PFAS being produced and used, PFAS production and use will likely result in increased exposure to PFAAs, which are associated with serious health harms.

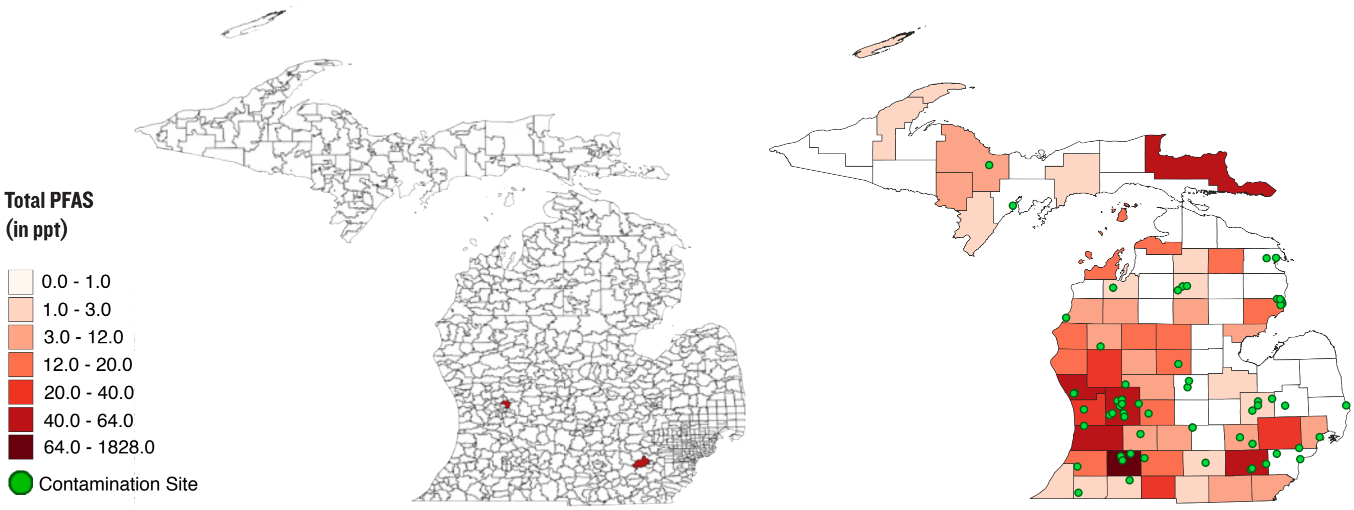
- Newer short-chain PFAS, such as GenX, have been introduced as purportedly "safer" alternatives to long-chain PFAS because they are supposedly eliminated more quickly from our bodies. However, evidence suggests short-chain PFAS are associated with adverse health effects similar to those of the legacy PFAS they are replacing.[20] Importantly, short-chain PFAS are still highly persistent and are even more mobile in the environment than long-chain PFAS.[21] This means their use will result in our continual and increased exposure.[22]

If we regulate only a handful of PFAS, we will find ourselves on a "toxic treadmill" whereby manufacturers simply substitute other harmful PFAS for those that are banned or regulated, creating an ongoing problem. Establishing effective safeguards to limit this growing class of dangerous chemicals requires a class-based approach to their regulation. This is the only approach guaranteed to protect our health.

FIGURE 2: PFAS DETECTION

EPA's nationwide testing detected PFAS in only 3 out of more than 4,000 samples from Michigan (left map; results reported by zip code). Michigan initiated its own monitoring and found PFAS in more than 100 of its public water systems (right map; results reported by county). Michigan officials have also identified highly contaminated sites throughout the state (green dots on right map). EPA's testing was limited in scope and required reporting only at high concentrations, which drastically understated the issue. Michigan's testing shows that comprehensive monitoring at low reporting concentrations is necessary to understand the full scope of PFAS contamination.

PFAS Detections in EPA Testing | **PFAS Detections in Improved State Testing**



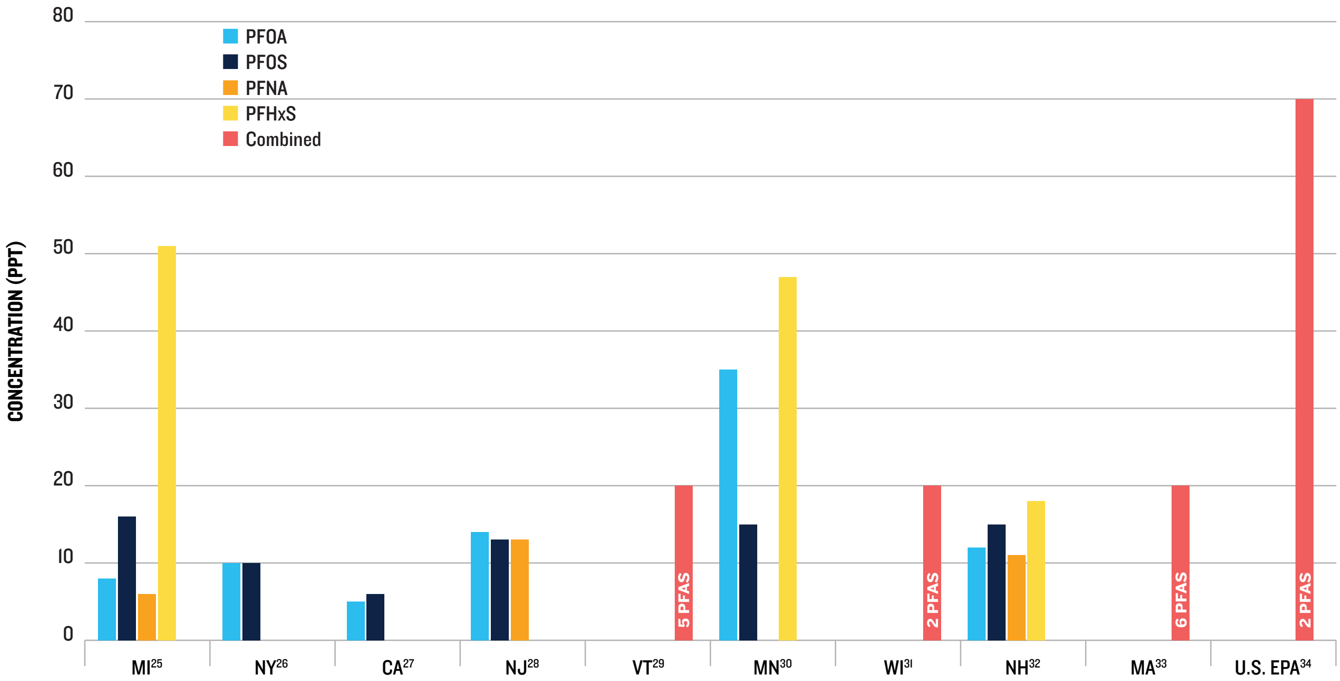
STATES ARE TAKING ACTION

Numerous states are acting to protect their citizens from the risk of PFAS exposure. Some are implementing their own standards for certain PFAS, and some, including Michigan, New Jersey, and California, are conducting their own, more comprehensive testing to better understand the extent of PFAS contamination statewide. Their findings have sobering implications for the rest of the country. For example, a 2013–2015 national survey detected just three instances of PFAS contamination in Michigan.[23] However, Michigan state experts subsequently performed their own investigations of areas thought to be at risk of PFAS contamination and tested all public water systems serving more than 25 people. Furthermore, Michigan tested for an expanded number of PFAS at lower health-relevant reporting limits. With this improved testing, more than 60 sites and more than 100 public water systems in Michigan were identified as contaminated with PFAS (see Figure 2)—increasing the estimate of the affected population from fewer than 200,000 people to approximately 1.5 million.[24]

In response to mounting evidence of the dangers of PFAS and the desire to protect the most vulnerable populations among us, Michigan, New Jersey, New York, Vermont, New Hampshire, Wisconsin, Minnesota, Massachusetts, and California have all recently proposed or adopted drinking water guidelines or standards (starting as low as 6 ppt) for several PFAS chemicals, individually or in combination, that are more protective than the EPA Health Advisory (see Figure 3).

FIGURE 3: SELECTED U.S. GROUNDWATER AND DRINKING WATER STANDARDS OR GUIDELINES

States are evaluating the health effects of PFAS and generating their own, more health-protective standards or guidelines for concentrations in drinking water or groundwater, much lower than the federal EPA health advisory of 70 ppt. Data reported here include both proposed and adopted levels as of August 2019. Figure is adapted from The Endocrine Disruption Exchange.



RECOMMENDATIONS AND NEXT STEPS

To address the extraordinary health threat posed to people across the country from widespread PFAS-contaminated drinking water, states should act now. We cannot wait for the federal government to respond because the current Safe Drinking Water Act needs to be fixed legislatively before the EPA can set health-protective national standards.[35] NRDC recommends that states take the following actions:

1. Set a health-based goal of zero for total PFAS in drinking water. Current science indicates that there may be no safe level for mixtures of these chemicals in our drinking water, particularly for vulnerable populations.
2. Immediately set strict, effective, and enforceable drinking water standards for well-studied PFAS at a level that is as close to the goal of zero as is feasible. This includes, at minimum, a combined standard of 2 ppt for PFOA, PFOS, PFNA, and PFHxS and a standard of 5 ppt for GenX. Until a treatment technique is adopted to ensure removal of the full class of PFAS chemicals (see #3, below), additional standards for other PFAS (such as PFBS, PFHxA, and PFHpA) should be set as the data become available.
3. Establish a treatment technique for removing a broad range of PFAS from our water, based on the best available detection and treatment technologies. Currently, this would be reverse osmosis, or an equally effective treatment train.
4. Ensure regular and comprehensive nationwide monitoring of PFAS in drinking water. Such surveys should use the most up-to-date testing methods that capture the greatest number of individual PFAS, as well as total PFAS (or a method approximating that, such as the TOP Assay), at levels relevant to human health.[36]

ENDNOTES
1 This fact sheet is based on an NRDC report that reviews evidence demonstrating the threats to human health from PFAS exposure and the best available technologies to test for PFAS and remove it from drinking water. It concludes with policy recommendations on how states can protect their citizens from PFAS-contaminated drinking water. Anna Reade, Tracy Quinn, and Judith Schreiber, *Scientific and Policy Assessment for Addressing Per- and Polyfluoroalkyl Substances (PFAS) in Drinking Water,* NRDC, March 2019, https://www.nrdc.org/sites/default/files/assessment-for-addressing-pfas-chemicals-in-michigan-drinking-water.pdf.
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