My STEEP Report

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1. Results Summary

While contaminants were found in many of the wells we tested, there are steps people can take to reduce contaminant levels in their drinking water. The following results and resources will help you make informed decisions to protect your water quality.

Your sample did not exceed any federal or state drinking water standards.

Your sample was below but close to the federal drinking water standard for nitrate.

Your sample did not exceed the federal Action Level for lead and copper.

Your sample did not exceed the MA state standard for the sum of 6 PFAS chemicals. Your sample had some of the highest levels in the study of PFAS chemicals.

Your sample did not exceed any federal drinking water standard for metals.

Health Concerns

About 44 million people in the United States get their drinking water from private wells. However, routine monitoring of water quality in private wells is often not required. In addition, these wells are often impacted by wastewater and other contamination sources. The chemicals in products that we use at home and at work can make their way into groundwater in areas with private wells.

Often we do not have enough information to know whether chemical levels in drinking water will cause specific health conditions in individuals. Some people are more sensitive to the chemicals than others. For example, exposures in a growing child can have different effects than exposures in adults.

You can learn more about the health concerns for each chemical we analyzed — and actions that can help reduce your exposure — on the results pages.

2. Overall Study Results

STEEP is testing private wells to improve our understanding of the extent of PFAS contamination in Cape Cod drinking water.

PFAS (per- and polyfluoroalkyl substances) are chemicals that are commonly added to nonstick, stain-resistant, and waterproof consumer products such as carpets and upholstery, rain jackets, cookware, food packaging, and even some dental floss. They are also added to certain firefighting foams used at military bases, airports, and fire training areas. They are resistant to degradation and extremely persistent in the environment.

PFAS have been found in public water supplies serving millions of people across the U.S. They have also been found in water supplies on Cape Cod, including in Hyannis, Mashpee, and Falmouth. In 2019, STEEP researchers found PFAS in private wells in towns all around Cape Cod. Potential sources of PFAS contamination of Cape groundwater include septic systems, firefighting foams, discharges from sewage treatment plants, and leachate from landfills.

To learn more about PFAS contamination on Cape Cod, STEEP conducted a second round of sampling in 2021. We tested water from 65 private wells in 12 towns across Cape Cod for 34 PFAS chemicals. We also tested for nitrate and boron, which are markers of septic system impact, as well as metals such as lead, copper, and iron.

STEEP tested for:

6 PFAS chemicals included in the 2020 Massachusetts drinking water standard. In October 2020, the Massachusetts Department of Environmental Protection adopted an enforceable standard to regulate PFAS in public water supplies. Their standard for public drinking water supplies established a maximum contaminant level of 20 nanograms per liter (ng/L) for six PFAS chemicals: PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA. One of the 65 wells we tested exceeded the current Massachusetts guideline. 80% of wells tested had detectable levels of at least one of these 6 PFAS chemicals, and 3% of wells contained detectable levels of all 6 chemicals.

28 PFAS chemicals not included in the Massachusetts standard. Many additional PFAS chemicals may be present in groundwater. 14 of these other PFAS chemicals were detected in at least one private well, and 14 were not detected in any well.

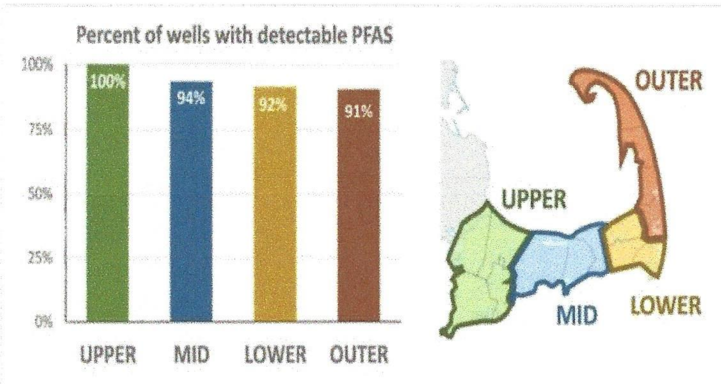
2 chemicals related to septic system influence. We tested for nitrate and boron, both of which are markers of septic system impact. Nitrate and boron levels ranged widely and indicated that some wells are located in relatively pristine areas, while others show clear impact from septic systems or other human activity.

2 metals related to plumbing. We tested for lead and copper, which can leach into drinking water from plumbing and are most common in houses with older plumbing and acidic water.

12 other metals in drinking water. Some metals naturally occur at high levels in Cape Cod groundwater, like iron and manganese, and are primarily of concern for the taste and appearance of water. Other metals are associated with mining and industrial activities, like cadmium and nickel, and are typically not present at levels of concern on Cape Cod.

PFAS chemicals were detected across all parts of Cape Cod, including areas with no known history of PFAS contamination.

We found detectable levels of PFAS in 94% of wells we tested. The percent of wells with detectable PFAS ranged from 91% on the Outer Cape to 100% on the Upper Cape.

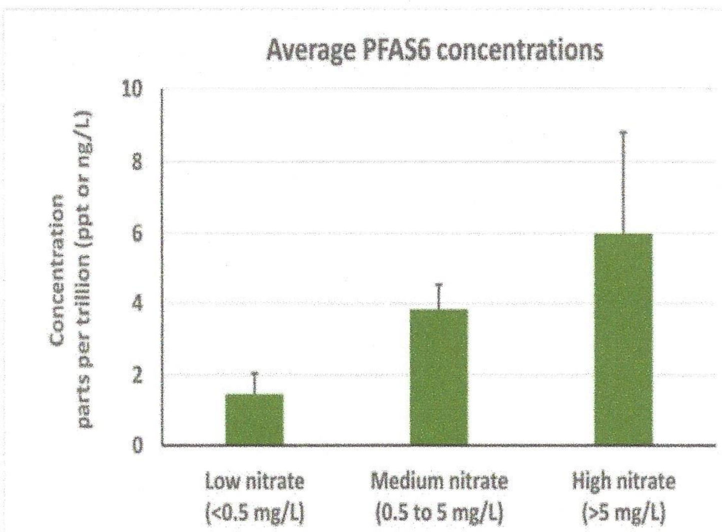


PFAS chemicals no longer produced in the U.S. are still present in groundwater, along with newer replacements.

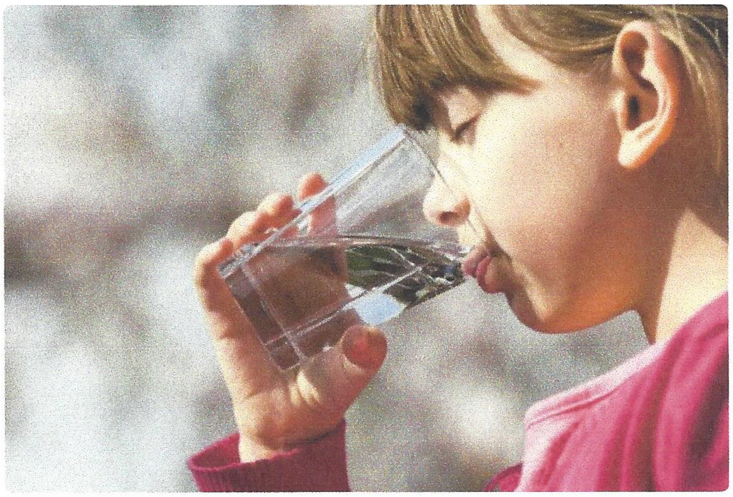
Of the 34 PFAS analyzed, 20 were detected at least once. The most frequently detected PFAS were PFHxA, PFHxS, and PFOA. PFOA, PFOS, and some other PFAS we detected are no longer produced in the U.S. due to concerns about their toxicity, but they can still show up in drinking water because PFAS chemicals are very resistant to degradation in the environment. Other frequently detected PFAS are newer PFAS chemicals that are used as replacements in products, like PFHxA.

Wells with higher levels of nitrate also had higher PFAS levels.

STEEP also tested for nitrate and boron, which are both markers of septic impact. Wells with higher levels of nitrate and boron tended to have higher PFAS levels. Average PFAS6 levels in wells with higher nitrate (above 5 milligrams per liter, mg/L) were more than three times higher than average PFAS6 levels in wells with lower nitrate. Since septic systems are the largest source of nitrate into Cape Cod groundwater, these findings suggest that septic systems could be an important source of PFAS to private wells on Cape Cod.

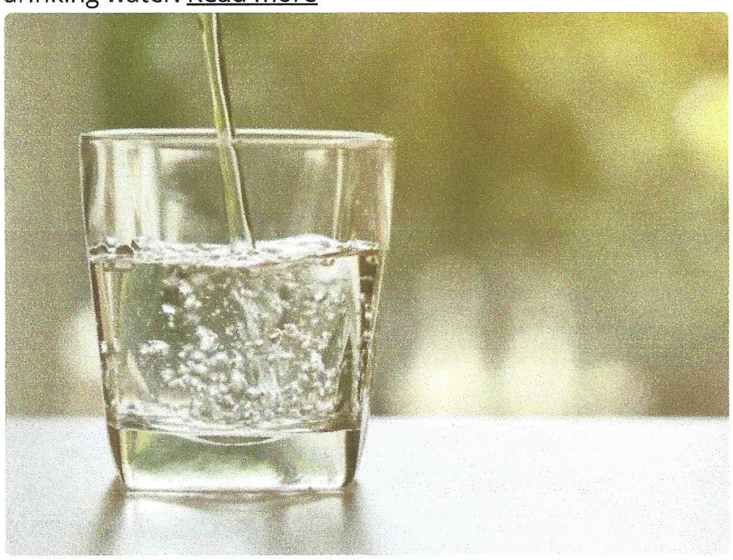


3. What You Can Do



In Your Home

The chemicals found in products that we use at home and at work can make their way into groundwater, ponds, and drinking water. Read more



Treat Your Water

Home water treatment systems can remove certain contaminants from well water. Read more

In Your Community

There are steps you can take with your community to reduce everyone's exposure to harmful chemicals. Read more

4. In Your Home

Chemicals found in products that we use at home can make their way into groundwater, ponds, and drinking water. You can take steps to reduce your exposure to PFAS in your home, lower your chemical footprint, and protect Cape Cod drinking water.

Eat more fresh foods to avoid foods sold in grease-proof packaging, like fast food wrappers, which can contain PFAS.

Make popcorn on the stovetop or with a popcorn maker. Microwave popcorn bags are lined with grease-resistant coatings typically made from PFAS, which can release chemicals into popcorn as it cooks.

Steer clear of spray treatments that make rugs, furniture, or other textiles stain- or water- resistant.

Avoid clothing labeled "stain-resistant" or "waterproof" when possible.

Choose cosmetics, lotions, and other personal care products that don't contain PTFE or ingredients that include the term "perfluoro."

Look for nylon or silk dental floss that is either uncoated or coated in natural wax, as some dental floss is made with PFAS.

Avoid non-stick cookware. Use pots and pans that are steel clad, enameled, cast iron, or anodized aluminum instead of non-stick pans coated with PFAS.

Keep dust levels low. Dust can contain chemicals from inside and outside the home. Wipe surfaces with a damp cloth and use wet mopping or a vacuum with a HEPA (high-efficiency particulate air) filter. These methods help to prevent dust from being recirculated into the air.

Wash hands frequently to avoid ingesting PFAS from products and dust.

5. In Your Community

You can take steps in your community to reduce everyone's exposure to harmful chemicals.

Be a vocal consumer. Call the toll-free numbers listed on product labels to let companies know you will switch brands if the ingredients are not safe.

Get involved with a local water quality organization and let local elected officials know that you support efforts to protect water quality.

Register to vote and support candidates who back more protective policies and legislation on toxic chemicals.

Connect with local and state organizations working to reduce toxic chemicals, such as STEEP partners Massachusetts Breast Cancer Coalition and the Sierra Club Cape Cod Group.

Ask your favorite brands and stores to choose products with safer chemicals and join campaigns to get chemicals of concern out of food packaging and consumer products.

Support the use of PFAS-free alternatives to AFFF firefighting foams. Safer States tracks legislation at the state level to restrict PFAS in firefighting foams and other products.

Follow the STEEP website for ongoing updates: web.uri.edu/steep.

Share what you learn about chemicals exposures and health with your family, friends, neighbors, and coworkers.

6. Treat Your Water

Home water treatment systems can remove certain contaminants from well water. Water treatment methods vary in cost, maintenance, and effectiveness.

Your STEEP water report may prompt you to consider treating your water to remove chemicals. When deciding whether and how to treat your water, there are several things you should keep in mind:

- **What chemicals you want to remove:** Different treatment systems remove different chemicals, and it may not be necessary to lower levels of all chemicals in your water. Deciding what the goal of the treatment system is will help you select the appropriate system.
- **Whole-house or point-of-use system:** A whole-house system treats all household water used for drinking, cooking, washing dishes, bathing, and laundry. Point-of-use systems treat water where it is being used and are typically installed under the kitchen or bathroom sink.
- **Costs:** These include purchase, installation, and maintenance of a treatment system.
- **Effort to maintain:** Evaluate how frequently parts, such as filters, need to be replaced, who will do the maintenance, and whether the system must be periodically "flushed." Systems that require backflushing can increase wastewater load to septic systems.
- **Some types of treatment are not effective for any of the contaminants measured in this report.** For instance, UV light and mechanical filters can be useful for other types of contaminants. Boiling water will not remove any of the contaminants in this study, and can make them more concentrated in your water.
- **Consider connecting to town water in areas where it is available.** Connecting to town water may be a good alternative to treatment in some cases. Consider whether the contaminants you are concerned about are present in the public water supply for your town. Some contaminants, like lead and copper, may come from the plumbing inside your home, so switching to town water may not lower levels in your water. You can search online for your town water system's most recent Consumer Confidence Report or call your local water department to find out more about drinking water quality in your area.

Two types of filters can remove PFAS from drinking water:

- **Activated carbon** systems effectively remove PFOA, PFOS, and some other PFAS chemicals. Types of activated carbon systems include solid carbon block filters (typically a filter under your sink) and granular activated carbon filters (as in a filter pitcher).
- **Reverse osmosis** systems effectively remove a wide range of PFAS chemicals. However, reverse osmosis systems can be more expensive and create several gallons of waste water for every gallon of filtered water. In Massachusetts, homeowners are not allowed to discharge wastewater from reverse osmosis systems into septic systems, and a separate injection well is required.

When choosing a filtering system, look for one that is “NSF P473 certified” or “NSF/ANSI 53 certified.” This certification means that there has been third party testing to check that a filter is able to meet a 2016 EPA drinking water guideline. Please note that there is no third-party testing to ensure that a filter can meet the 2020 Massachusetts drinking water standard or new standards proposed by EPA in March 2023. choosing a filtering system, look for one that is “NSF P473 certified” or “NSF/ANSI 53 certified.” Be sure to follow manufacturer instructions and replace the cartridges or membranes as recommended.

This table shows which types of home water treatment systems are effective at removing other contaminants from well water.

	Ion exchange	Activated carbon	Activated alumina	Reverse osmosis	Distillation	Chlorination	Aeration with filtration
Aluminum				✓	✓		
Arsenic	✓		✓	✓	✓		
Boron	✓			✓			
Cadmium	✓			✓	✓		
Chromium				✓	✓		

Copper	✓			✓	✓		
Iron	✓			✓		✓	✓
Lead	✓	✓	✓	✓	✓		
Manganese	✓			✓	✓	✓	✓
Nickel				✓	✓		
Nitrate	✓			✓	✓		
PFAS		✓		✓			
Selenium	✓	✓		✓	✓		
Silver				✓	✓		
Zinc	✓			✓	✓		

Source: University of Massachusetts Amherst Center for Agriculture, Food, and the Environment

Other tips for private well owners:

- **Know the source of your well water and what type of well you have.**
- **Test your well water regularly.**
- **Maintain your septic system** and have your septic tank pumped as recommended.
- MassDEP recommends certain tests should be conducted annual. The Barnstable County Water Quality Laboratory offers routine testing for private wells on Cape Cod.

7. About STEEP

Sources, Transport, Exposure & Effects of PFAS (STEEP) is a Superfund Research Program led by the University of Rhode Island in partnership with the Harvard T.H. Chan School of Public Health's Department of Environmental Health and Silent Spring Institute. STEEP is funded by the National Institute of Environmental Health Sciences (NIEHS) Superfund Research Program to address the emerging problem of PFAS contaminated sites across the U.S. and elsewhere. STEEP is engaging communities on Cape Cod, Massachusetts, to address local PFAS contamination issues. Our local community partners include Massachusetts Breast Cancer Coalition, the Sierra Club Cape Cod Group, and the Mashpee Wampanoag Tribe.

8. Methods

In 2021, STEEP researchers tested 65 private wells on Cape Cod – including your well. We asked well owners to collect samples prior to any water treatment systems and after flushing the water line for 10 minutes. The results provided in this report are representative of untreated water that was pulled directly from your well. If you have a water treatment system in place or use a water filter, you may have lower levels of contaminants in your drinking water.

Your sample was analyzed for several types of contaminants:

- **PFAS (per- and polyfluoroalkyl substances):** PFAS are a class of chemicals found in household products and certain firefighting foams. Potential sources of PFAS contamination in Cape Cod groundwater include discharges from septic systems and sewage treatment plants, landfills, and fire training areas. We tested for 34 PFAS chemicals in your water sample.
- **Nitrate and boron:** Elevated levels of nitrate and boron in well water can be an indication of septic system impact. Other sources of nitrate include fertilizers, stormwater runoff, and airborne pollution. Higher boron levels can also come from saltwater intrusion.
- **Lead and copper:** Lead and copper can leach into drinking water from plumbing and are most common in houses with older plumbing and acidic water.
- **Other metals:** Some metals, such as iron and manganese, naturally occur at high levels in Cape Cod groundwater, and are primarily a concern in terms of their effects on the taste and appearance of drinking water. Other metals, like cadmium and nickel, are mainly associated with mining and industrial activities and are typically not present at levels of concern on Cape Cod.

Your well water was analyzed by three laboratories:

- **PFAS** analyses were conducted by the laboratory of STEEP director Dr. Rainer Lohmann at University of Rhode Island.
- **Boron and metals** analyses were conducted by the laboratory of STEEP researcher Dr. Elsie Sunderland at Harvard University.
- **Nitrate** analyses were conducted by the Barnstable County Water Quality Laboratory.

9. Contact Us

Visit our website: http://web.uri.edu/steep/wellwater

Email: steepprivatewell@gmail.com

Call: 617-332-4288 x224

Study leaders:

Laurel Schaider, PhD

Senior Scientist

Silent Spring Institute

Emily Diamond, PhD

Assistant Professor

University of Rhode Island

10. PFAS

Your sample did not exceed the MA state standard for the sum of 6 PFAS chemicals. Your sample had some of the highest levels in the study of 3 PFAS chemicals, which are not currently regulated.

Where do these chemicals come from?

PFAS (per- and polyfluoroalkyl substances) are a family of highly persistent chemicals found in many consumer products. These include stain-resistant carpets and upholstery, waterproof clothing, floor waxes, nonstick cookware, grease-proof food packaging, and even some dental floss. They are also added to certain firefighting foams that are commonly used at military bases, airports, and fire training areas. Potential sources of PFAS contamination on Cape Cod include fire training areas, septic systems, wastewater treatment plants, and landfills.

How are PFAS regulated in drinking water?

As of October 2023, there are no federal standards regulating PFAS in drinking water. The U.S. Environmental Protection Agency (EPA) is in the process of setting drinking water standards for several PFAS chemicals. EPA has issued non-enforceable guidelines for 2 PFAS chemicals, PFOS and PFOA. In 2020, the Massachusetts Department of Environmental Protection (MassDEP) issued an enforceable standard for 6 PFAS chemicals (known as "PFAS6") in public water supplies in Massachusetts. The Massachusetts PFAS6 standard is 20 parts per trillion (ppt) for the total amount of six PFAS chemicals (PFOA, PFOS, PFNA, PFHpA, and PFHxS).

What are the health concerns?

Nearly all US residents have PFAS in their blood. Because of their unique chemical properties, PFAS tend to persist in the body and the environment. Of the more than 14,000 compounds identified as PFAS, most have not been studied for health effects. Some PFAS are difficult for humans to excrete and can stay in our bodies for years. Exposures to PFAS have been associated with higher cholesterol, liver and kidney problems, decreased vaccine response in children, testicular and kidney cancer, thyroid disruption, and effects on growth and development, including mammary gland development in animals. Scientists from the STEEP Superfund Research Program are working to improve our understanding of how PFAS can affect our health.

How can I reduce my exposure?

Treat your water

Two types of household filters can remove PFAS from drinking water. Activated carbon systems effectively remove PFOA, PFOS, and some other PFAS chemicals. Types of activated carbon systems include solid carbon block filters (typically a filter under your sink) and granular activated carbon filters (as in a filter pitcher). Another option is reverse osmosis systems, which effectively remove a wide range of PFAS chemicals. However, reverse osmosis systems can be more expensive and create several gallons of waste water for every gallon of filtered water. In Massachusetts, homeowners are not allowed to discharge wastewater from a reverse osmosis system into septic systems, and a separate injection well is required.

When choosing a filtering system, look for one that is "NSF P473 certified" or "NSF/ANSI 53 certified." This certification means that there has been third party testing to check that a filter is able to meet the 2016 EPA drinking water guideline. Please note that there is no third-party testing to ensure that a filter can meet the 2020 Massachusetts drinking water standard or new standards proposed by EPA in March 2023. For every type of water filter, be sure to follow manufacturer instructions and replace the cartridges or membranes as recommended.

Avoid PFAS-containing products

Chemicals found in products that we use at home and at work can make their way into groundwater, ponds, and drinking water. Reducing your reliance on products containing harmful chemicals will protect your health and the environment. Read more about ways to reduce your personal exposure to PFAS chemicals in your home and protect Cape Cod drinking water.

Your Results

Graph legend

● your chemical level

○ participants' chemical levels

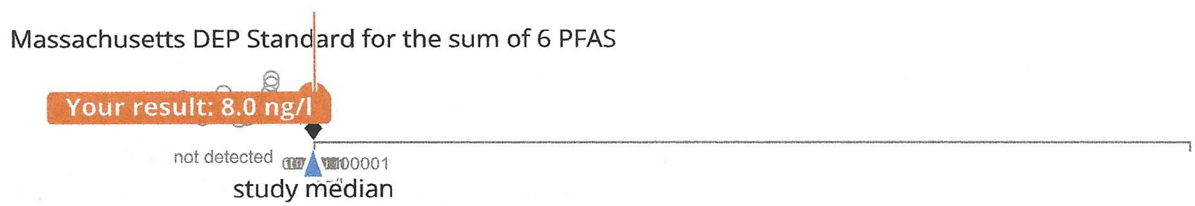
● participants for whom the chemical was not detected

▲ study median

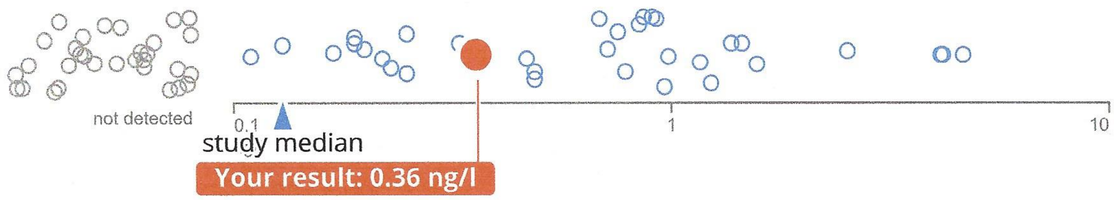
◆ state or federal drinking water guideline (when available)

Tip: Mouse over your graphs to learn how to read them.

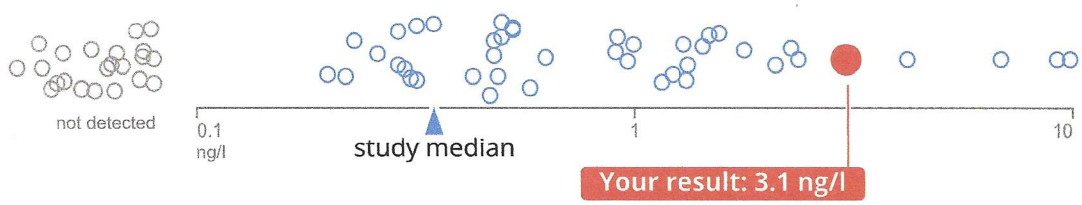
PFAS6



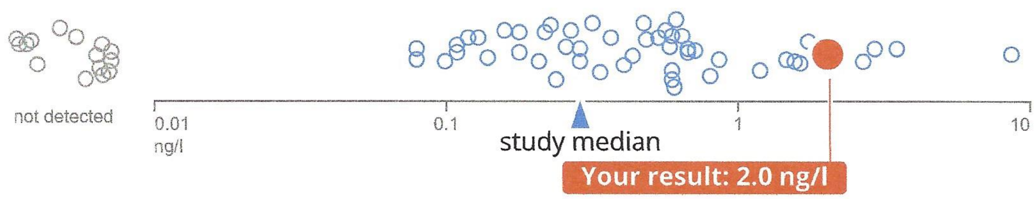
PFOS (perfluorooctane sulfonic acid)



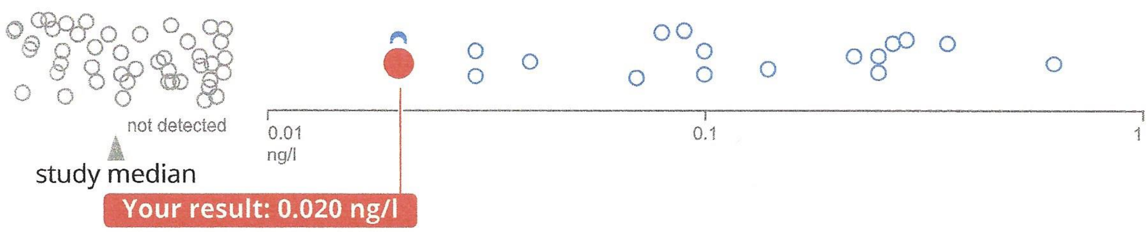
PFOA (perfluorooctanoic acid)



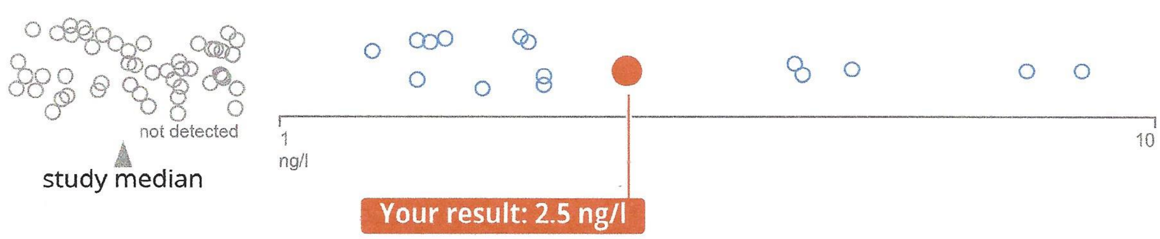
PFHxS (perfluorohexane sulfonic acid)



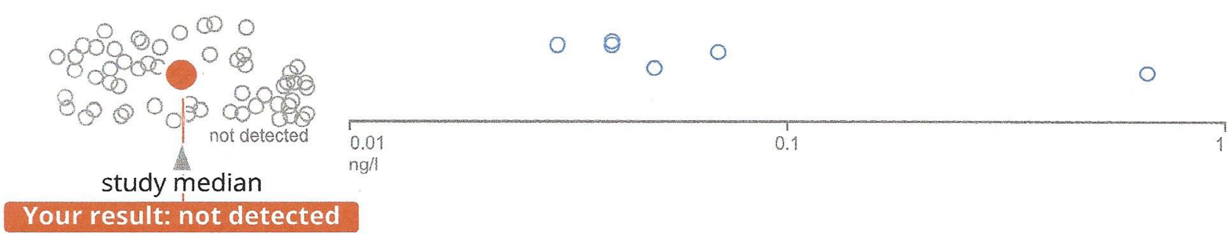
PFNA (perfluorononanoic acid)



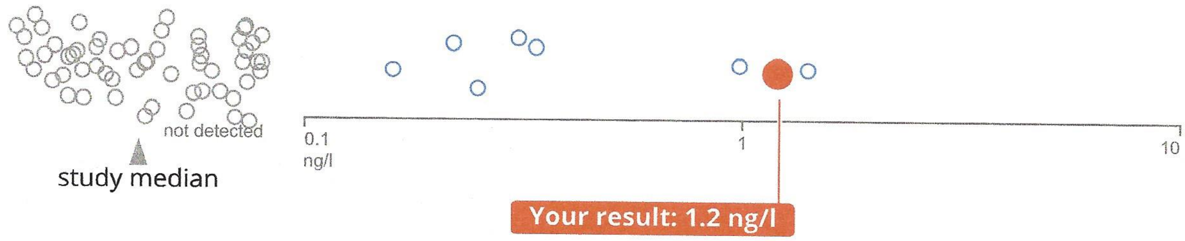
PFHpA (perfluoroheptanoic acid)



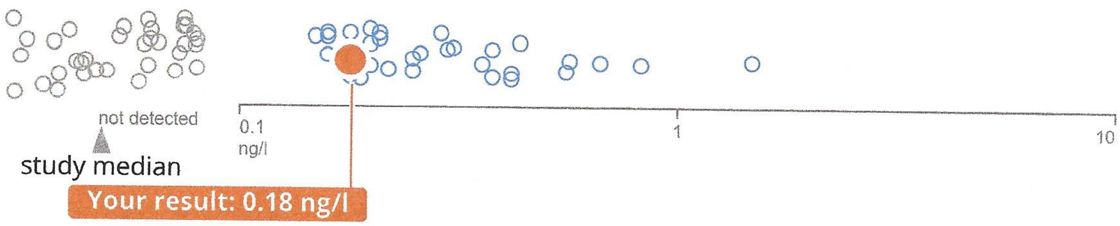
PFDA (perfluorodecanoic acid)



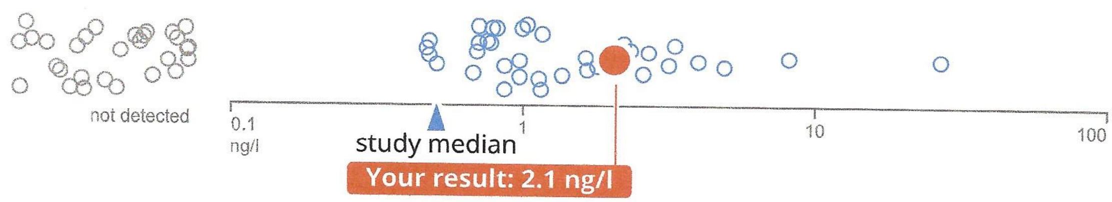
FBSA (perfluorobutane sulfonamide)



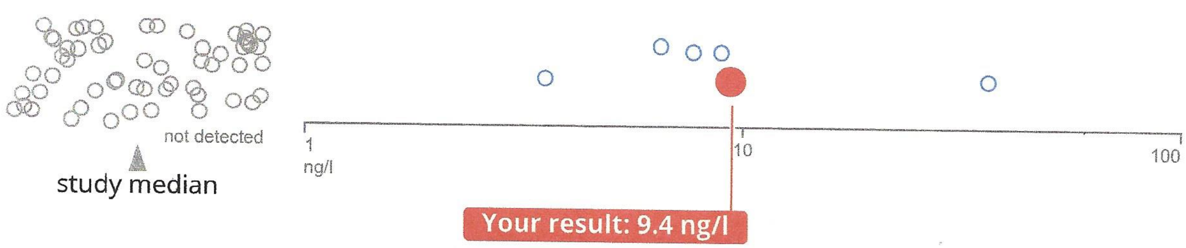
FOSA (perfluorooctane sulfonamide)



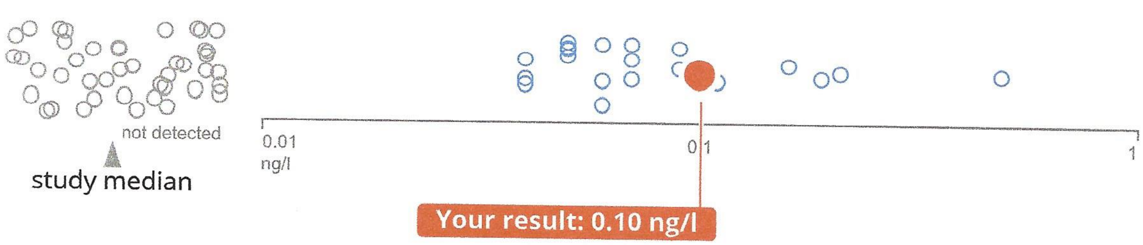
PFBA (perfluorobutanoic acid)



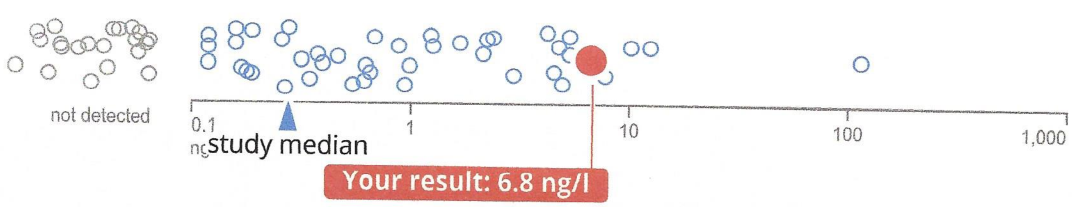
PFBS (perfluorobutane sulfonic acid)



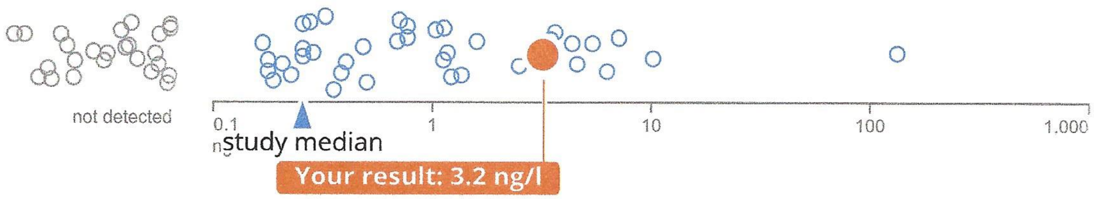
PFHpS (perfluoroheptane sulfonic acid)



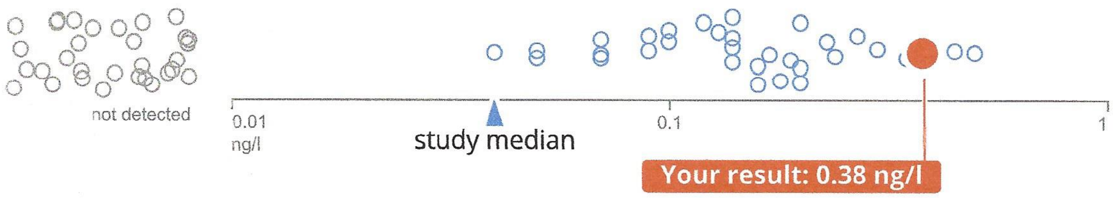
PFHxA (perfluorohexanoic acid)



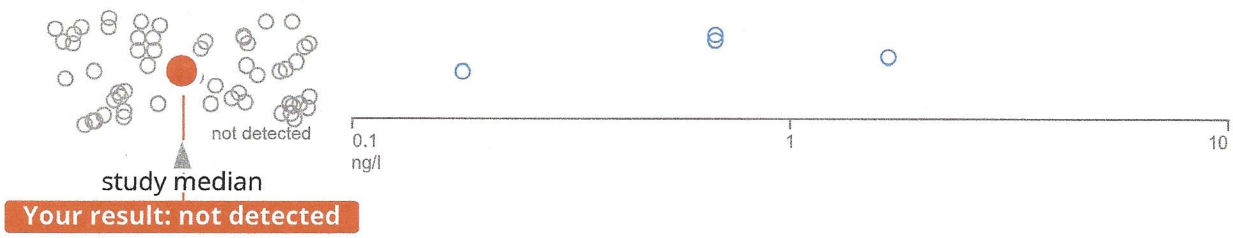
PFPeA (perfluoropentanoic acid)



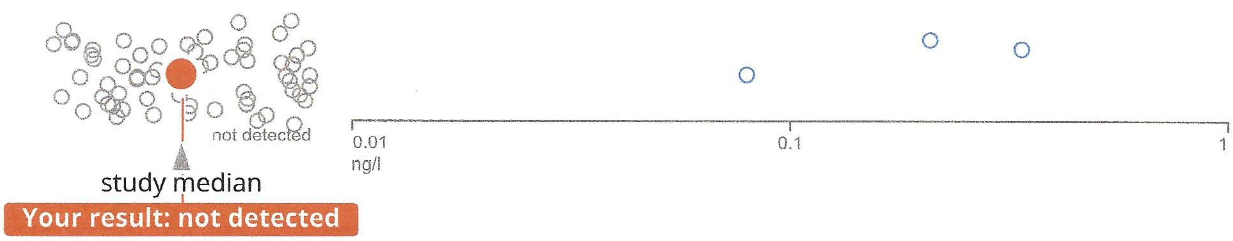
PFPeS (perfluoropentane sulfonic acid)



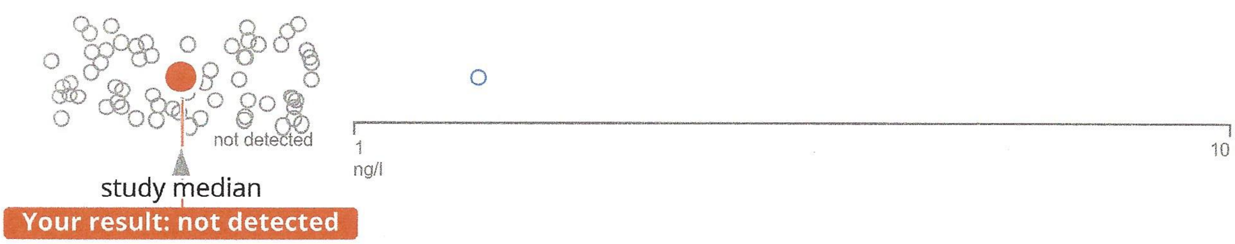
6:2 FtS (6:2 fluorotelomer sulfonic acid)



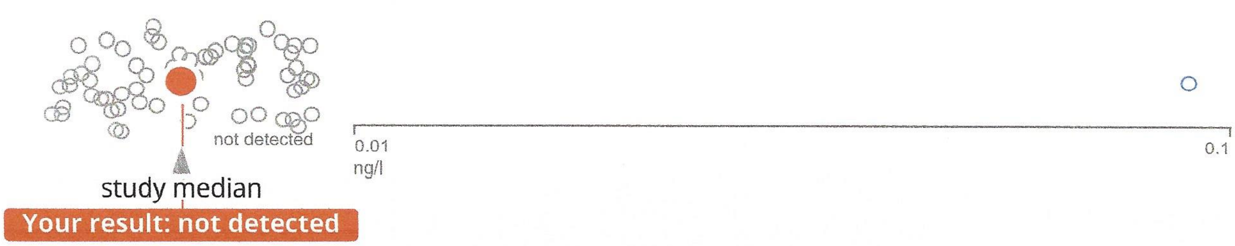
FHxSA (perfluorohexane sulfonamide)



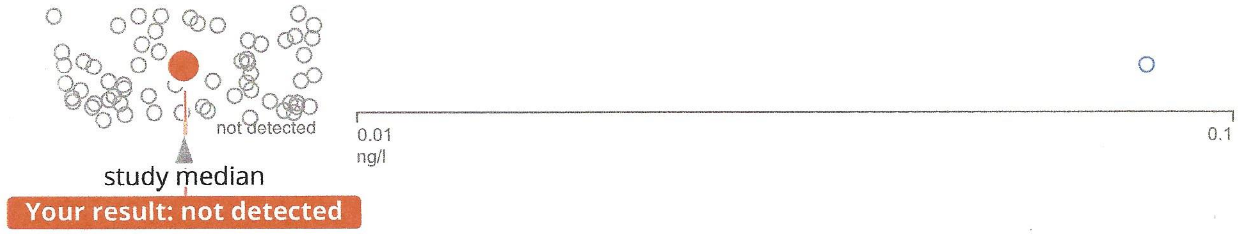
MeFBSA (1-butanesulfonamide)



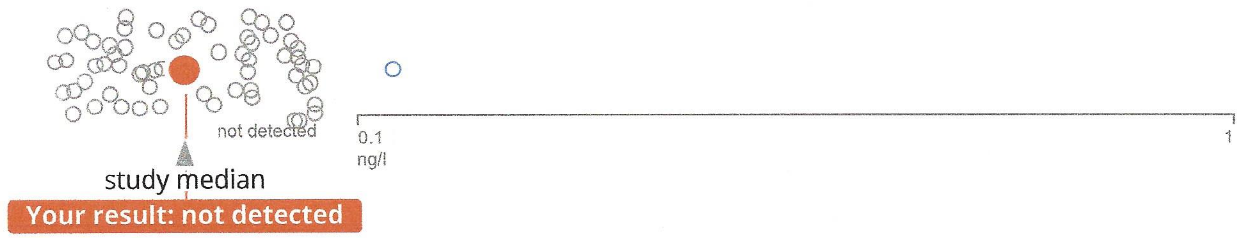
PFDoDA (perfluorododecanoic acid)



PFNS (perfluorononane sulfonic acid)



PFUnDA (perfluoroundecanoic acid)



11. Indicators of septic influence

Your sample was below but close to the federal drinking water standard for nitrate. The level of nitrate in your sample is much higher than background levelsin pristine areas on the Cape. This could be an indication of impact from septic systems, fertilizers, or other sources relatedto human activities.

Where do these chemicals come from?

On Cape Cod, septic systems are the largest source of nitrate pollution into groundwater. Other sources include fertilizers used for landscaping, animal manure, wastewater discharges from sewage treatment plants, and fossil fuel combustion.

Boron is a naturally occurring element found in rocks, soil, and seawater. Boron is also commonly used in soaps, bleaches, and detergents. Elevated boron in drinking water can come from septic systems or from saltwater intrusion.

What are the health concerns?

EPA's drinking water standard for nitrate of 10 mg/L (milligrams per liter, or parts per million) is based on studies showing that water containing nitrate concentrations above this level can cause "blue-baby syndrome" in infants who consume formula mixed with high nitrate water.

Other studies have shown health effects at nitrate levels below the EPA standard. Nitrate in drinking water has been associated with bladder cancer, thyroid cancer, colon cancer, kidney cancer, and birth defects. Some of these effects occurred in populations with drinking water above 5 mg/L.

Nitrate levels above 0.5 mg/L indicate impacts from septic systems or other human sources such as fertilizers. Prior studies by Silent Spring Institute on Cape Cod found that wells with higher levels of nitrate are also more likely to contain contaminants of emerging concern, such as PFAS, pharmaceuticals, and consumer product chemicals. Many of these contaminants of emerging concern are endocrine disruptors, meaning that they can interfere with the normal activity of hormones in the body.

EPA has set a long-term health advisory for boron of 2.0 mg/L for children based on studies showing developmental effects in young males. Levels of boron in Cape Cod drinking water are typically well below this advisory.

How can I reduce my exposure?

First, look around your well and yard to see if you can identify possible sources of the problem. For example, is there animal or compost waste near the well? Have you or close neighbors used commercial fertilizers on your lawns or gardens that might have seeped into the groundwater from heavy rains?

You can also call a professional who can check your septic system for leaks or check that your private well has been properly maintained and that the cap is on tight and the well casing is tightly sealed.

If you have elevated nitrate in your well and cannot find and fix the source, you can consider switching to an alternate water supply (bottled water or public water), drilling a new well that is deeper or in a new location, or installing a home treatment system to remove or reduce nitrate and other wastewater contaminants. Distillation, ion exchange and reverse osmosis all remove nitrate. Heating or boiling water will not remove nitrate and may actually increase the concentration in boiled water.

Your Results

Graph legend

● your chemical level

○ participants' chemical levels

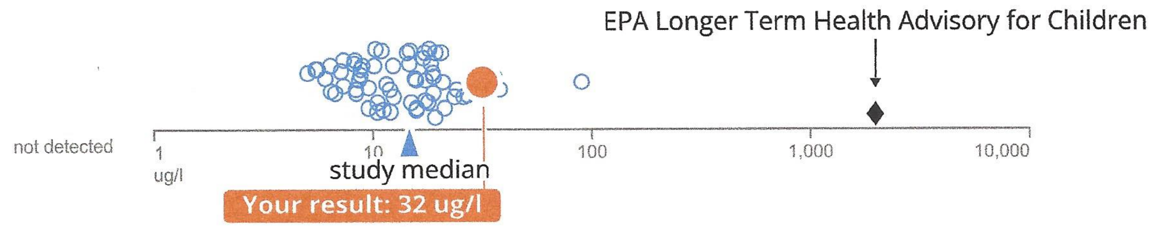
● participants for whom the chemical was not detected

▲ study median

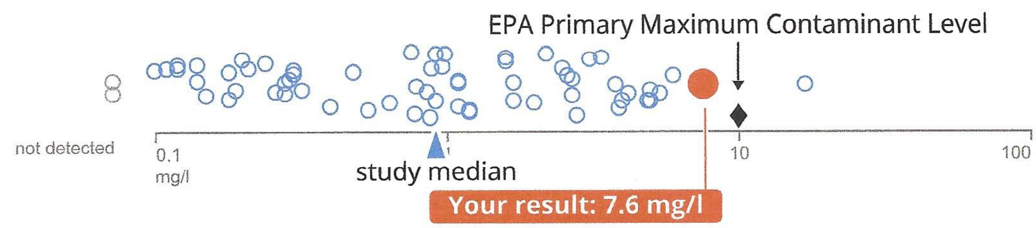
◆ state or federal drinking water guideline (when available)

Tip: Mouse over your graphs to learn how to read them.

Boron



Nitrate



12. Metals from plumbing

Your sample did not exceed the U.S. Environmental Protection Agency's Action Level for lead and copper.

Where do these chemicals come from?

Most lead and copper in well water results from corrosion (wearing away) of metal in old lead and copper pipes, lead-based solder, or brass fittings. The amount of lead and copper in water also depends on the types and amounts of minerals in the water, how long the water stays in the pipes, and how acidic the water is. Acidic water (below pH 7) corrodes lead and copper plumbing more quickly.

Homes built before 1988 are more likely to have lead pipes or solder. Older wells may have been built using lead screens. Sometimes, lead was poured into older wells to keep out sand.

What are the health concerns?

Exposure to lead from drinking water can greatly harm babies in the womb, infants, and children. Low levels of lead exposure in children have been linked with damage to the central and peripheral nervous system, behavior and learning problems, slower growth, impaired hearing, lower IQ and hyperactivity, anemia, and impaired formation and function of blood cells.

Copper is an essential nutrient, so people require trace amounts of copper in their diets for good health; however, exposure to elevated levels of copper can be harmful. High levels of copper can cause stomach and intestinal distress, liver or kidney damage, and complications of Wilson's disease in genetically predisposed people.

Children are more susceptible to copper and lead exposure because their bodies absorb copper and lead more rapidly than adults.

How can I reduce my exposure?

There are several possible solutions for reducing lead and copper in your drinking water:

- **Replace the plumbing.** The most effective treatment is to find the source and replace the plumbing with approved plastic.
- **Check and treat for corrosivity.** Groundwater on Cape Cod tends to be acidic, which can leach lead and copper from pipes and fittings. If your water's pH is less than 6.5, an acid neutralization system will make the water less corrosive and should lower the levels of lead and copper in your water.
- **Install a home water treatment system.** Treatment methods for removing copper and lead from drinking water include reverse osmosis, ultra-filtration, distillation, and ion exchange.
- **Flush the pipes.** Whenever water remains unused for more than 6 hours (such as first thing in the morning or after work), let the water run as cold as it can get for at least one minute before using. Do not use water from the hot water faucet for cooking, drinking, or making baby formula. Use cold water and heat it up on the stove.

Note: The levels in this report are representative of water from your well prior to any treatment and after running the water ("flushing the line") for 10 minutes. While flushing your pipes of standing water is good practice, it is unlikely to lower the level of lead and copper in your water below what is reported here. Neither boiling your water nor using a chlorine disinfection product will remove copper or lead.

Your Results

Graph legend

● your chemical level

○ participants' chemical levels

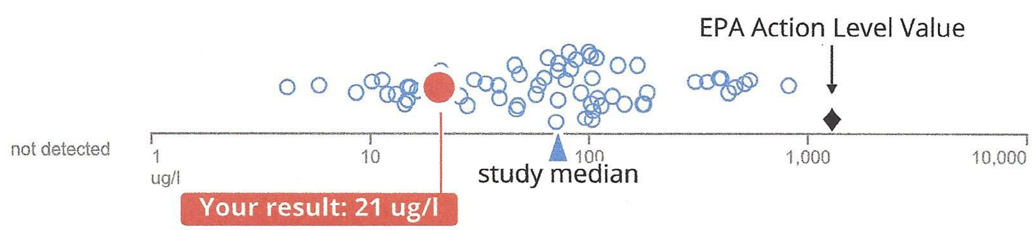
● participants for whom the chemical was not detected

▲ study median

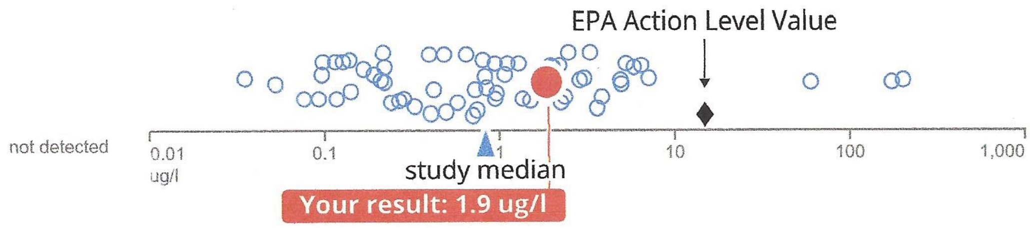
◆ state or federal drinking water guideline (when available)

Tip: Mouse over your graphs to learn how to read them.

Copper



Lead



13. Other metals

Your sample did not exceed any drinking water standard set by the U.S. Environmental Protection Agency for metals.

Where do these chemicals come from?

These elements are all naturally occurring in soils. Iron, zinc, and cadmium can also enter drinking water through corrosion of galvanized pipes. In some areas, these metals can enter the environment from human and industrial activities, such as mining and burning of coal at power plants.

What are the health concerns?

Harmful health effects related to these metals are primarily of concern when exposures are extremely high. Due to the wide range of uses for these metals, you may be exposed to them in different ways, such as on-the-job exposures.

How can I reduce my exposure?

Most of these elements can be removed through reverse osmosis, ion exchange, or distillation. Boiling your water is not effective and can increase the concentration of these metals in water.

Your Results

Graph legend

● your chemical level

○ participants' chemical levels

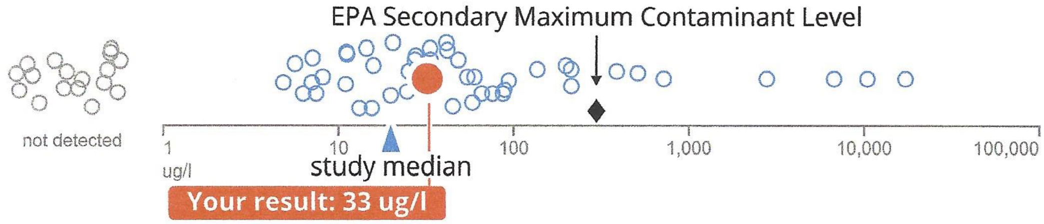
participants for whom the chemical was not detected

▲ study median

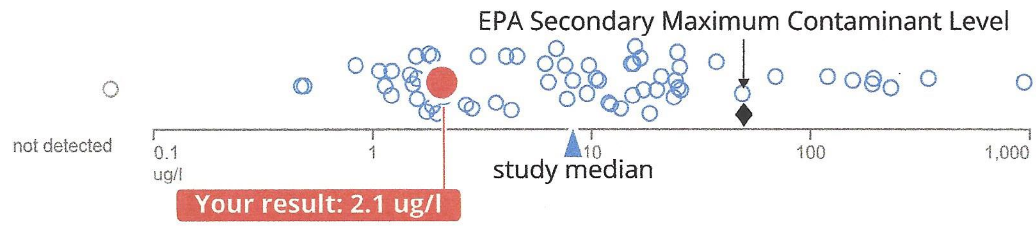
◆ state or federal drinking water guideline (when available)

Tip: Mouse over your graphs to learn how to read them.

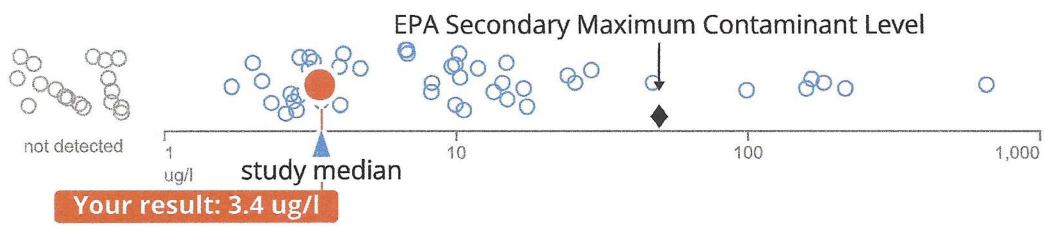
Iron



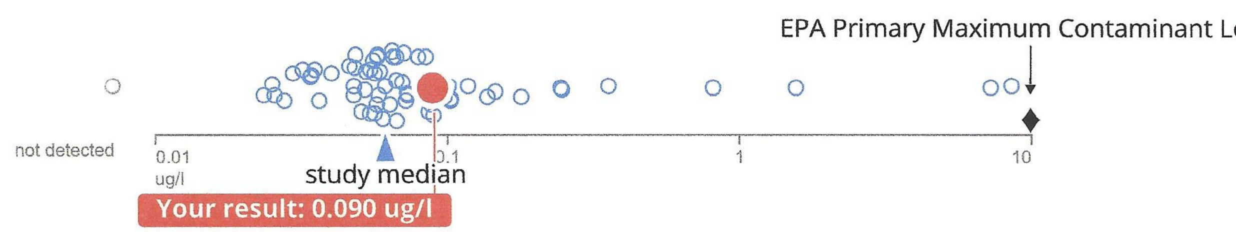
Manganese



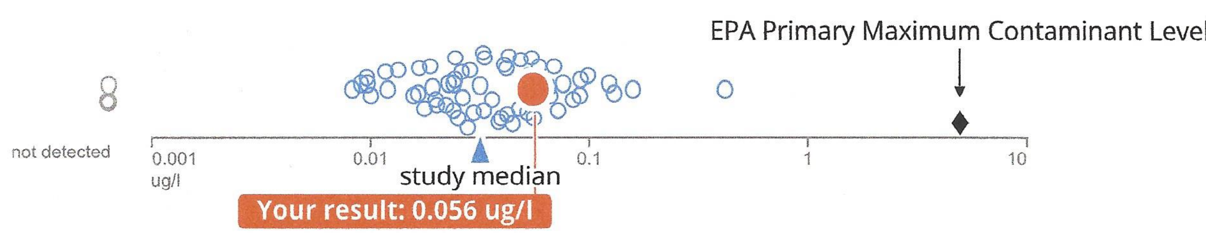
Aluminum



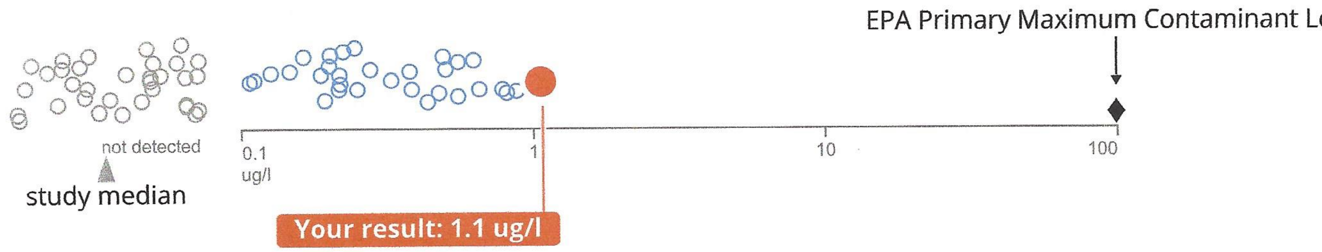
Arsenic



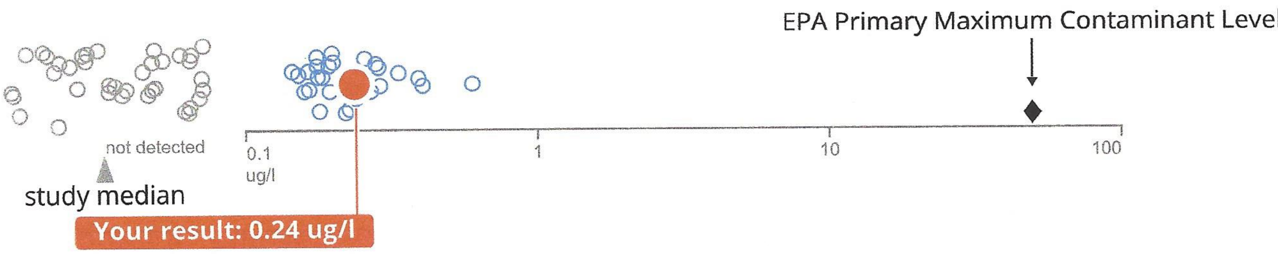
Cadmium



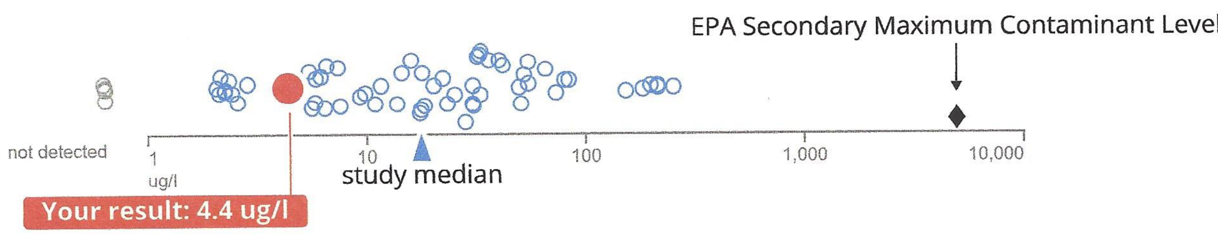
Chromium



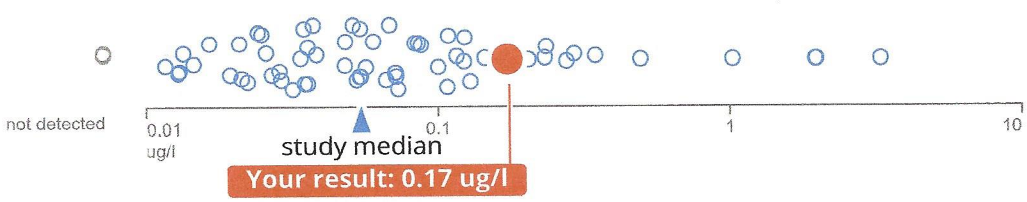
Selenium



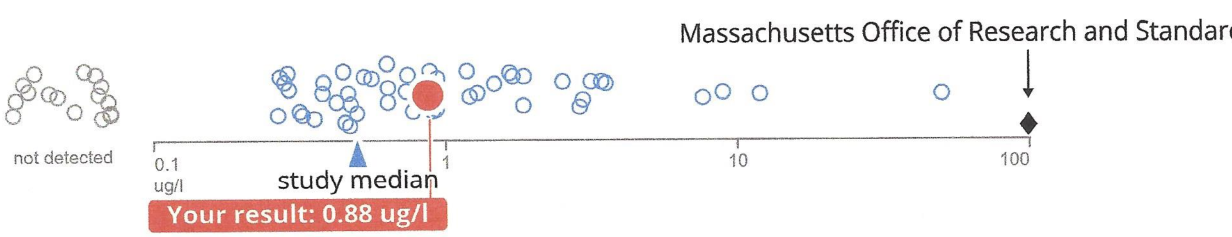
Zinc



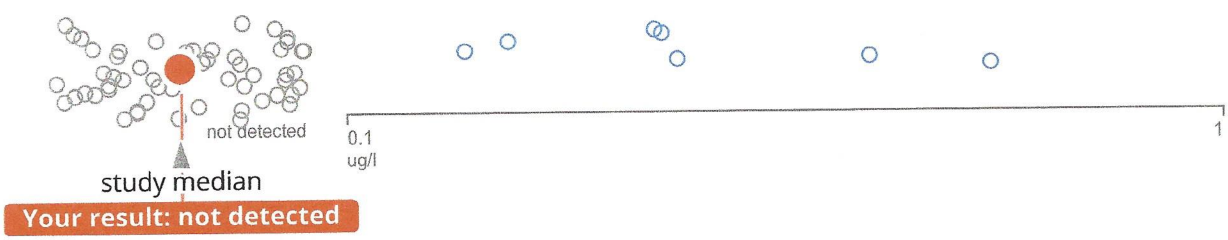
Cobalt



Nickel



Vanadium



14. Table of Your Results

Chemical	Measurement	Group
6:2 FtS (6:2 fluorotelomer sulfonic acid)	not detected in water	PFAS
FBSA (perfluorobutane sulfonamide)	1.2 ng/l in water	PFAS
FHxSA (perfluorohexane sulfonamide)	not detected in water	PFAS
FOSA (perfluorooctane sulfonamide)	0.18 ng/l in water	PFAS
MeFBSA (1-butanesulfonamide)	not detected in water	PFAS
PFAS6	8.0 ng/l in water	PFAS
PFBA (perfluorobutanoic acid)	2.1 ng/l in water	PFAS
PFBS (perfluorobutane sulfonic acid)	9.4 ng/l in water	PFAS
PFDA (perfluorodecanoic acid)	not detected in water	PFAS
PFDoDA (perfluorododecanoic acid)	not detected in water	PFAS
PFHpA (perfluoroheptanoic acid)	2.5 ng/l in water	PFAS
PFHpS (perfluoroheptane sulfonic acid)	0.10 ng/l in water	PFAS
PFHxA (perfluorohexanoic acid)	6.8 ng/l in water	PFAS
PFHxS (perfluorohexane sulfonic acid)	2.1 ng/l in water	PFAS
PFNA (perfluorononanoic acid)	0.020 ng/l in water	PFAS
PFNS (perfluorononane sulfonic acid)	not detected in water	PFAS
PFOA (perfluorooctanoic acid)	3.1 ng/l in water	PFAS
PFOS (perfluorooctane sulfonic acid)	0.36 ng/l in water	PFAS
PFPeA (perfluoropentanoic acid)	3.2 ng/l in water	PFAS
PFPeS (perfluoropentane sulfonic acid)	0.38 ng/l in water	PFAS
PFUnDA (perfluoroundecanoic acid)	not detected in water	PFAS

Boron	32 ug/l in water	Indicators of septic influence
Nitrate	7.6 mg/l in water	Indicators of septic influence
Copper	21 ug/l in water	Metals from plumbing
Lead	1.9 ug/l in water	Metals from plumbing
Aluminum	3.4 ug/l in water	Other metals
Arsenic	0.090 ug/l in water	Other metals
Cadmium	0.056 ug/l in water	Other metals
Chromium	1.1 ug/l in water	Other metals
Cobalt	0.17 ug/l in water	Other metals
Iron	33 ug/l in water	Other metals
Manganese	2.1 ug/l in water	Other metals
Nickel	0.88 ug/l in water	Other metals
Selenium	0.24 ug/l in water	Other metals
Vanadium	not detected in water	Other metals
Zinc	4.4 ug/l in water	Other metals