

PFAS Exposure Assessment Community Summary

New Castle County, Delaware near the New Castle Air National Guard Base

INFORMATION TO PROTECT OUR COMMUNITIES



The Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) conducted exposure assessments (EAs) in communities that were known to have PFAS in their drinking water and are near current or former military bases. The EAs provide information to communities about levels of PFAS in their bodies and can provide guidance to help people reduce or stop exposure. This document summarizes the exposure assessment results from in and around the City of New Castle in New Castle County, Delaware, near New Castle Air National Guard Base (the Base). The full exposure assessment report is available at <https://www.atsdr.cdc.gov/pfas/activities/assessments/sites/new-castle-county-de.html>.

Why did we select the New Castle County EA site?

When selecting EA sites, ATSDR considered the extent of PFOA and PFOS contamination in drinking water supplies, the duration over which exposure may have occurred, and the number of potentially affected residents. The New Castle County EA site was one of several sites nationwide identified with PFAS drinking water contamination from use of products such as aqueous film forming foam (AFFF).

The Base used AFFF containing PFAS for its firefighter training in the past. Over time, the PFAS from the AFFF entered the ground, moved into the groundwater to offsite locations, and affected nearby municipal wells. In 2014, two drinking water systems serving the New Castle area, Artesian Water and Municipal Services Commission (MSC) of the City of New Castle, were found to contain PFAS levels exceeding the Environmental Protection Agency's (EPA) provisional health advisory (HA). Both water systems removed contaminated wells from service and upgraded their systems to reduce PFAS exposures. Both systems mitigated PFAS exposures below the provisional HA in 2014. In 2016, one additional well in Artesian's system was found to exceed the (lower) 2016 EPA HA. Artesian took additional action to remove that well from service and reduce concentrations of PFAS in drinking water below the EPA HA. Final mitigation was achieved by MSC in August 2014 and by Artesian in July 2016.

Based on the information ATSDR has reviewed, the Artesian and MSC public drinking water supplies currently meet or are below the EPA's 2016 HA for PFAS in drinking water. At this time, ATSDR does not recommend community members who get drinking water from the Artesian and MSC public water systems use alternative sources of water.

What are PFAS?

PFAS (or "per- and polyfluoroalkyl substances") are a family of man-made chemicals that have been used in industry and consumer products since the 1950s.

The vast majority of PFAS do not occur naturally but are widespread in the environment. Most PFAS (including PFOA, PFOS, PFHxS, and PFNA) are either very resistant to breaking down themselves or degrade into other PFAS that do not degrade further. Certain PFAS will therefore remain in the environment indefinitely. Some studies have shown that PFAS exposure may harm human health.



How was the testing conducted?

ATSDR invited randomly selected households to participate in the PFAS exposure assessment. To be eligible to participate, household residents must have (1) been served by the MSC drinking water system for at least 1 year before August 5, 2014, or by the Artesian Water system at least 1 year before July 18, 2016 (these residents have the greatest likelihood of past exposures to PFAS via the drinking water supplies), (2) been greater than three years

old at the time of sample collection, and (3) not been anemic or have a bleeding disorder that would prevent giving a blood sample.

Measuring PFAS in the blood of people from randomly selected households allows us to estimate exposure from consumption of public drinking water for the entire community in the affected area, even those who were not tested.

In October 2019,
ATSDR collected samples and other information from participants.

ATSDR
analyzed
data from

214
people,
including
children



from
134
households

(203 adults and 11 children)



Everyone
completed a
questionnaire



most people provided
blood and urine samples.



The serum portion of the blood was analyzed for PFAS. ATSDR collected samples of tap water and dust from some homes.

ATSDR sent each participant their individual results in May 2020.

Key Takeaways

- Levels of some PFAS in blood (detailed below) in New Castle County EA site were as much as 9.8 times higher than national levels. Other PFAS measured in blood (PFUnA and MeFOSAA) were detected at low concentrations but could not be compared to national levels.
- Elevated blood levels may be linked with past drinking water contamination.
- Some demographic and lifestyle characteristics were linked with higher PFAS blood levels.
- All tap water samples collected during the EA in 2019 met the EPA's health advisory PFAS in drinking water.

What did we learn about PFAS levels in blood?

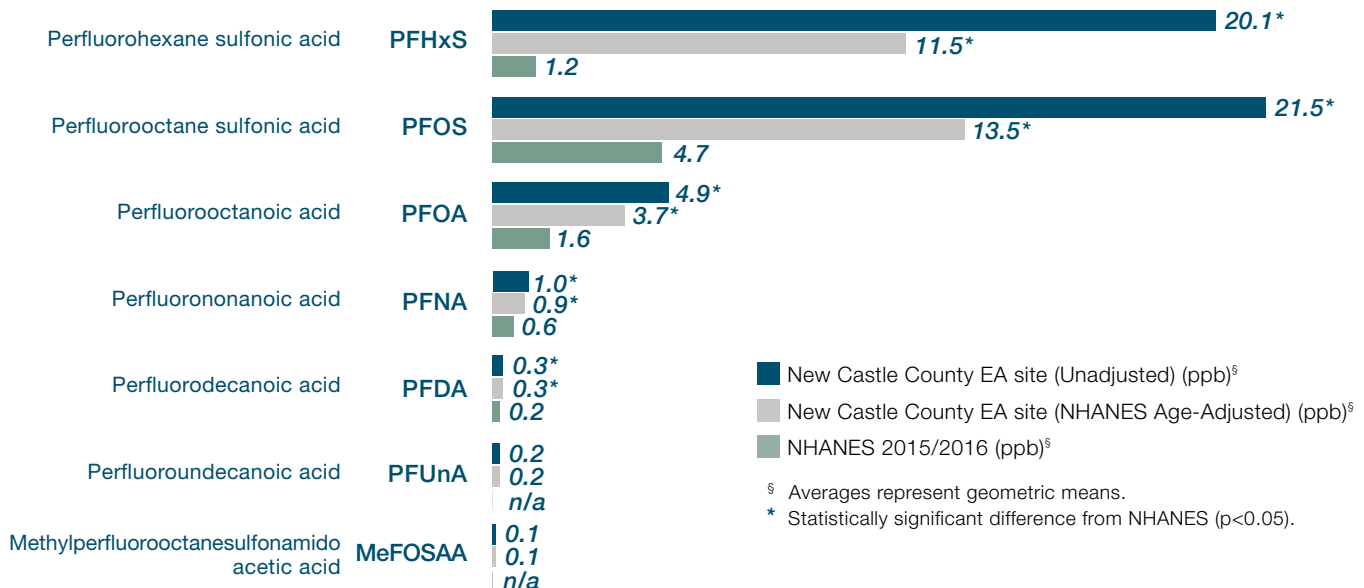
Of the seven PFAS tested at the New Castle County EA site, at least one PFAS was detected in all participants. And all 7 PFAS were detected in more than 60% of the blood samples collected: PFHxS, PFOS, PFOA, PFNA, PFDA, PFUnA, and MeFOSAA.

Since 1999, the National Health and Nutrition Examination Survey (NHANES) has measured PFAS levels in blood in the U.S. population, and PFAS levels are shown to be age dependent. In its analysis, ATSDR adjusted blood levels of EA participants at the New Castle County EA site for age to enable meaningful comparison to the NHANES dataset. After adjusting for the effects of age, PFHxS, PFOA, PFOS, PFNA and PFDA were all elevated compared to levels nationwide. Age-adjusted averages are more representative the New Castle County EA site community.



Average blood levels of 5 PFAS (PFHxS, PFOS, PFOA, PFNA, and PFDA) in New Castle County EA participants were higher than average levels nationwide.

New Castle County EA site average PFAS blood levels compared to national averages[§]





Elevated blood levels of PFHxS, PFOS, and PFOA in the New Castle County EA participants may be linked with past contamination of the drinking water systems.

Three PFAS (PFHxS, PFOS, and PFOA) were detected in the MSC system in 2009 and in the Artesian Water system in 2014. We do not know if PFAS contamination began earlier, because data are not available before 2009 for the MSC system and 2014 for the Artesian Water system.

In 2014, the MSC water supply system mitigated the contamination. The Artesian water supply system took similar action in 2014. In 2016, an additional well was

found to be contaminated above the 2016 EPA HA so final mitigation in the Artesian system was not completed until 2016. PFAS have long half-lives in the human body. Therefore, even though drinking water exposures were reduced 3 to 5 years before the collection of EA blood samples, past drinking water exposures were a likely contributing factor to the EA participants' elevated blood PFAS levels.

Generally, participants who had elevated PFHxS blood levels also had elevated PFOS and PFOA blood levels. This suggests a common source of exposure, such as the drinking water supply. Other sources of exposure were not measured but could have contributed to blood PFAS concentrations of the EA participant

Additional observations:



Adults who lived in the MSC service area had higher blood levels than those in the Artesian Water service area.

The differences in participants' PFAS blood levels between the two water systems were consistent with the historic levels of PFAS in the drinking water, i.e., higher historical PFAS levels in MSC public water.



Long-time residents have higher PFHxS, PFOS, and PFOA blood levels

(for either MSC or Artesian users).



Adults who used at least one water filter or treatment device had lower PFHxS, PFOS, and PFOA blood levels compared to those who did not

(for either MSC or Artesian users).

ATSDR used statistical models to study relationships between various demographic and lifestyle characteristics of the tested residents. The models showed that, in general:



Males had 28% higher blood levels of PFOS than females.

Adults who reported a **history of kidney disease had 56% higher PFHxS blood levels** than those who did not report kidney disease.



Adults who reported **cleaning their homes an average of 3+ times per week had 42% lower PFHxS and 34% lower PFOS blood levels** than adults who reported cleaning a few times per month or less.

What did we learn about exposure in children?



Most associations in children (<18 years) could not be evaluated because of the small number of child participants (n=11). However, blood levels of PFHxS and PFOS increased with self-reported water consumption levels at school. This finding should be interpreted with caution due to the small number of children who participated in this EA. The final report on all EA sites will include a more robust analysis of children



What did other testing find at the New Castle County EA site?



Only one PFAS (PFBA) was detected in urine; it was detected at low concentrations.



All tap water samples collected during the EA in 2019 met the EPA's HA for PFAS in drinking water.



PFAS contamination in house dust was similar to that reported in other studies (with and without PFAS contamination) and likely contributed to PFAS levels in the blood.

What do these results mean for community members?

This PFAS EA provides evidence that past exposures to PFAS in drinking water have impacted the levels of some PFAS in people's bodies. PFAS are eliminated from the body over a long period of time. This allowed ATSDR to measure PFAS even though exposures through drinking water were mitigated, or lowered, years ago.

Although not everyone exposed to PFAS through drinking water in New Castle had the opportunity to participate, by including a random selection of households, the results help estimate exposure for all community members, even those who were not tested. This means that average PFAS levels reported in this assessment may be representative of levels among community members living in the sampling frame and who meet the eligibility criteria. PFAS found in a person's blood or urine means that

exposure has occurred. The presence of PFAS in blood or urine does not tell us how, where, when, or for how long a person was exposed to PFAS. Exposure to PFAS does not mean adverse health effects will result, either now or in the future.

Although the exposure contribution from PFAS in drinking water at the New Castle County EA site has been mitigated, there are actions community members and city officials can take to further reduce exposures to PFAS and protect public health.

Based on the recent PFAS drinking water test results from Artesian Water and MSC water system, ATSDR does not recommend an alternate source of drinking water at this time.

What can community members do?



Become familiar with Consumer Confidence Reports Artesian Water, <https://www.artesianwater.com/my-bills-services/water-quality-reports>; MSC, <https://newcastlemsc.delaware.gov/consumer-confidence-reports/> for information on water quality.



Nursing mothers should continue breastfeeding. Based on current science, the benefits of breastfeeding outweigh the potential risks for infants exposed to PFAS in breast milk.



When possible, eliminate or decrease potential exposure to PFAS in consumer products such as stain-resistant products, and food packaging materials. To learn more visit: <https://www.fda.gov/food/chemical-contaminants-food/questions-and-answers-pfas-food>



Pay attention to advisories about food consumption, such as local fish advisories.



Discuss any health concerns or symptoms with your health care provider. Share results of PFAS blood testing with your health care provider and make them aware of ATSDR resources for clinicians (<https://www.atsdr.cdc.gov/pfas/resources/info-for-health-professionals.html>).

[professionals.html](https://www.atsdr.cdc.gov/pfas/resources/info-for-health-professionals.html)). Follow the advice of your health care provider and the recommendations for checkups, vaccinations, and health screening tests.



At this time, ATSDR does not have plans to conduct additional blood testing for PFAS nor recommend PFAS exposure assessment participants get individually retested for PFAS in blood.

The biological half-lives of many of the PFAS measured in people's blood are long. PFHxS, in particular, has one of the longest half-lives—some estimates range in the decades. This means that PFAS blood levels are not expected to change significantly in the near-term, even if exposure stops. Additionally, it is unclear what an individual's PFAS test results mean in terms of possible health effects. For the general population, blood tests for PFAS are most useful when they are part of a scientific investigation or a health study like the exposure assessment. Test results tell you how much of each PFAS is in your blood, but it is unclear what the results mean in terms of possible health effects. In addition, blood testing for PFAS is not a routine test offered by most doctors or health departments. If you are concerned about the effects of PFAS on your health, talk to your health care provider and make them aware of ATSDR resources for clinicians (<https://www.atsdr.cdc.gov/pfas/resources/info-for-health-professionals.html>).



Follow the advice of your child's health care provider and the recommendations for well child checkups, vaccinations, and health screening tests. Consult <https://health.gov/myhealthfinder> to help identify those vaccinations and tests.



For additional information about environmental exposures and children's health, contact the Pediatric Environmental Health Specialty Units, a nationwide network of experts in reproductive and children's environmental health (<https://www.pehsu.net/>).

What can the Artesian Water and MSC water supply systems do?



Operators of the two impacted public water systems should continue to monitor concentrations of PFAS in drinking water delivered to the community near the New Castle County EA site to ensure that concentrations of PFAS remain below the EPA's HA for PFAS in drinking water.



Results of PFAS drinking water monitoring should continue to be shared with community members (Consumer Confidence Reports for Artesian Water, <https://www.artesianwater.com/my-bills-services/water-quality-reports/>; Consumer Confidence Reports for MSC, <https://newcastlemsc.delaware.gov/consumer-confidence-reports/>).



All treatment systems to remove PFAS from the drinking water in the Artesian Water and MSC systems should be maintained appropriately to ensure that PFAS concentrations remain below the EPA's HA.

What will we do next?



ATSDR will hold a meeting to discuss the results and is available to answer questions from the community at any time.



When all of the exposure assessments are complete, we will prepare a report analyzing the data across all sites.



We are also reaching out to doctors, nurses, and other health care providers in your area to provide PFAS information. PFAS clinician guidance and continuing medical education can be found at <https://www.atsdr.cdc.gov/pfas/resources/clinical-guidance.html>.



ATSDR is conducting a Multi-site PFAS health study. The study's findings will be shared with the community once they become available.

About ATSDR

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency of the U.S. Department of Health and Human Services. <https://www.atsdr.cdc.gov/>

For More Information

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