NC STATE UNIVERSITY
Center for Human Health and the Environment

GenX Exposure Study
North Carolina State University
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https://genxstudy.ncsu.edu/

August 2025

[STREET]
[CITY, STATE, ZIP]

Dear [PARTICIPANT NAME],

Thank you for participating in the GenX Exposure Study 2024 blood collection event. We aim to understand human exposure to per- and polyfluoroalkyl substances (PFAS), including GenX, in people living in the Cape Fear River Basin, NC.

We are working in the Lower Cape Fear River Basin (Brunswick and New Hanover Counties), the private well community around the Fayetteville Works facility near Fayetteville, and Pittsboro, NC. You are part of an important health study. Your participation will help us understand the long-term health consequences of PFAS exposure.

This letter shares both your individual PFAS results and overall PFAS results for all study participants in your community. At the end, we provide strip charts for both your results and the results of your community. These samples and data were collected for research purposes only; they are not diagnostic. We are sharing your results with you so that you will know what we measured.

What did we do?

- From October through November 2024, we recontacted study participants who previously had provided a blood sample. We asked them to come to a clinic event and provide an additional blood sample.
- In total, we collected blood samples from 278 participants in the three study areas:
    - 158 people from Lower Cape Fear River Basin,
    - 62 people from the private well community around the Fayetteville Works facility, and
    - 58 people from the town of Pittsboro.
- Participants provided blood and urine samples, completed a questionnaire, and had their height, weight, and body composition measured.

- We tested blood samples for 41 PFAS in 2024. The list of all PFAS we tested for is on our website (https://bit.ly/3VsNf40). The blood samples were analyzed at Eurofins Environment Testing in Sacramento, California.

What's in this letter?

- Your *personal* PFAS blood results from the 2024 sampling event.
- Information that you can share with your healthcare provider about your PFAS results.
- Stripcharts showing your 2024 PFAS blood results compared to 2024 PFAS blood results for people in your community. You will also see the median concentration (half of the participants are above this value, half of the participants are below) of the results for each PFAS.
- While the community's results are shared with all participants in your community, your individual results are shared only with you.

What are PFAS and where did PFAS in the Cape Fear River Basin, NC, come from?

- PFAS are human-made chemicals that are resistant to heat, water, and grease. Because of this, they have been used to make a large variety of products including non-stick cookware, fast-food packaging, rain gear, stain- and water-resistant carpeting and upholstery, paint, microchips, and fire-fighting foams. PFAS last for a long time in the environment and can accumulate in plants, animals, and people.
- Sources of PFAS contamination in the Cape Fear River Basin include textile and furniture manufacturing, use of sludge from wastewater treatment plants as fertilizer, and use of fire-fighting foams at airports.
- Also, discharges into water and air from the Fayetteville Works facility near Fayetteville, NC, have contaminated the Fayetteville area and lower Cape Fear River Basin with PFAS.

What did we find in blood samples collected in 2024?

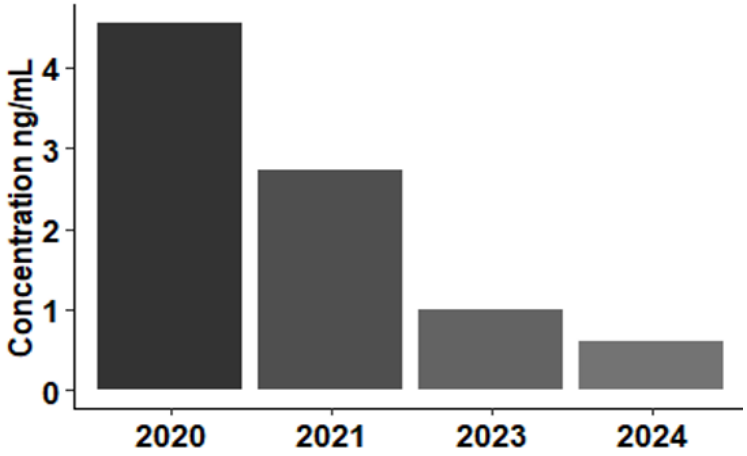
- We detected 4 PFAS (PFOS, PFOA, PFHxS, and PFNA) in almost everyone who participated no matter where they lived in the Cape Fear River Basin. These 4 PFAS are also commonly detected in people living in the United States. In this study, the concentrations in people were higher than the United States national averages.
- We detected 8 PFAS in more than half of participants across all communities (PFOS, PFOA, PFHxS, PFNA, PFDA, PFUnDA, PFHpS, and PFO5DoA).
- In 2024, we continue to detect PFO5DoA in most people (82%) in the Lower Cape Fear River Basin. We also measured it in some people (23%) in the Fayetteville private well community.

- We detected Nafion byproduct 2 in about a third of people in the lower Cape Fear River Basin (35%) and in some people in the Fayetteville area (13%). No one in Pittsboro had Nafion byproduct 2 in their results.
- At the end of this letter (pages 9-12) are strip charts for each PFAS measured for your community in 2024, with your individual results noted on the charts.

How have levels changed over time?
Since our initial blood collection, PFAS exposure through drinking water has been reduced through a combination of interventions, including treatment of public water, home filters, and bottled water. We can see the impact this has made in the PFAS blood measurements for samples collected in 2020, 2021, 2023, and 2024.

● On a community level, the blood levels of all PFAS were lower in 2024 than they were in previously sampled years.

● Blood levels of PFO5DoA and Nafion byproduct 2, two Chemours Fayetteville Works-related chemicals, continue to come down in people from the lower Cape Fear River Basin. As seen in the figure, the median PFO5DoA blood levels decreased from 4.5 ng/mL in 2020 to <1 ng/mL in 2024. Similar changes were seen for Nafion byproduct 2, but the overall levels were much lower.



Changes in Median PFO5DoA levels in blood from 2020 to 2024 in people from the Lower Cape Fear River Basin

● Although most people's PFAS levels went down, some individuals did have some PFAS levels increase from their last visit. This may be due to ongoing exposures to PFAS or biological factors that affect PFAS levels in blood. We are working to understand why this is happening.

What are the potential health effects?
In July 2022, the National Academies of Sciences, Engineering and Medicine (NASEM) reviewed the scientific literature on human health effects of PFAS. The committee determined that PFAS exposure is possibly associated with:

- elevated cholesterol,
- reduced immune response to vaccines,
- increased risk of breast, testicular, and kidney cancers,
- thyroid disruption,
- altered liver enzymes,
- increased risk of ulcerative colitis,
- decreased infant and fetal growth, and
- pregnancy-induced hypertension

Other health effects are possible but lacked sufficient evidence at the time of review. Based on this literature review, the NASEM published recommendations for medical monitoring of PFAS-exposed people based on the total (sum) concentration of 7 specific PFAS in blood: PFOS, PFOA, PFHxS, PFNA, PFDA, PFUnDA and MeFOSAA (see table on pg 7).
People with less than 2 ng/mL were not expected to have health effects related to PFAS exposure while those with more than 20 ng/mL serum PFAS were expected to have a higher risk. The NASEM report is available online (bit.ly/PFAS-guidance). A summary of the guidance is included here.

These guidelines do not consider exposure to other PFAS, such as PFO5DoA.
Your individual NASEM recommendation is included in this letter.

How do study participants compare?

- In the 2024 round of GenX Exposure Study testing, 97% of the participants had more than 2 ng/mL of these PFAS in their blood, suggesting that almost everyone should follow the NASEM guidance for medical follow up.
- 12% of people in our study in 2024 had levels higher than more than 20 ng/mL.

How can you reduce your PFAS exposure?
The PFAS in your blood tells you about the PFAS that you are currently exposed to and what you were exposed to in the past. Many people in the Cape Fear River Basin have been exposed to PFAS through contaminated drinking water. You may also be exposed to PFAS through food, consumer products, and workplace use of PFAS.

Recently, municipal water suppliers have worked to remove PFAS from drinking water. The Sweeney Water Treatment plant of the Cape Fear Public Utility Authority (CFPUA) in New Hanover County, H2Go which serves some of Brunswick County, and the Town of Pittsboro have installed treatment technologies to remove PFAS from drinking water sources. Brunswick County Utilities' filtration technology is set to be completed in 2025.

If you use well water, you may want to have your water tested for PFAS and, if PFAS are detected, install filtration at your sink to reduce PFAS exposure. Private well owners in the Fayetteville area may be eligible for water testing and remediation (https://bit.ly/DEQGenX).

To learn what more you can do to reduce PFAS exposure, please visit this website (atsdr.cdc.gov/pfas/prevent-exposure/index.html). You can also contact our community partners:

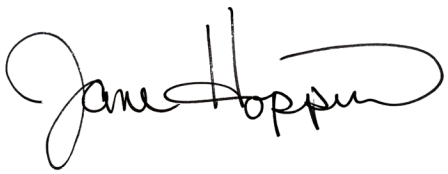
- Cape Fear River Watch for Lower Cape Fear River Basin (https://capefearriverwatch.org/; phone: **910-762-5606**),
- Sustainable Sandhills for private well community (https://sustainablesandhills.org/; phone: **910-484-9098**), and
- Haw River Assembly for Pittsboro (https://hawriver.org; phone: **910-542-5790**).

What's next?

- Please check our study website (https://genxstudy.ncsu.edu) or the NC State Superfund website (superfund.ncsu.edu) for more information on the study and upcoming events.
- If you have questions about these results, the GenX Exposure Study, or the NASEM recommendations, please contact our study office by phone **(855-854-2641)** or email (genx-exposure-study@ncsu.edu).

Once again, we thank you for your participation in the GenX Exposure Study.

Sincerely,



Jane Hoppin, ScD
GenX Exposure Study, Principal Investigator

Clinical Guidance for PFAS Exposed People

In July 2022, the National Academies of Sciences, Engineering, and Medicine (NASEM) published recommendations for medical monitoring based on the total (sum) concentration of seven specific PFAS in blood.

Below, the table on the left shows the levels of seven key PFAS we measured in your blood sample from 2024, and the sum of these seven PFAS. On the right, the current NASEM recommendations are provided — the clinical recommendations based on the sum of the seven PFAS in **your** sample are shaded with a bold box around them.

PFAS Chemical	Your 2024 Blood result (ng/mL)
PFOS	11
PFOA	4
PFHxS	3.1
PFNA	1.5
PFDA	0.92
MeFOSAA	0.05
PFUnDA	0.39
Your Sum (total)	**20.96**

2022 Guidance on PFAS from the National Academies of Sciences, Engineering, and Medicine

Sum PFAS More Than 20 ng/mL

Associated with higher risk of adverse effects. You should…

- Reduce PFAS exposure
- Speak with your medical provider and ask them to check cholesterol levels, hypertensive disorders of pregnancy, breast cancer, thyroid function, kidney and testicular cancer, and ulcerative colitis, as per NASEM guidance.

Sum PFAS Between 2 and 20 ng/mL

Associated with potential for adverse effects in sensitive populations. You should…

- Reduce PFAS exposure
- Speak with your medical provider and ask them to check cholesterol levels, hypertensive disorders of pregnancy, and breast cancer, as per NASEM guidance.

Sum PFAS Less Than 2 ng/mL

Health effects not expected at this time. You should…

- Maintain usual medical care.

What can you do with this information? You can discuss these PFAS blood results and the NASEM recommendations with your clinician to decide if you would benefit from specific medical tests.

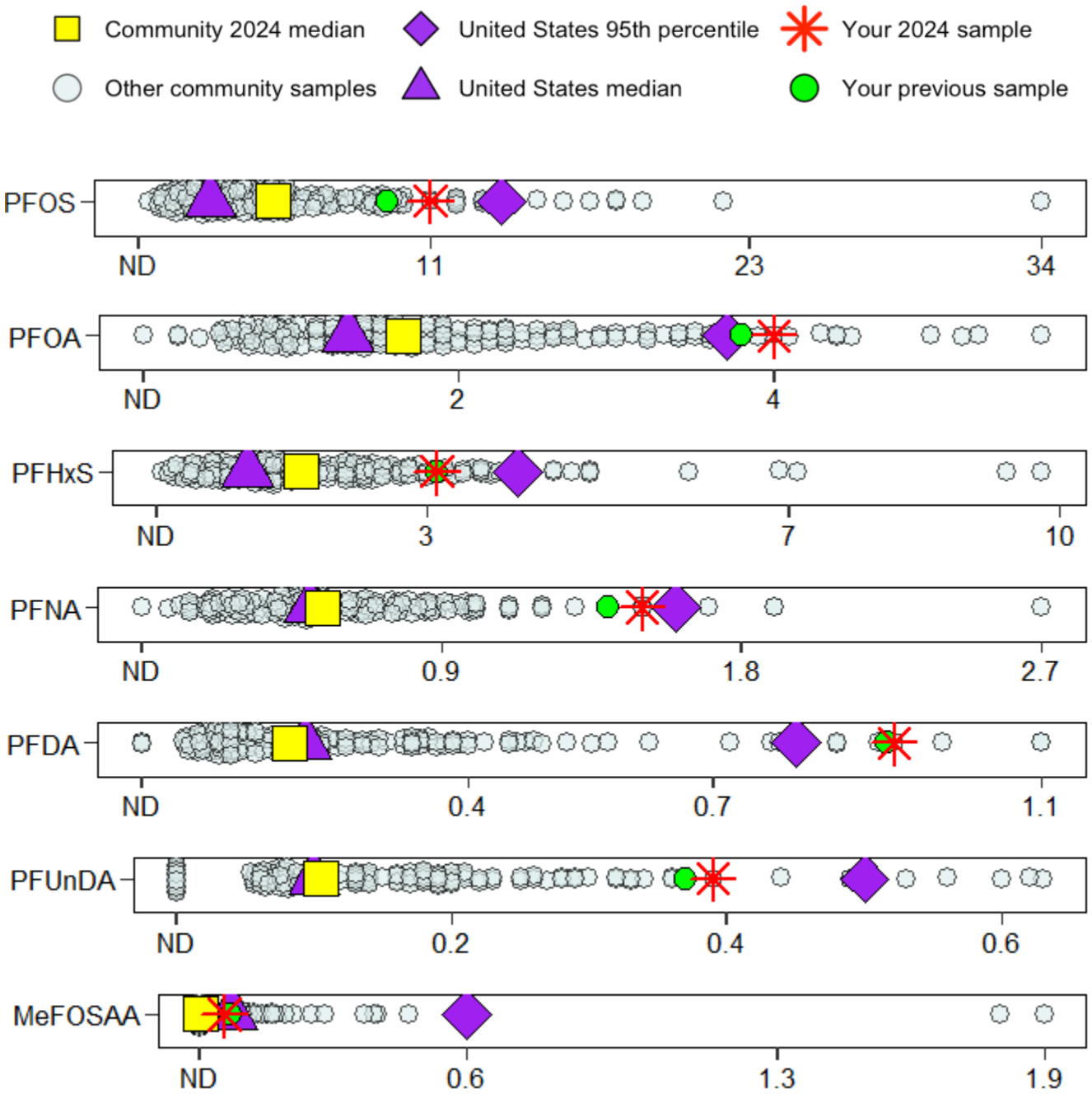
If your clinician has questions about PFAS, they can refer to the NASEM report (bit.ly/PFAS-guidance) or to a memo from the North Carolina Department of Health and Human Services (bit.ly/DHHSMemo). If you would like use to email you a copy of the NASEM report, please contact our study office. These recommendations do not mean that insurance will pay for any additional PFAS or clinical testing at this time.

If you are underinsured or noninsured and are seeking primary care services, please contact one of the following resources.

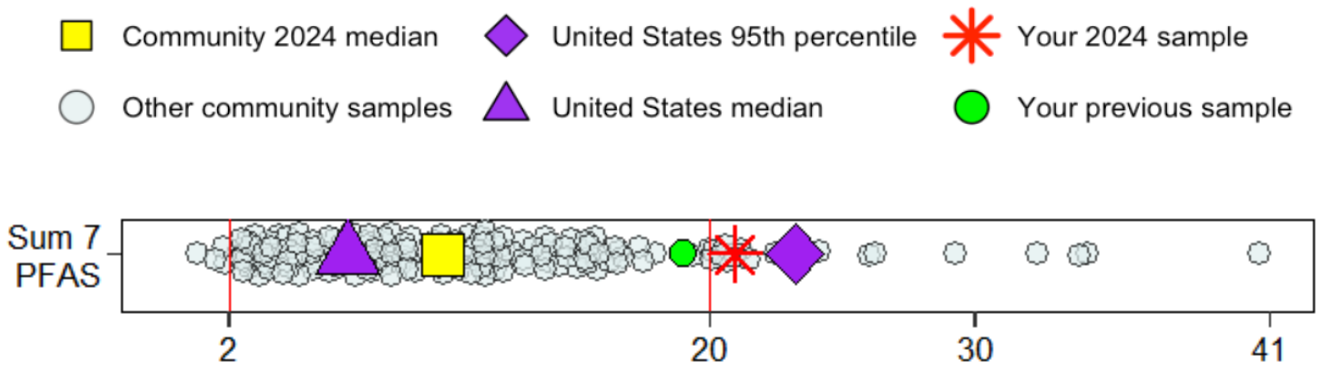
- For Lower Cape Fear River Basin Region, NC (Wilmington area), contact Cape Fear Health Net (Phone: 910-399-2751; http://www.capefearhealthnet.org/getting-care/). Note that Novant outpatient clinics have assistance places for low-income and uninsured people.
- For Fayetteville area, NC, contact Stedman-Wade Health Services, Inc., 7118 Main St. Wade, NC, 28395 (Phone: 910-483-6694)
- For Pittsboro, NC, contact Siler City Community Health Center, 224 S 10th Ave., Siler City, NC, 27344 (Phone: 919-663-1744) *OR* Moncure Community Health Center, 7228 Moncure-Pittsboro Road, Moncure, NC, 27559 (Phone: 919-542-4991).

What about other PFAS besides these seven? The 2022 NASEM recommendations are based on the sum of these seven PFAS in blood. These seven PFAS have been monitored in Americans by the Centers for Disease Control and Prevention for the past 20 years. Health screening recommendations for people exposed to PFAS may change as scientists learn more about the health effects of PFAS. Please see page 14 for your other PFAS results, including PFAS that are not in this list of seven specific PFAS in the Current NASEM recommendations.

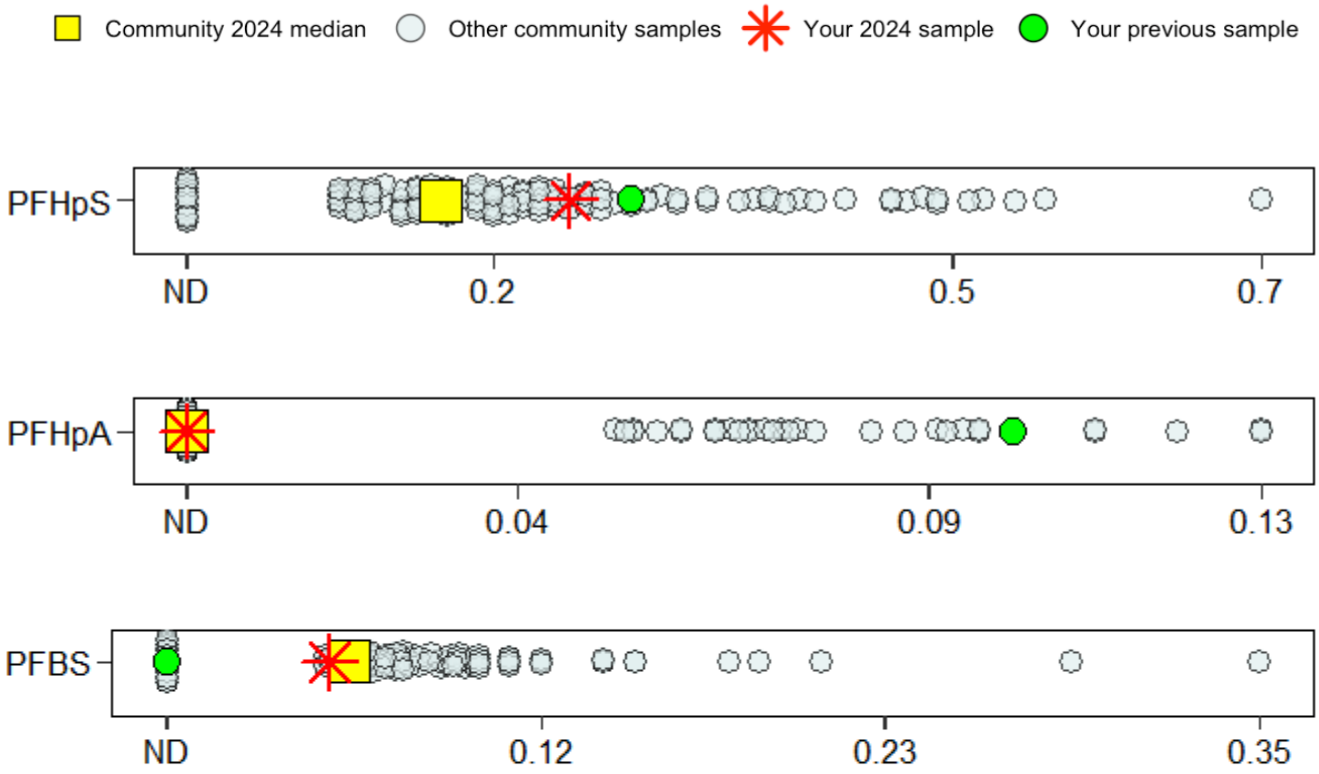
Below are the results for the sample you provided in 2024. Each strip chart shows results for all 158 people who lived in the Lower Cape Fear River Basin, North Carolina, and provided a blood sample in 2024. For PFAS measured by the Centers for Disease Control and Prevention (CDC) in 2017-2020, we show the median and 95th percentile for United States residents. These values show you how your 2024 sample (red star) compares with your previous sample if you had one (green circle) and the average United States resident (purple triangle) and someone who has a blood level higher than 95% of US residents (purple diamond). **All concentrations are nanograms PFAS per milliliter of blood (ng/mL). "ND" means not detected.**



The National Academies of Sciences, Engineering, and Medicine recently published guidelines for PFAS blood levels based on the summed blood concentration of 7 PFAS (PFOS + PFOA + PFHxS + PFNA + PFDA + PFUnDA + MeFOSAA). **The strip chart below shows your blood's sum for these 7 PFAS in your sample from 2024 and the sums for samples from all 158 people in the Lower Cape Fear River Basin, North Carolina, in 2024.** You can also see how your 2024 sample (red star) compares with your previous sample if you had one (green circle) and the average United States resident (purple triangle) and someone who has a blood level higher than 95% of US residents (purple diamond). **The concentrations are nanograms summed PFAS per milliliters of blood (ng/mL). "ND" means not detected.**



The strip charts below are for other PFAS frequently detected in the Lower Cape Fear River Basin, North Carolina, in 2024. The United States median and 95th percentile are not shown on these strip charts because CDC did not test for these PFAS in blood samples collected 2017-2018. You can compare your 2024 sample (red star) to your previous sample if you had one (green circle) and to others in your community. **All concentrations are nanograms PFAS per milliliter of blood (ng/mL). "ND" means not detected.**



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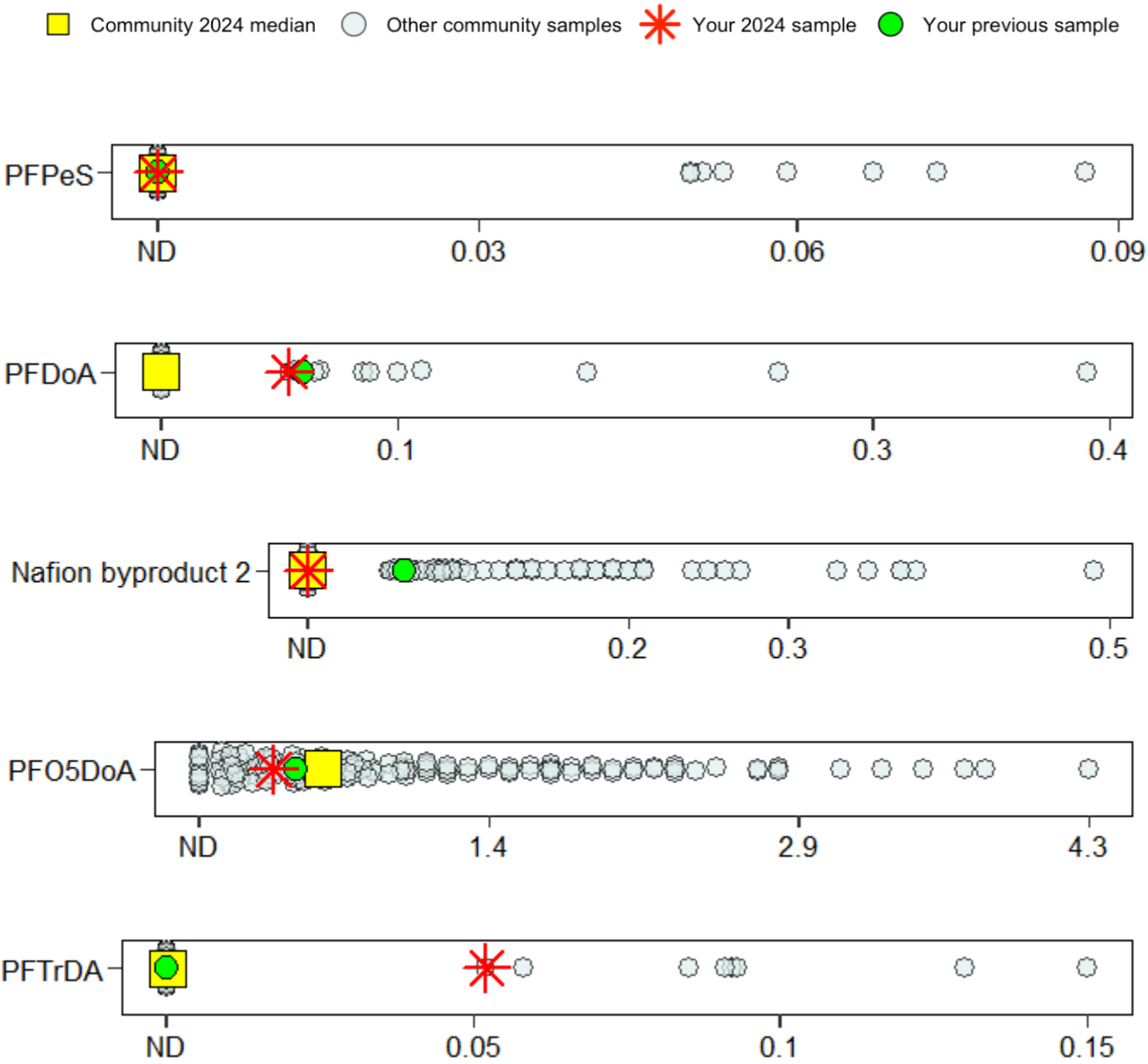

On the next page are your *new* PFAS results for the blood sample you provided in 2024, and your *previous* PFAS results from your last visit.

All concentrations are given as nanograms of PFAS per milliliter of blood (ng/mL).
The laboratory's Method Reporting Limit (MRL) is the lowest concentration of PFAS the laboratory could test for in blood samples. The 2024 MRLs for each chemical are shown to the right of that chemical.

- If your result is listed as "**<MRL**" that means this PFAS was not detected in your blood above the MRL. You may still have this PFAS in your body, but it may be lower than the laboratory can measure.
- IF your result is listed as "**–**" that means we do not have data for you on this PFAS. If 2023 was your first time participating in the GenX Exposure Study, you will not have any results available for previous years.

Samples collected in 2020-2021 were analyzed at NC State University in Raleigh, NC. Samples collected in 2023 and 2024 were analyzed at Eurofins Environment Testing in Sacramento, California. For more information on the PFAS we test for please visit our website: http://genxstudy.ncsu.edu/faq.

See next page for your personal PFAS results

Your Personal PFAS Results

Your new result is from 2024. Your previous result is from 2023.

pfas	Your *Previous* Blood Result (ng/mL)	Your *New 2024* Blood Result (ng/mL)	*2024* Laboratory MRL (ng/mL)
PFOS	9.40	11	0.05
PFOA	3.80	4	0.14
PFHxS	3.10	3.1	0.05
PFNA	1.40	1.5	0.05
PFDA	0.91	0.92	0.05
MeFOSAA	0.07	0.05	0.05
PFUnDA	0.37	0.39	0.05
PFHpS	0.29	0.25	0.10
PFPeS	<MRL	<MRL	0.05
Nafion byproduct 2	0.06	<MRL	0.05
PFO5DoA	0.47	0.36	0.10
PFHpA	0.10	<MRL	0.05
PFDoA	0.06	0.05	0.05
PFDS	<MRL	<MRL	0.05
PFTrDA	<MRL	0.05	0.05
PFBS	<MRL	0.05	0.05
7:3 FTCA	<MRL	<MRL	0.05
4:2 FTS	<MRL	<MRL	0.05
NEtFOSAA	<MRL	<MRL	0.05
F53B Major (9Cl-PF3ONS)	<MRL	<MRL	0.05
PFHxA	<MRL	<MRL	0.10
PFO4DA	<MRL	<MRL	2.00
PFTeDA	<MRL	<MRL	0.05
8:2 FTS	<MRL	<MRL	0.05
PFBA	0.11	0.61	0.20

"< MRL" means your result for this PFAS was below the laboratory's method reporting limit (MRL) for that year. The MRL is the lowest concentration of that PFAS the laboratory could test for in blood samples.

"—" means there is no available data for you for this PFAS that year.