

GenX Exposure Study

PFAS results for blood samples collected 2020-2021

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Plan for today

Summarize PFAS results for blood samples collected 2020-2021

Share adjusted PFO5DoA results for blood samples collected 2017-2018

Discuss recent health recommendations for PFAS-exposed people

“PFAS” stands for per- and polyfluoroalkyl substances

Human-made chemicals with carbon-fluorine bonds

Resistant to heat, water, grease

Commercial production of PFAS began in 1940s

By 1950s, several products with PFAS available (e.g., Scotchgard™)

Today, there are thousands of different PFAS

Used in consumer products, industrial processes, fire-fighting foams

Where did PFAS in the Cape Fear River Basin, NC, come from?

Releases from textile and furniture manufacturers

Sludge from wastewater treatment plants used as fertilizer

Use of fire-fighting foams at airports

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Air and wastewater releases from Fayetteville Works facility near Fayetteville, NC

GenX, Nafion byproduct 2, and several other PFAS

Wastewater discharges to Cape Fear River →



What is the GenX Exposure Study?

Aims to answer community members' questions

What PFAS are in people?

What PFAS are in the environment?

How long do these PFAS stay in people's bodies?

Not just about GenX

Started in Wilmington, NC, in 2017-2018

What we learned in Wilmington, NC, 2017-2018

Three PFAS from Fayetteville Works found in blood of almost everyone

Nafion byproduct 2

PFO4DA

PFO5DoA

GenX was not found in blood

Higher blood levels of PFOS, PFOA, PFHxS, and PFNA in Wilmington than the average American

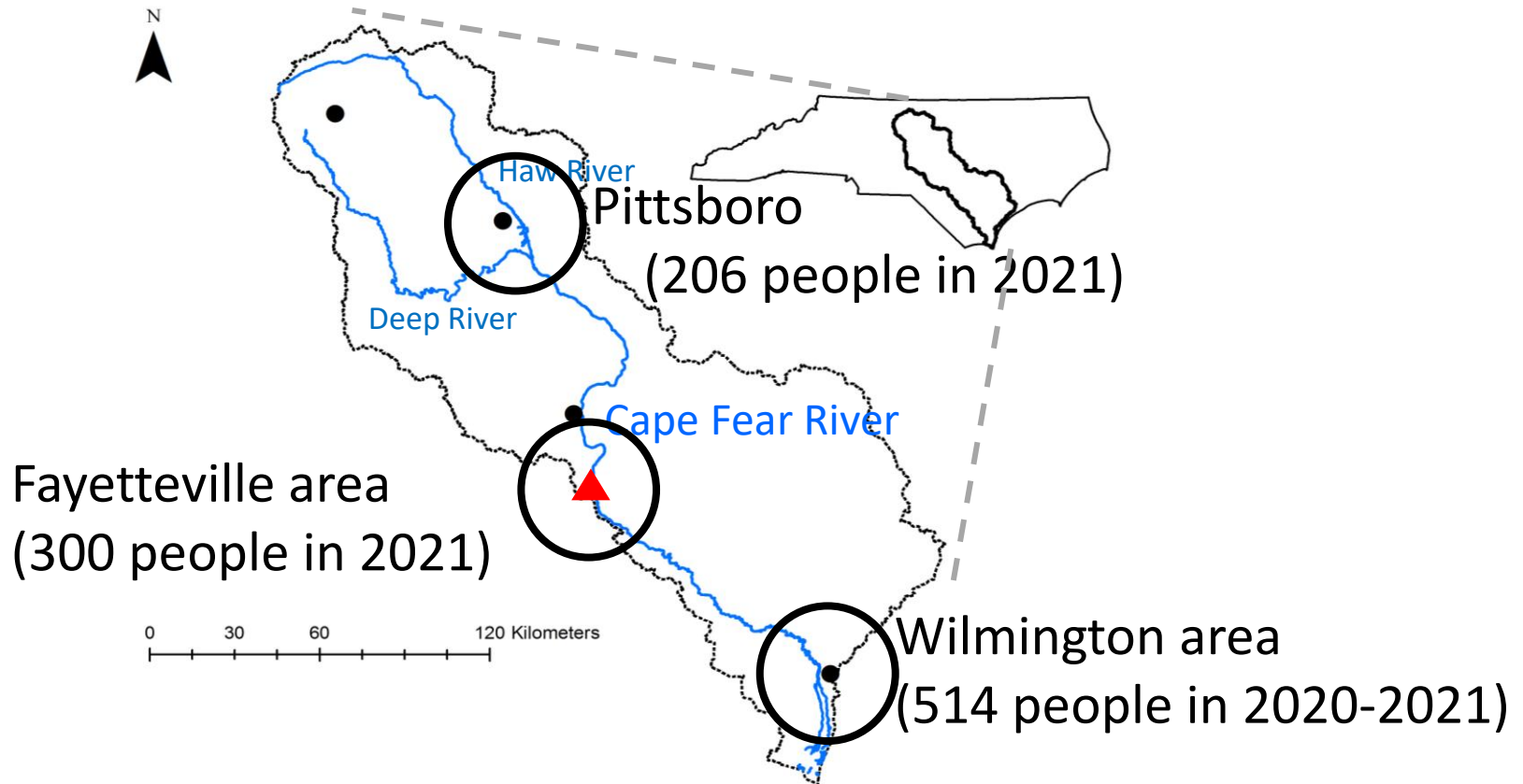
What did we do in 2020-2021?

Collected **blood** from **1,020 people** across **3 communities**



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What did we do in 2020-2021?

Tested blood samples for 44 PFAS

We will focus on these 10 PFAS today

1. Nafion byproduct 2
2. PFO5DoA
3. PFO4DA
4. PFOS
5. PFOA
6. PFHxS
7. PFNA
8. PFDA
9. PFUnDA
10. MeFOSAA

Blood PFAS Results from 2020-2021

Key Findings

1. Found Nafion byproduct 2 and PFO5DoA in most people in Wilmington area; PFO4DA in some people

Detection frequency and levels going down over time

2. Did not find GenX in any blood samples
3. Found 4 PFAS (PFOS, PFOA, PFHxS, and PFNA) in almost everyone
4. Higher levels in Wilmington area than United States averages

Many people exceed health guidelines

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1) Three PFAS from Fayetteville Works still found in blood samples, 2020-2021

Nafion byproduct 2

Found in 422 out of 514 people (82%)

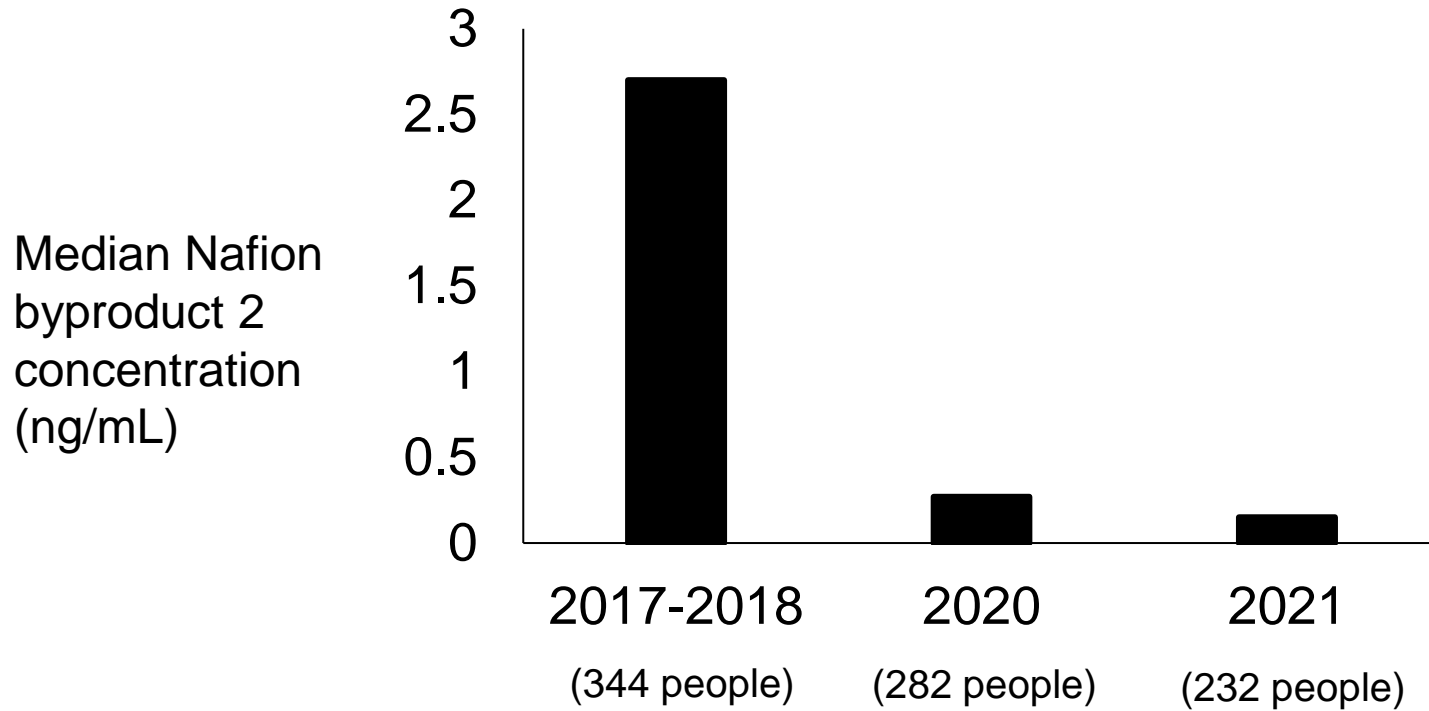
PFO5DoA

Found in 433 out of 514 people (84%)

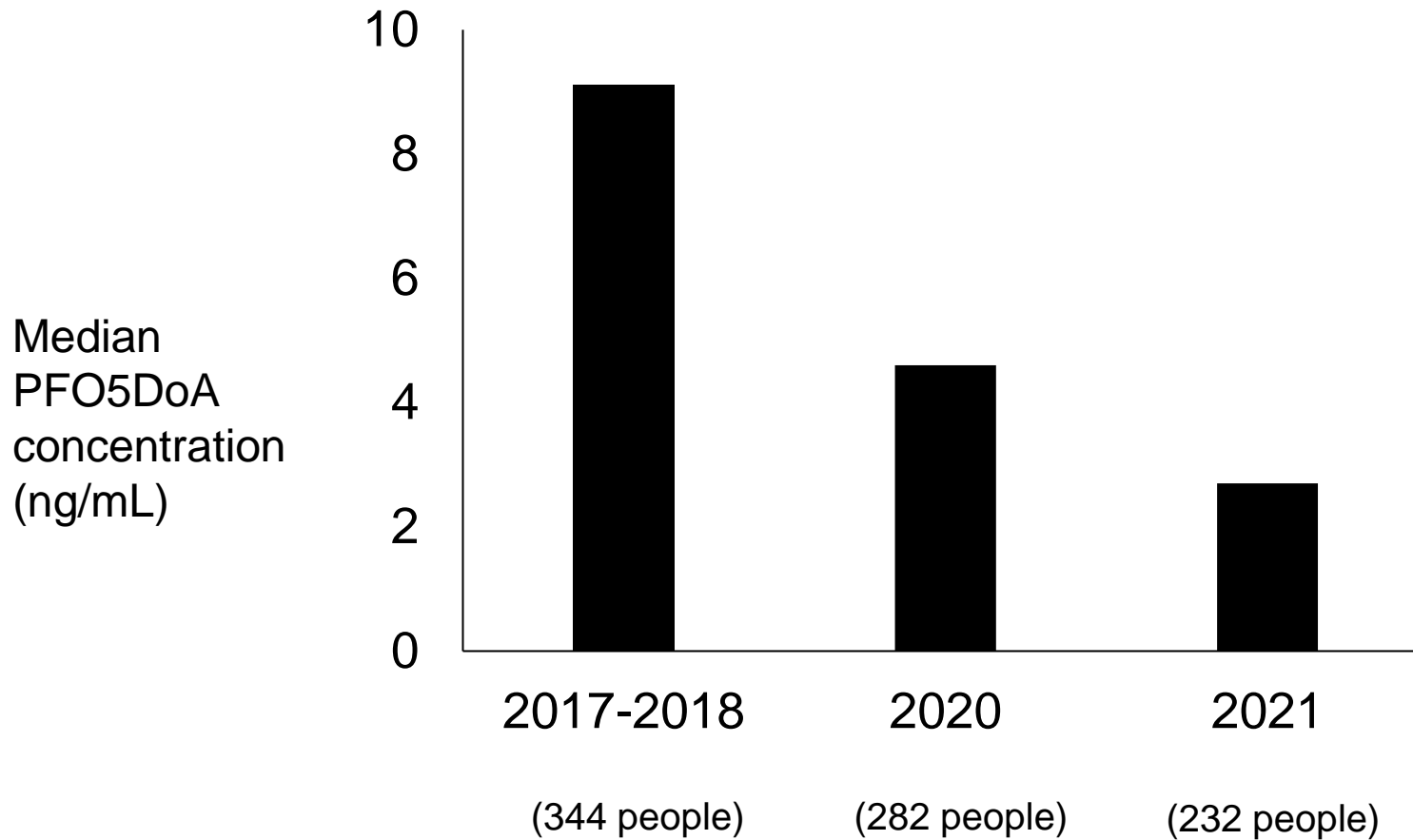
PFO4DA

Found in 39 of 514 people (7.5%)

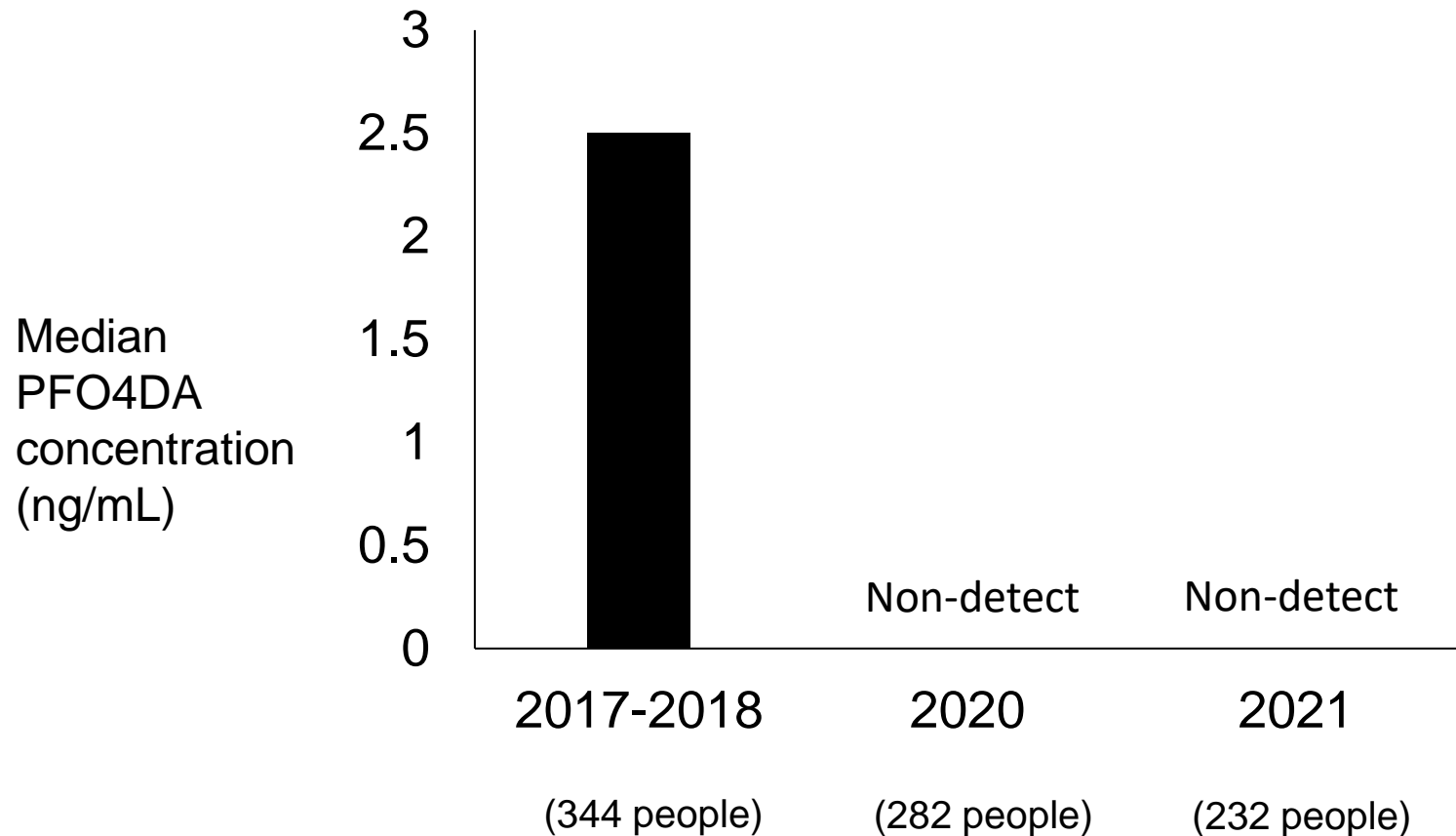
Blood levels of Nafion byproduct 2 in Wilmington area over time



Blood levels of PFO5DoA in Wilmington area over time



Blood levels of PFO4DA in Wilmington area over time



2) Was GenX found in blood?

No, GenX was not found in any blood samples

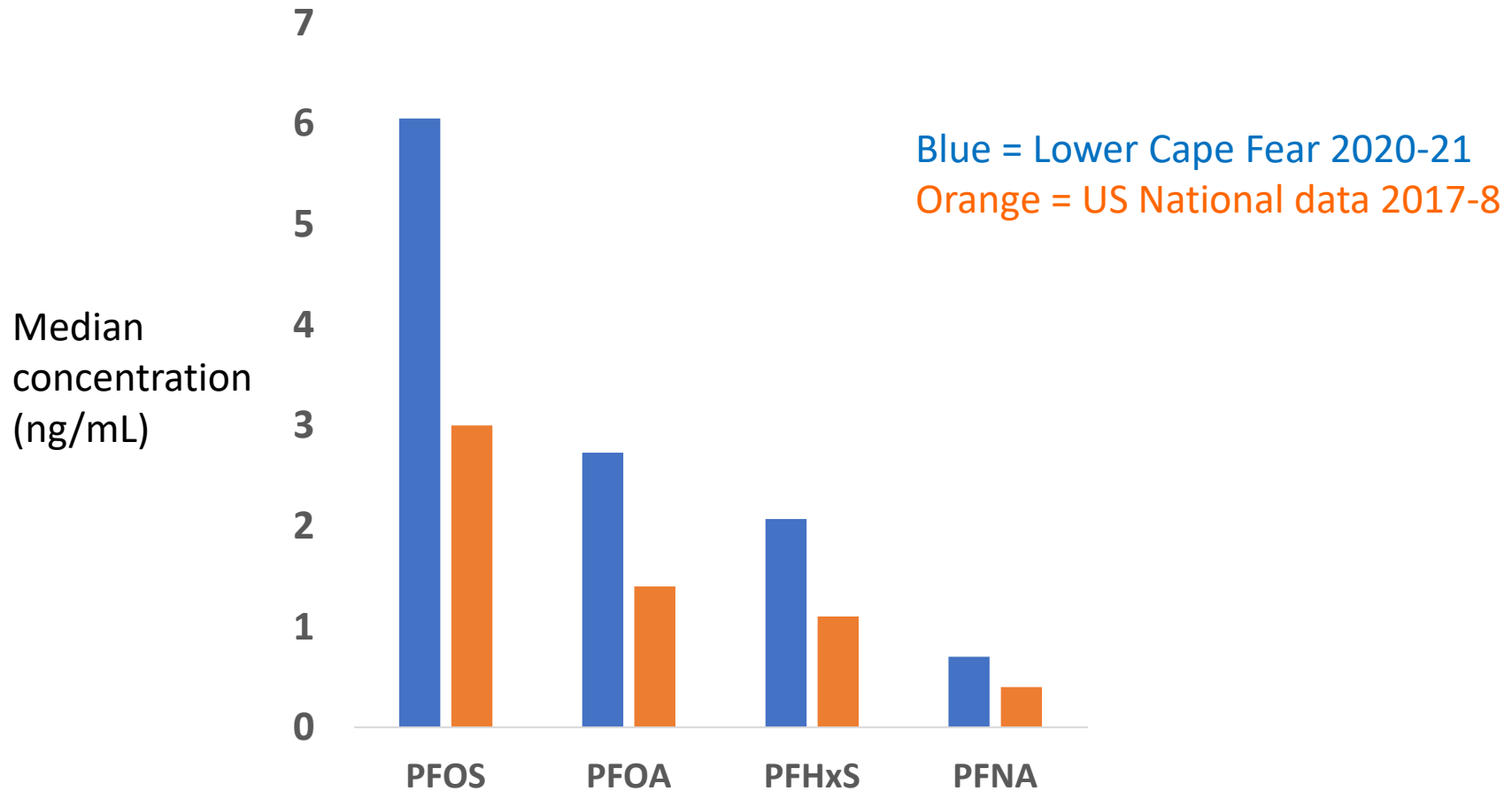
People were exposed to GenX through drinking water but GenX does not last in blood for a long time

Will estimate GenX exposure levels another way

3) Four PFAS found in almost everyone, 2020-2021

Chemical	Frequency of Detection (%)
PFOS	99
PFOA	99
PFHxS	98
PFNA	96

4) Wilmington area blood levels are higher than United States values



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We now do comparison studies to check methods

Interference in calibration curve used for PFO5DoA in 2017-2018

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How did we respond?

Finished analyzing 2020-2021 samples

Re-analyzed 80 of the 388 samples from 2017-2018

Used a commercial PFO5DoA standard to get new results

Estimated results for the rest of the samples

Sharing the adjusted PFO5DoA results with you today

Adjusted PFO5DoA results for blood samples from 2017-2018

Results we reported before

Detection frequency: 88%

Median: 0.3 ng/mL

Adjusted PFO5DoA results

Detection frequency: ~100%

Median: 9 ng/mL

Higher detection frequency and higher concentrations of PFO5DoA in Wilmington area, 2017-2018, than first reported

PFO5DoA is a PFAS from Fayetteville Works
Little is known about its toxicity to humans

Adjusted PFO5DoA results for blood samples from 2017-2018


**All other PFAS values were consistent in comparison study
Interference only for PFO5DoA in 2017-18**

PFO5DoA results for 2019, 2020, and 2021 were not affected

We will update the manuscript in Environmental Health Perspectives

 Environmental Health Perspectives

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Measurement of Novel, Drinking Water-Associated PFAS in Blood from Adults and Children in Wilmington, North Carolina

 is corrected by [▼](#)

Nadine Kotlarz, James McCord, David Collier, C. Suzanne Lea, Mark Strynar, Andrew B. Lindstrom, Adrien A. Wilkie, Jessica Y. Islam, Katelyn Matney, Phillip Tarte, M.E. Polera, Kemp Burdette, Jamie DeWitt, Katlyn May, ... [See all authors](#) [▼](#)

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NATIONAL
ACADEMIES *Sciences
Engineering
Medicine*

Guidance on PFAS Exposure, Testing, and Clinical Follow-Up

July 2022

<https://www.nationalacademies.org/our-work/guidance-on-pfas-testing-and-health-outcomes>



Report focused on Seven PFAS measured in United States

1. PFOS
2. PFOA
3. PFHxS
4. PFNA
5. PFDA
6. PFUnDA
7. MeFOSAA

Does not discuss all PFAS (e.g., Nafion byproduct 2, GenX not included)

Health Effects of PFAS: Conclusions

Sufficient evidence of an association

- Decreased antibody response (in adults and children)
- Dyslipidemia (in adults and children)
- Decreased infant and fetal growth
- Increased risk of kidney cancer (in adults)

Limited suggestive evidence of an association

- Increased risk of breast cancer (in adults)
- Increased risk of testicular cancer (in adults)
- Liver enzyme alterations (in adults and children)
- Increased risk of pregnancy-induced hypertension (gestational hypertension and preeclampsia)
- Thyroid disease and dysfunction (in adults)
- Increased risk of ulcerative colitis (in adults)

Summed serum PFAS levels for adverse health effects: Lower Cape Fear Region, 2020-21

Sum 7 PFAS = PFOS + PFOA + PFHxS + PFNA + PFDA + PFUnDA + MeFOSAA

≥ 20 ng/mL summed PFAS

Higher risk of adverse effects
Reduce exposure
Also test for thyroid function, kidney and testicular cancer, ulcerative colitis

2 - <20 ng/mL summed PFAS

Potential for adverse effects in sensitive populations
Reduce PFAS exposure
Screen for dyslipidemia, hypertensive disorders of pregnancy, and breast cancer

< 2 ng/mL summed PFAS

Adverse health effects not expected.
Recommend usual standard of care.

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≥ 20 ng/mL summed PFAS
Higher risk of adverse effects
Reduce exposure
Also test for thyroid function, kidney and testicular cancer, ulcerative colitis

28.5% of participants in 2020-21 in this group

2 - <20 ng/mL summed PFAS
Potential for adverse effects in sensitive populations
Reduce PFAS exposure
Screen for dyslipidemia, hypertensive disorders of pregnancy, and breast cancer

70.2% of participants in 2020-21 in this group

< 2 ng/mL summed PFAS
Adverse health effects not expected.
Recommend usual standard of care.

1.4% of participants in this group in 2020-21

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Community partners

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Department
Chatham County Health
Department
Cumberland County Health
Department
Cape Fear River Watch
Sustainable Sandhills
Haw River Assembly
New Hanover County NAACP
UNCW Latino Alliance

<https://genxstudy.ncsu.edu/>

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Panelists

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