Center for Environmental and Health Effects of PFAS
NC STATE | ECU

GenX Exposure Study

GenX Exposure Study:
PFAS blood levels in the Gray's Creek Community, NC 2021, 2023

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Principal Investigator

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NC STATE UNIVERSITY
ECU
NIH National Institute of Environmental Health Sciences

Agenda

Welcome
Introduction to PFAS and GenX Exposure Study
Overall study findings for PFAS blood levels
Overview of results for Fayetteville Private Well Community
Future Plans
Q&A Panel

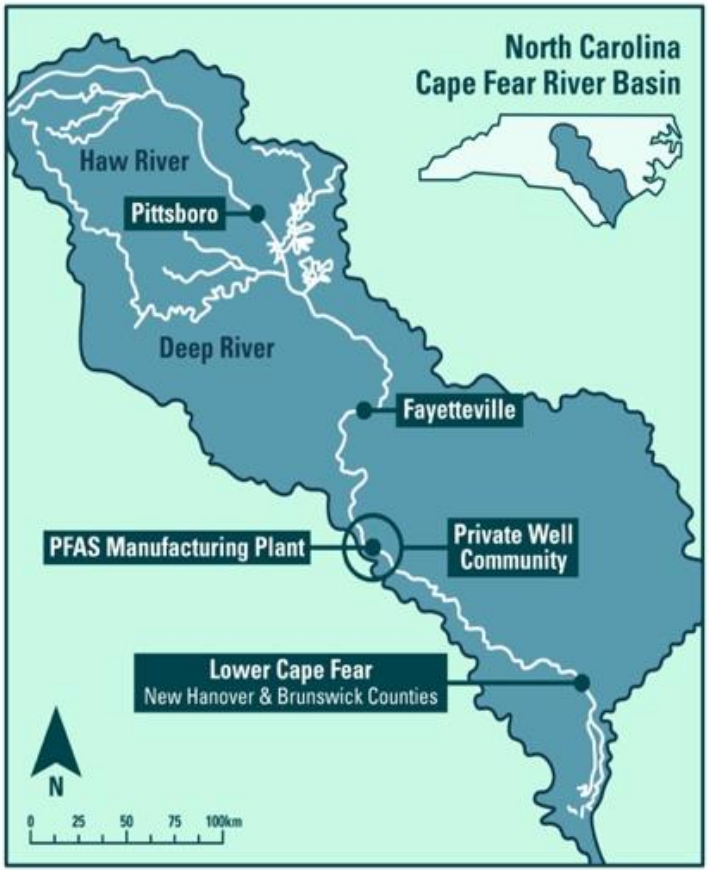
If you have questions, we will pass around notecards and pens for you to submit before and during the Q&A.

GenX Exposure Study Mission

The purpose of the GenX Exposure Study is to understand how PFAS chemicals in drinking water may impact human health of residents of the Cape Fear River Basin.

Tonight's Topic

PFAS levels in blood samples collected in 2023.



GenX Exposure Study

Background

PFAS, and PFAS in the Cape Fear River Basin, & The GenX Study

Per- and Polyfluoroalkyl Substances (PFAS)

Resistant to:

- Water
- Stains
- UV radiation

Used in consumer products since the 1950s:

- Surfactants, lubricants, adhesives
- Carpet, upholstery, clothing
- Car interiors
- Food packaging, nonstick cookware
- Cleaning products
- Personal care products
- Fire-fighting foam

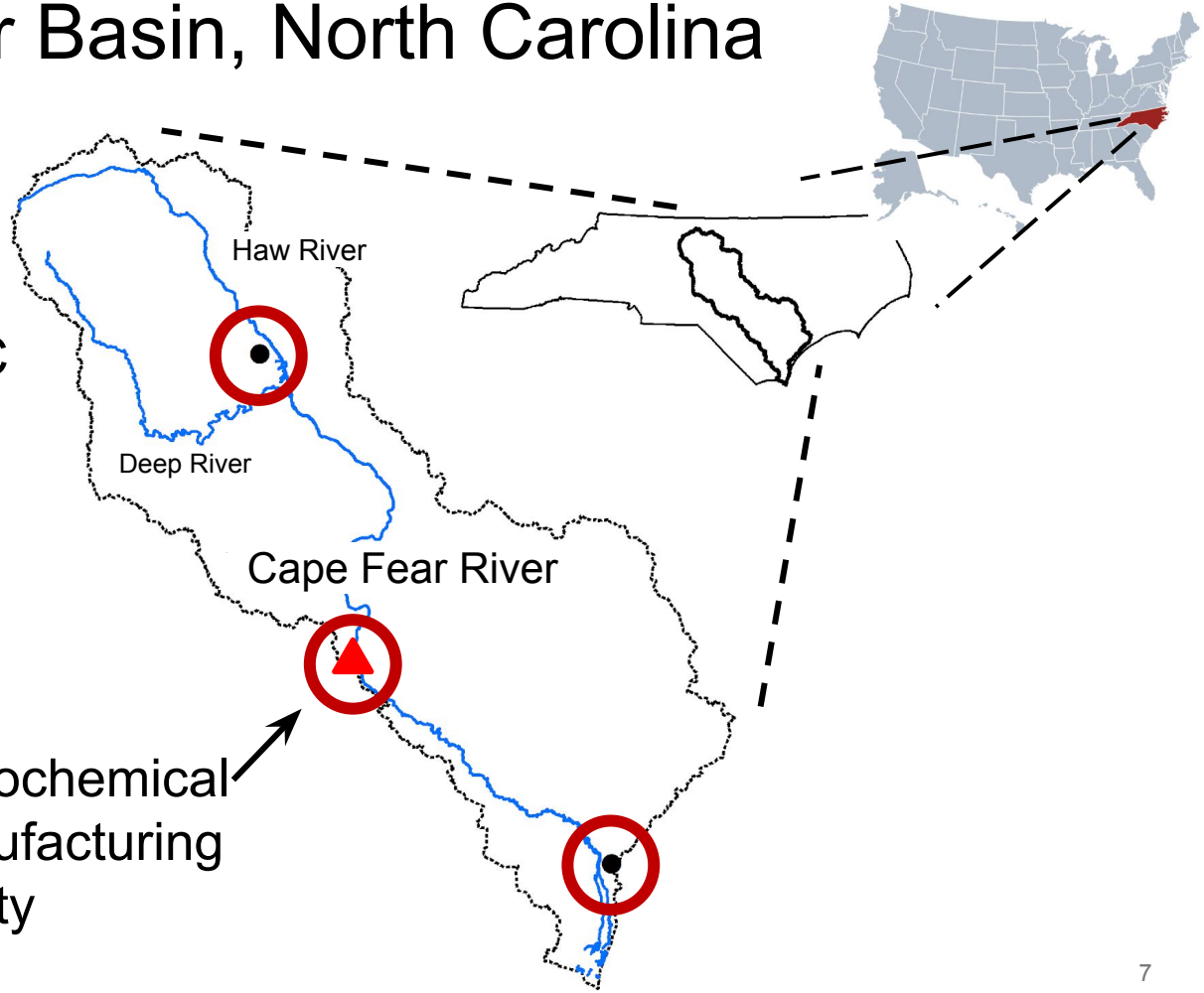
Chemical Properties Lead to:

- Persistence and bioaccumulation
- Ubiquitous in indoor environment and blood (e.g., NHANES)
- Transport around globe in ocean currents and atmosphere

Cape Fear River Basin, North Carolina

Largest watershed in NC

Supplies ~1.5M people with drinking water



GenX Exposure Study

GenX Study Background: Exposure Study 2017-2019

In 2017, we started in Wilmington, NC.

In 2019, we included the Fayetteville private well community.

- Found high levels of PFAS in people's blood.
- Identified new PFAS associated with the Chemours.
  - Nafion byproduct 2, PFO5DoA, PFO4DoA in almost everyone from Wilmington
  - Nafion byproduct 2 and PFO5DoA in some people from Fayetteville.
- We did not find GenX in people's blood.

GenX Cohort Health Study: 2020 – date

In 2020-21, we enrolled 1020 people throughout the Cape Fear River Basin to measure PFAS exposure in blood and to follow them for up to 20 years to learn about health effects.

We included Pittsboro to characterize PFAS upriver from the chemical plant.

In 2023, we resampled 519 people and enrolled 72 new people to improve the representation of people in the sample.

In 2024, we plan to resample the people who did not participate in 2023.

Study Design: GenX Cohort Study

Enroll people ages 6 and older from 3 regions in the Cape Fear Basin

- Lower Cape Fear
- Fayetteville
- Pittsboro

Started in 2020-21

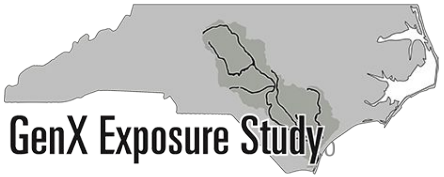
- Enrolled >1000 people
- Resampled in 2023

Plan to follow people for up to 20 years

Collect blood

- Analyze for GenX and other PFAS
- Analyze for lipids, thyroid hormones, and comprehensive metabolic panel

Report back results to community, individuals

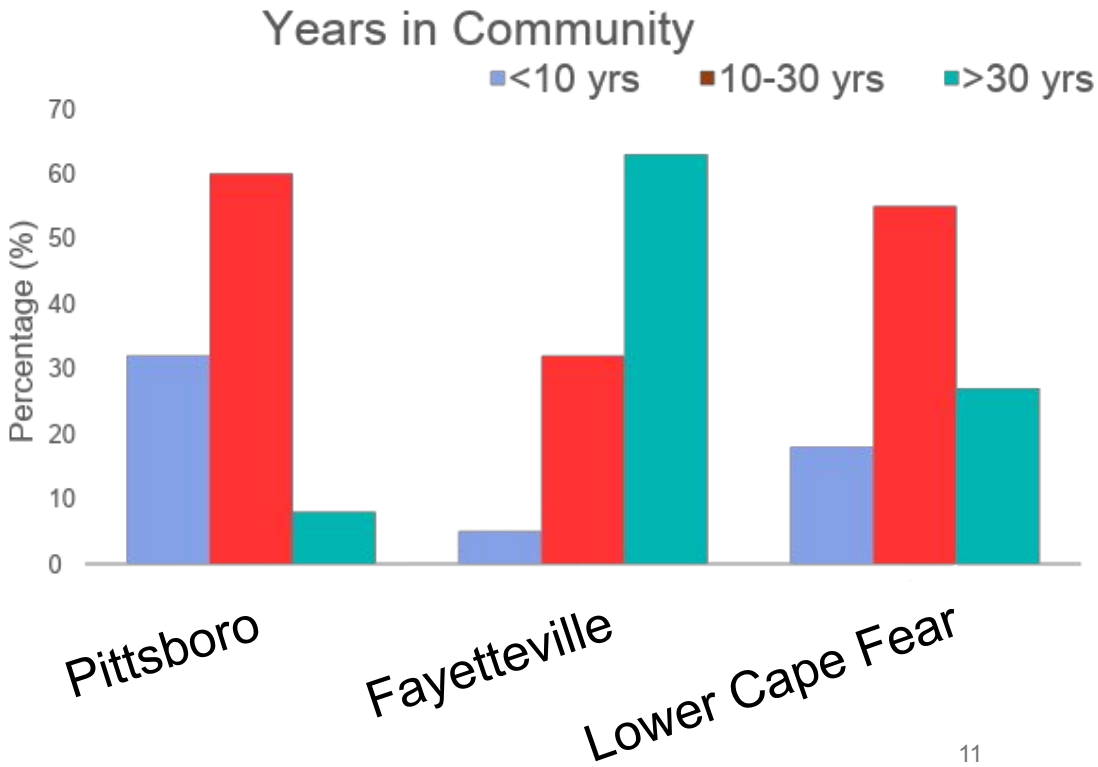


Who is in the study?

People range in age from 6 to 92 years old.

Most people are 60 and older

About 55% female



Sample Collection: Summer-Fall 2023

Blood sample

Clinical measures

- lipids,
- comprehensive metabolic panel,
- thyroid hormones
- Results returned in December 2023

Serum PFAS

- 41 analytes in 2023
- Results returned in April-May 2024

Body composition

Questionnaire

Update health history

GenX Exposure Study

Sample Collection 2023

- Collected blood from 591 people
  - 118 Pittsboro
  - 126 Fayetteville
  - 347 Lower Cape Fear
- Resampled 523 of original 1019 (~50%)
- Enrolled 72 new people
  - Mostly in Lower Cape Fear Region

GenX Exposure Study

Two Letters to Study Participants about 2023 results

Individual PFAS Results

- Your individual PFAS values for 2023 and 2020/21
- Your individual NASEM recommendations

Community PFAS results

- Shows where your PFAS results fit in your community

Key Overall Findings

We measured blood samples from over 500 people for 41 different PFAS.

- On average, levels of PFAS in blood are lower in 2023 than 2020-21
- Not all people's blood levels went down
- PFAS blood levels are still higher than most people in the US
- People throughout the Cape Fear River Basin from Pittsboro to New Hanover and Brunswick Counties are adversely impacted by a variety of PFAS.

Sampling in 2021

Collected blood from 1,019 people across the entire study area

300 of those were from Fayetteville

We tested for 44 different PFAS

Sampling in 2023

Collected blood from 591 people across the entire study area

126 of those were from Fayetteville

We tested for 41 different PFAS

Tested blood samples for 41 PFAS in 2023

7 PFAS commonly found in people
PFOS
PFOA
PFHxS
PFNA
PFDA
PFUnDA
MeFOSAA
Other perfluoroalkyl carboxylic acids
PFBA
PFPeA
PFHxA
PFHpA
PFTrDA
PFDoA
PFTeDA
PFHxDA
PFODA
Other perfluoroalkyl sulfonic acids
PFBS
PFPeS
PFHpS
PFNS
PFDS

Perfluoroether carboxylic acids
PEPA
GenX
PFO3OA
PFO4DA
PFO5DoA
NaDONA
Perfluoroether sulfonic acids
Nafion byproduct 1
Nafion byproduct 2
F53B Major (9Cl-PF3ONS)
Perfluoroalkyl sulfonamides
6:2 FTS
FHxSA
FOSA
MeFOSA
F53B Minor (11Cl-PF3OUdS)
FBSA
NEtFOSAA
Fluorotelomer carboxylic acid
7:3 FTCA

Fluorotelomer sulfonic acids
10:2 FTS
8:2 FTS
4:2 FTS

Samples analyzed at Eurofins laboratory in Sacramento, CA

Focus today on these PFAS

7 PFAS commonly found in people
PFOS
PFOA
PFHxS
PFNA
PFDA
PFUnDA
MeFOSAA
Other perfluoroalkyl carboxylic acids
PFBA
PFPeA
PFHxA
PFHpA
PFTrDA
PFDoA
PFTeDA
PFHxDA
PFODA
Other perfluoroalkyl sulfonic acids
PFBS
PFPeS
PFHpS
PFNS
PFDS

Perfluoroether carboxylic acids
PEPA
GenX
PFO3OA
PFO4DA
PFO5DoA
NaDONA
Perfluoroether sulfonic acids
Nafion byproduct 1
Nafion byproduct 2
F53B Major (9Cl-PF3ONS)
Perfluoroalkyl sulfonamides
6:2 FTS
FHxSA
FOSA
MeFOSA
F53B Minor (11Cl-PF3OUdS)
FBSA
NEtFOSAA
Fluorotelomer carboxylic acid
7:3 FTCA

Fluorotelomer sulfonic acids
10:2 FTS
8:2 FTS
4:2 FTS

Four PFAS were found in almost everyone:

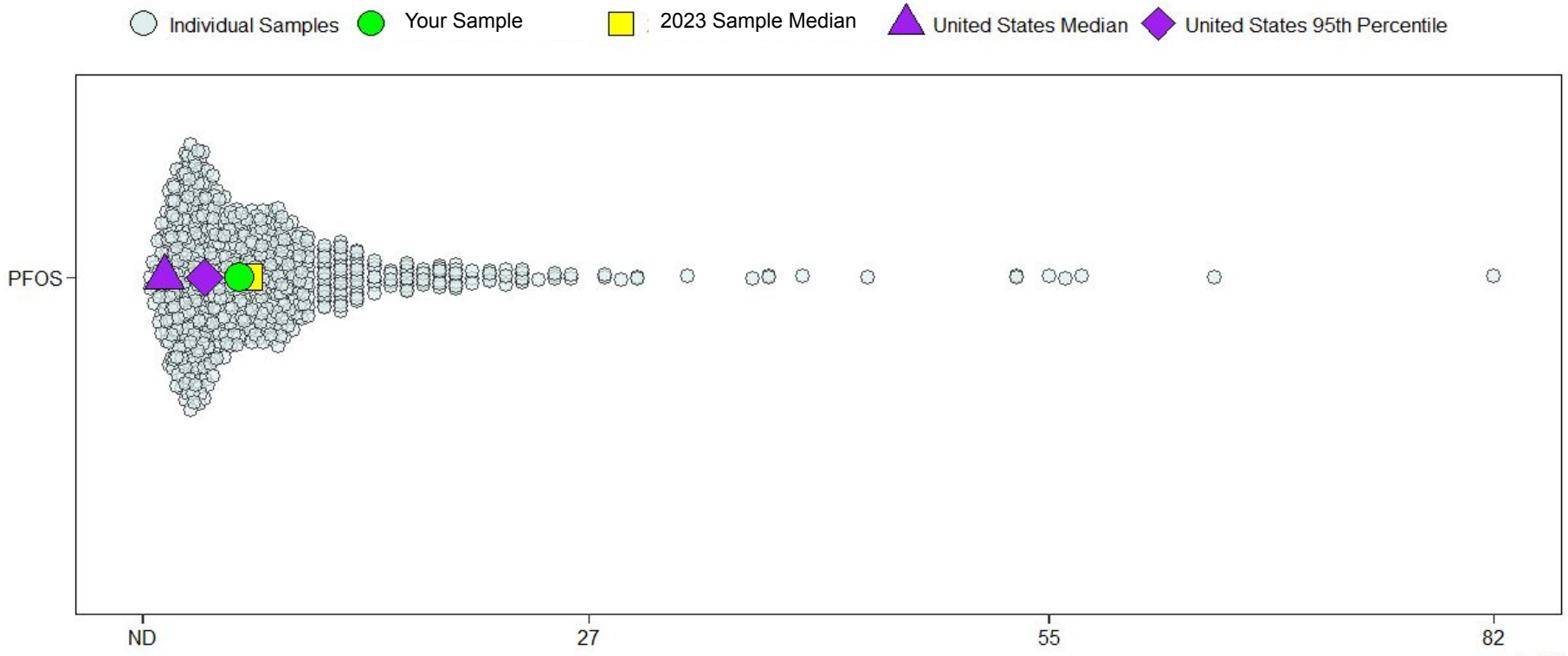
PFOS

PFOA

PFHxS

PFNA

Stripchart for PFOS for entire study, 2023



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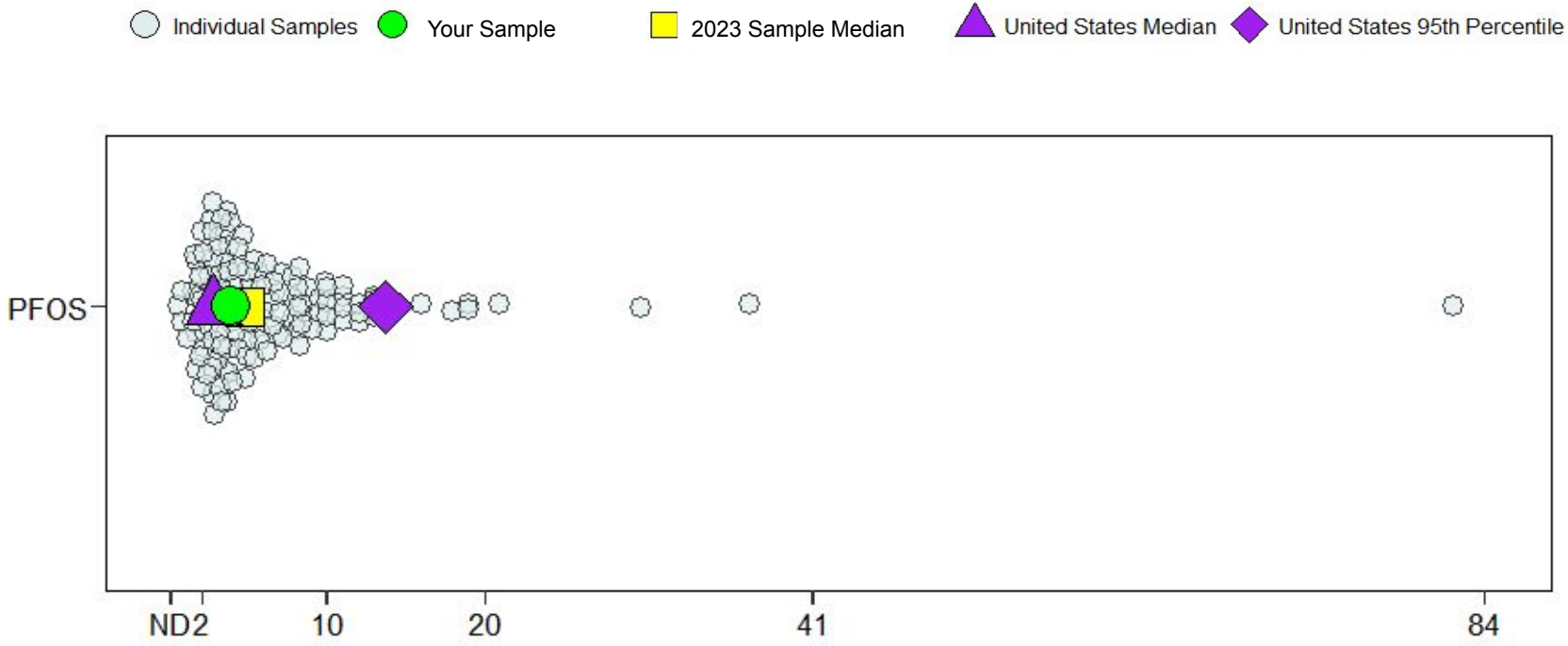
GenX Exposure Study

Stripchart for PFOS for Fayetteville, 2023



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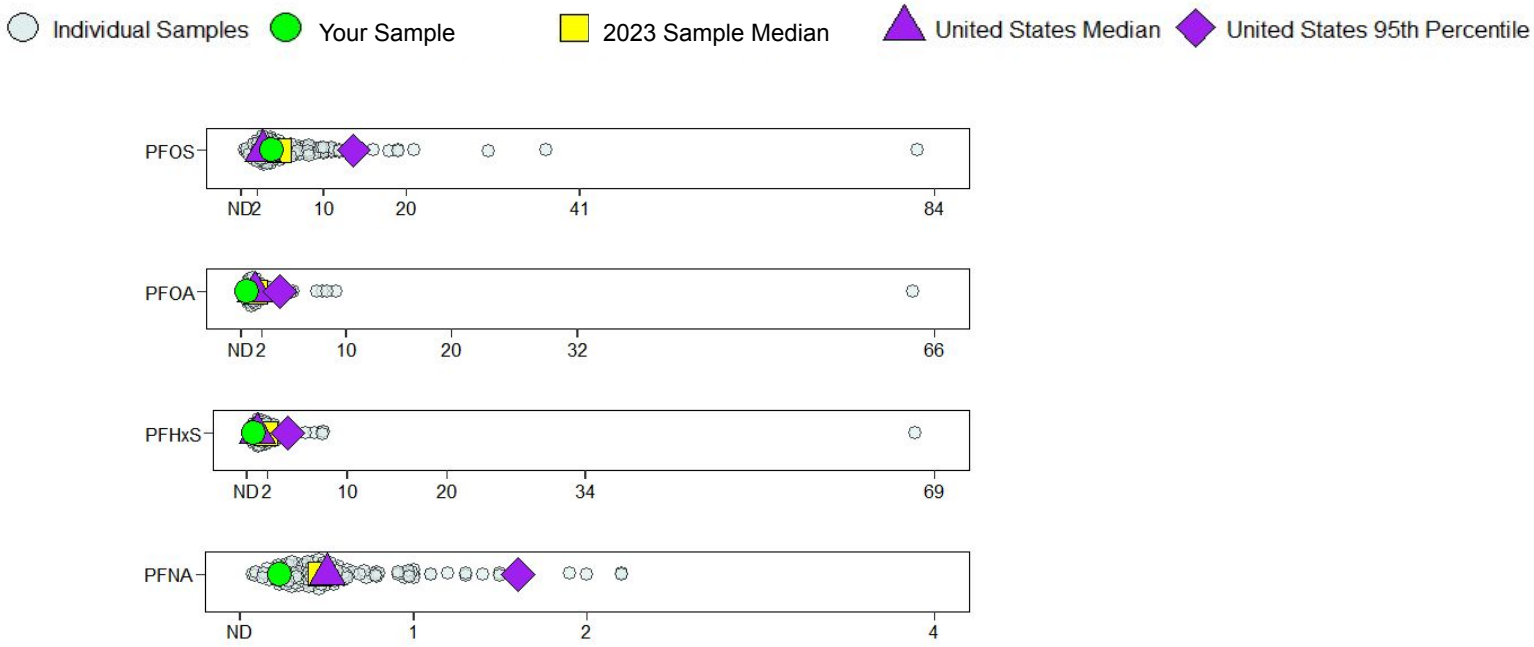
GenX Exposure Study

Strip Charts of Individual PFAS Across Fayetteville Samples 2023



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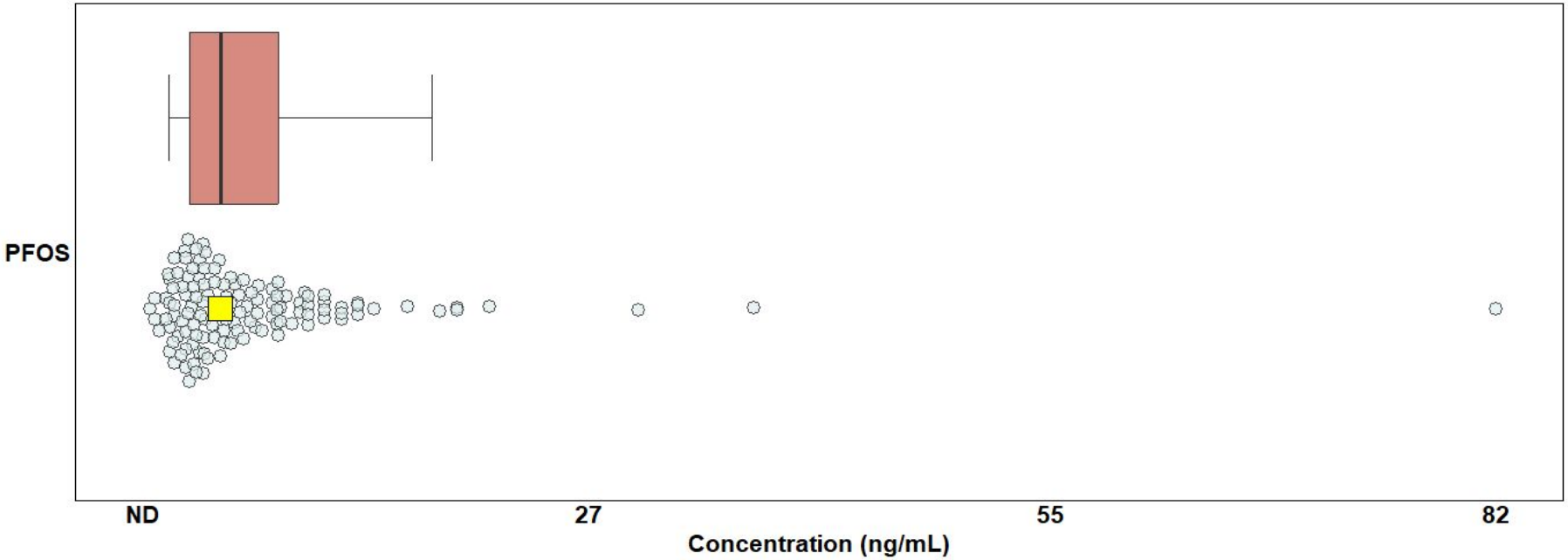
GenX Exposure Study

Fayetteville 2023 PFOS Stripchart to Boxplot



GenX Exposure Study

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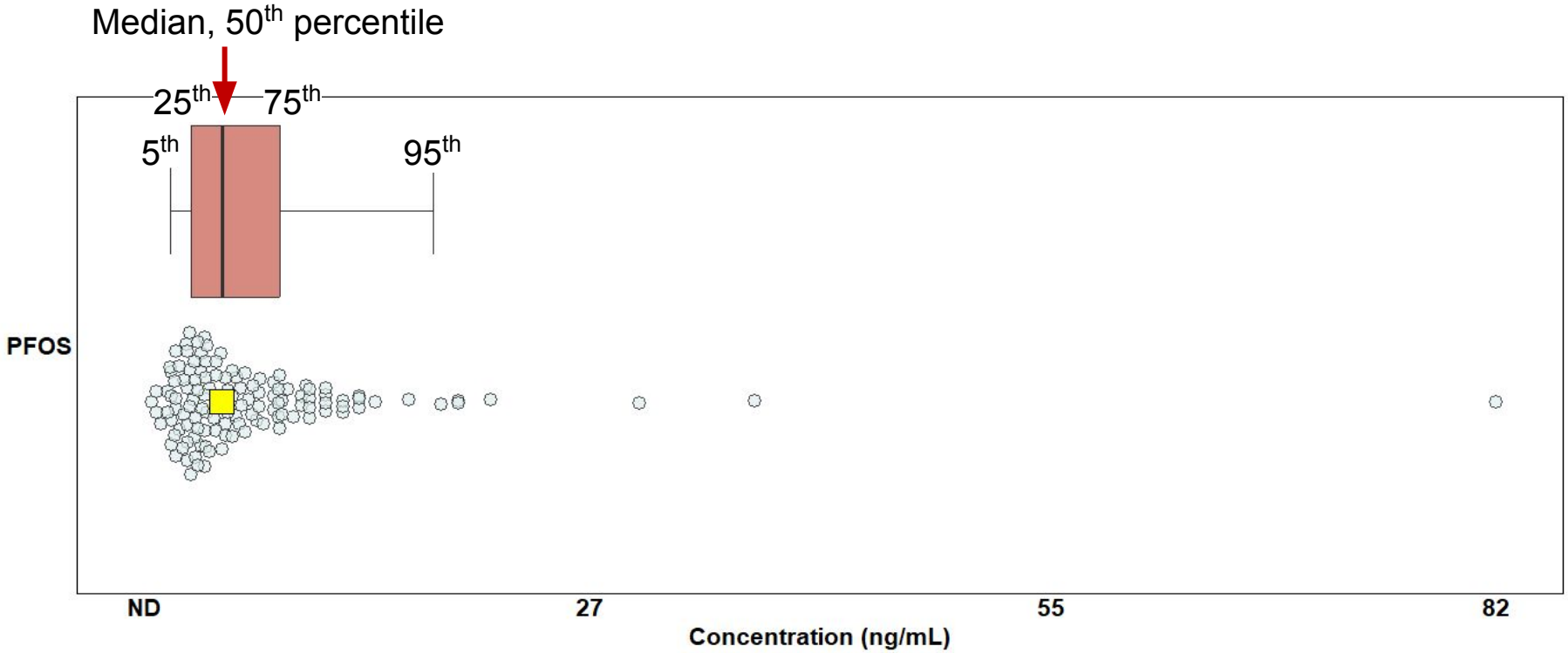
Fayetteville 2023 PFOS Stripchart to Boxplot



GenX Exposure Study

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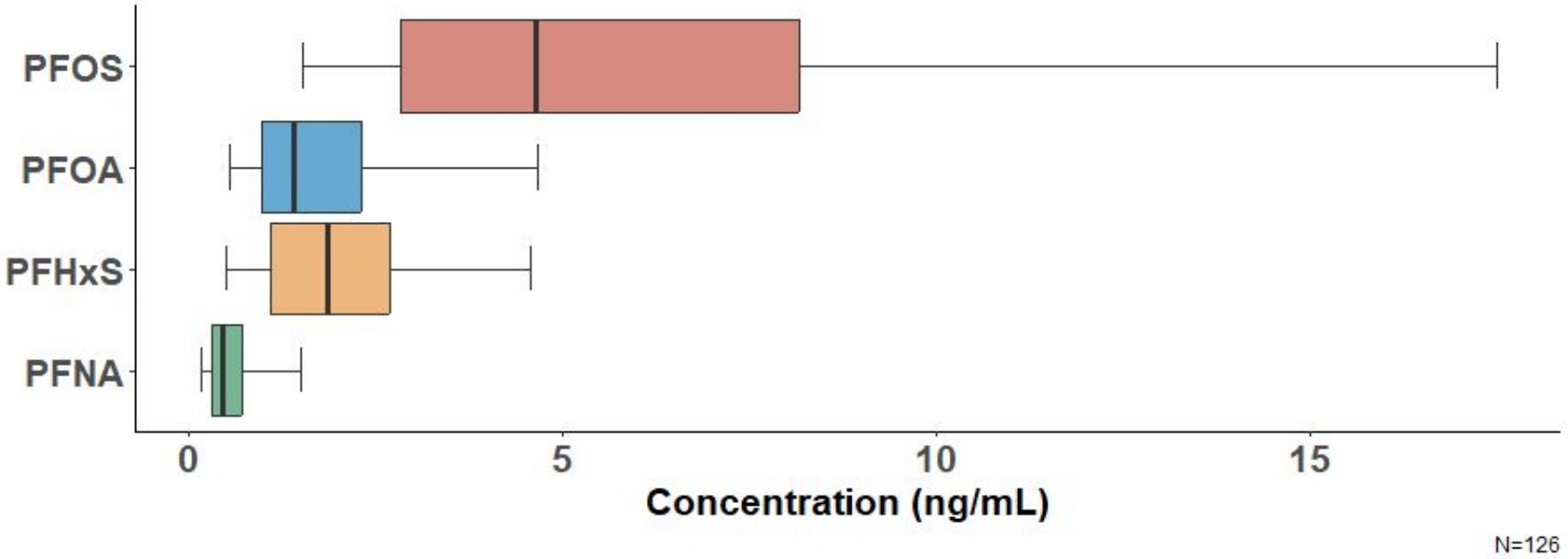
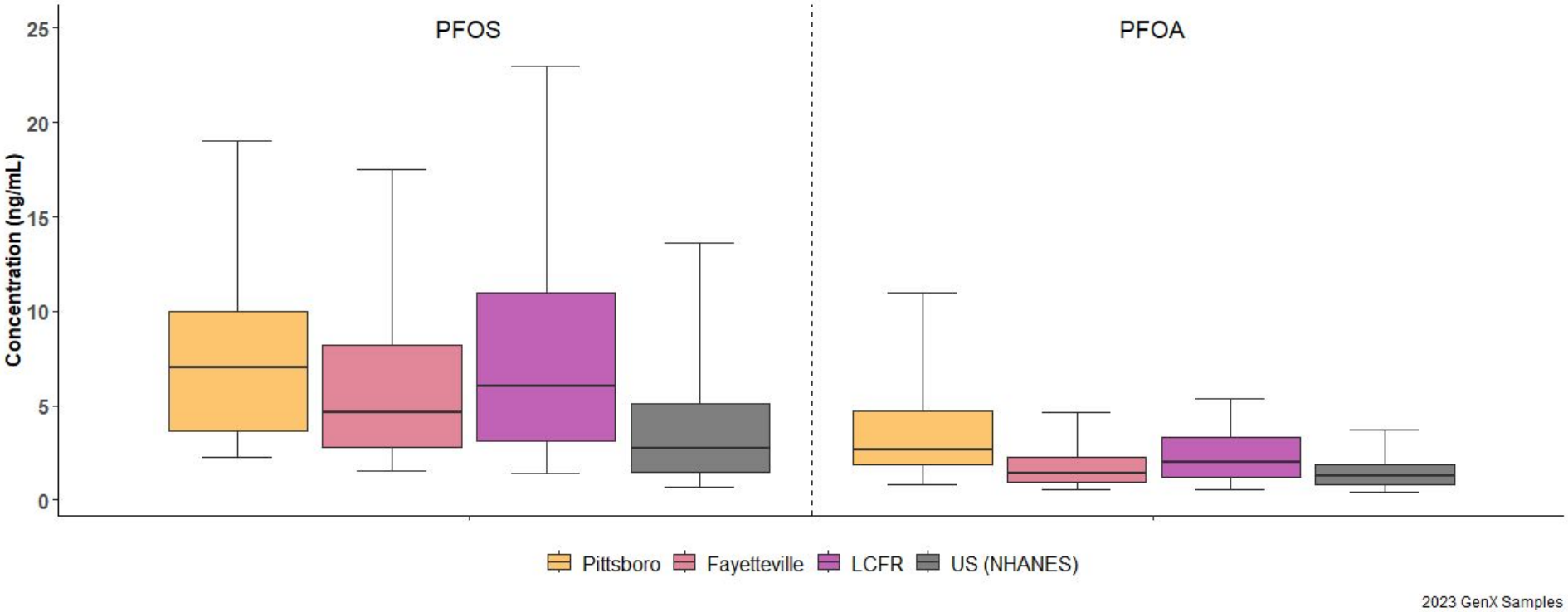
PFAS Levels for 4 most common PFAS in Fayetteville 2023



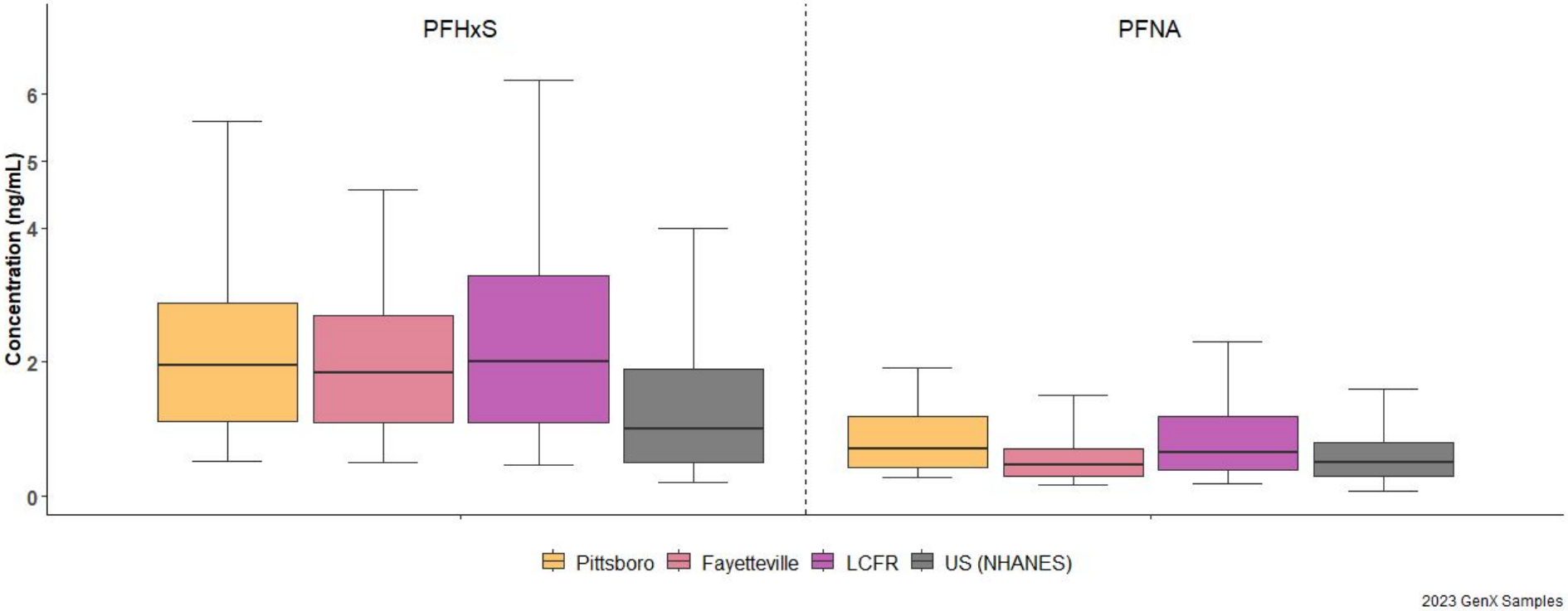
GenX Exposure Study

PFOS & PFOA Levels in 2023 by community compared to US population for 2017-2020



GenX Exposure Study

PFHxS and PFNA Levels from 2023 by community compared to US population for 2017-2020



GenX Exposure Study

How have PFAS blood levels changed over time?

For the common PFAS (PFOS, PFOA, PFHxS, PFNA), the levels in blood have decreased over time

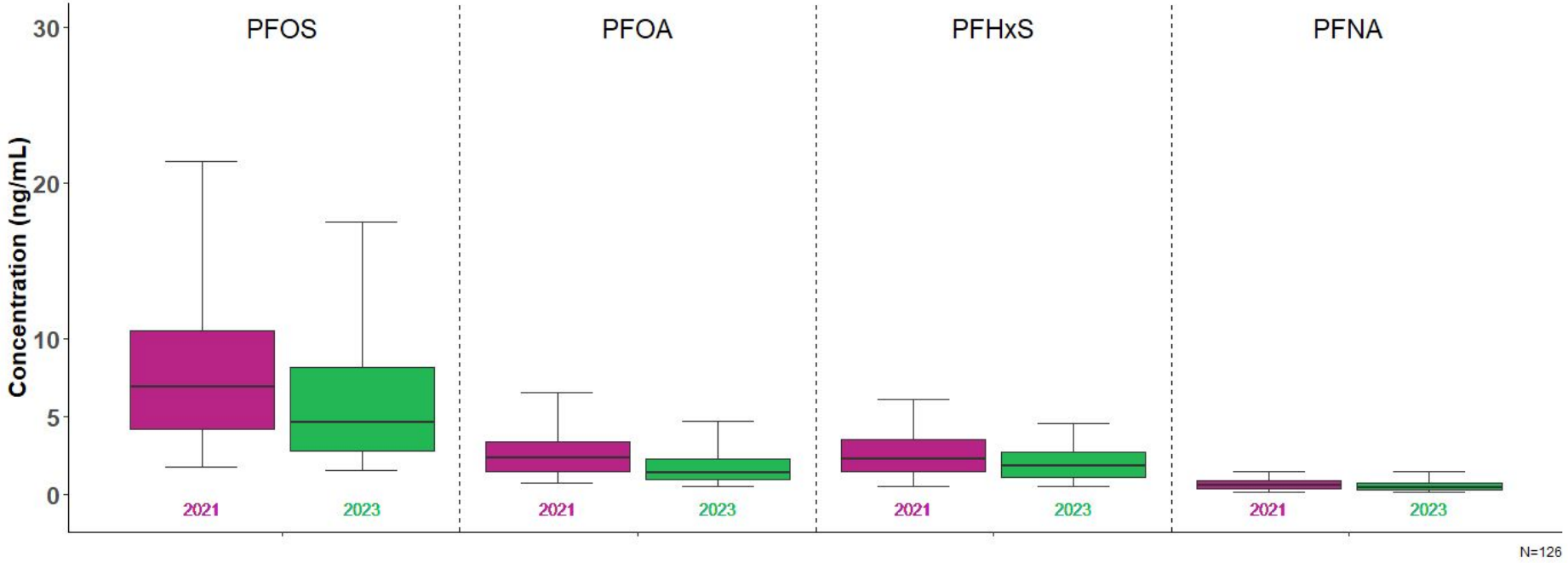
In people with two measurements (N=519)

PFOS dropped 1.7 ng/mL (24%)
PFOA dropped 1 ng/mL (32%)
PFHxS dropped 0.5 ng/mL (21%)
In a 2-3 year period

Results are similar across all communities.

GenX Exposure Study

PFAS Blood Levels in 2021 vs 2023 in Fayetteville samples



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GenX Exposure Study

Not all people's PFAS levels went down

We measured 41 PFAS in people's blood

Some individuals had one or more PFAS increase

We are working to understand why?

- Maybe a different exposure source than water
  - Food, cleaning products, occupational exposures?
- Change in body composition
  - We're measuring chemicals in people's bodies, so changes in your body may affect the concentration we measure
- Analytical variability
  - Some levels are really low and may bounce around a bit.

Reach out to us if you want help identifying why your levels changed.

Chemours-related PFAS

What about the Chemours-related PFAS

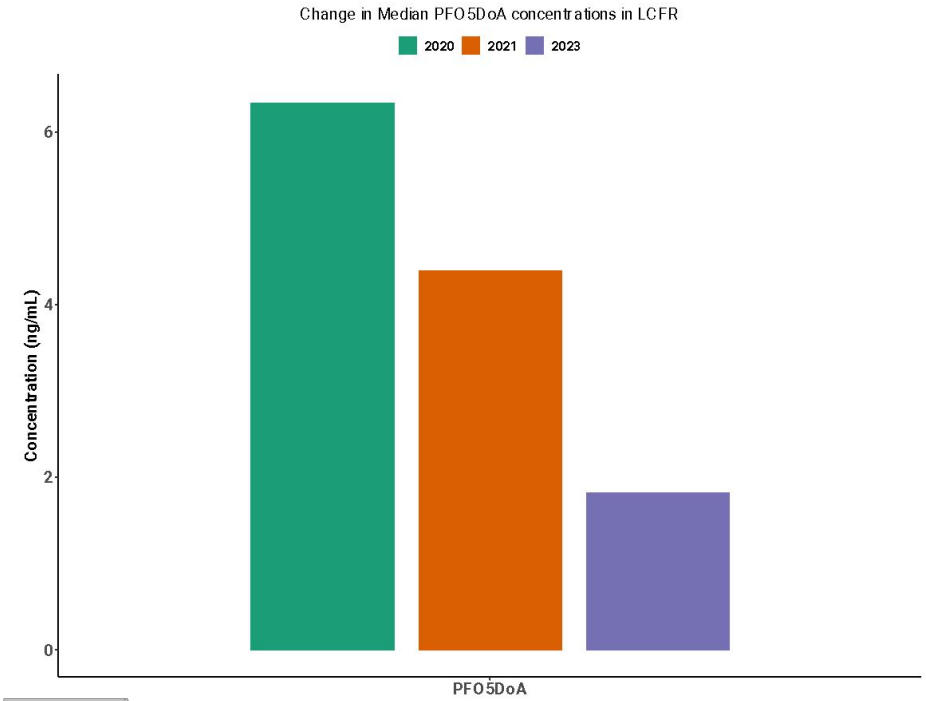
In 2023, we continued to find PFO5DoA and Nafion byproduct 2 in the blood of most people from the Lower Cape Fear Region & about 20% of the people from Fayetteville.

Overall, the levels continue to decrease over time.

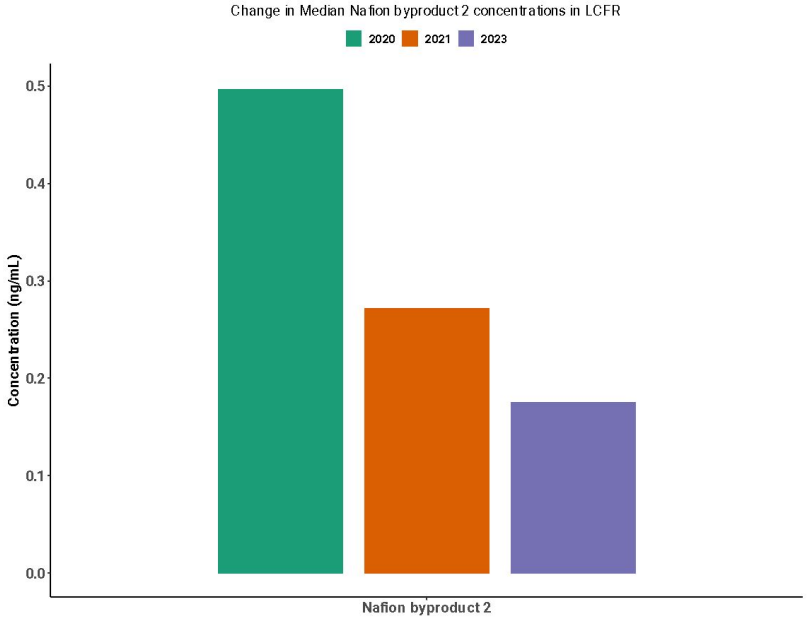
	Lower Cape Fear Region		Fayetteville	
	2021	2023	2021	2023
PFO5DoA	87%	90%	10%	18%
Nafion byproduct 2	84%	57%	30%	21%

Change in median levels in blood samples from Lower Cape Fear region (ng/mL) since 2020

PFO5DoA



Nafion byproduct 2



GenX Exposure Study

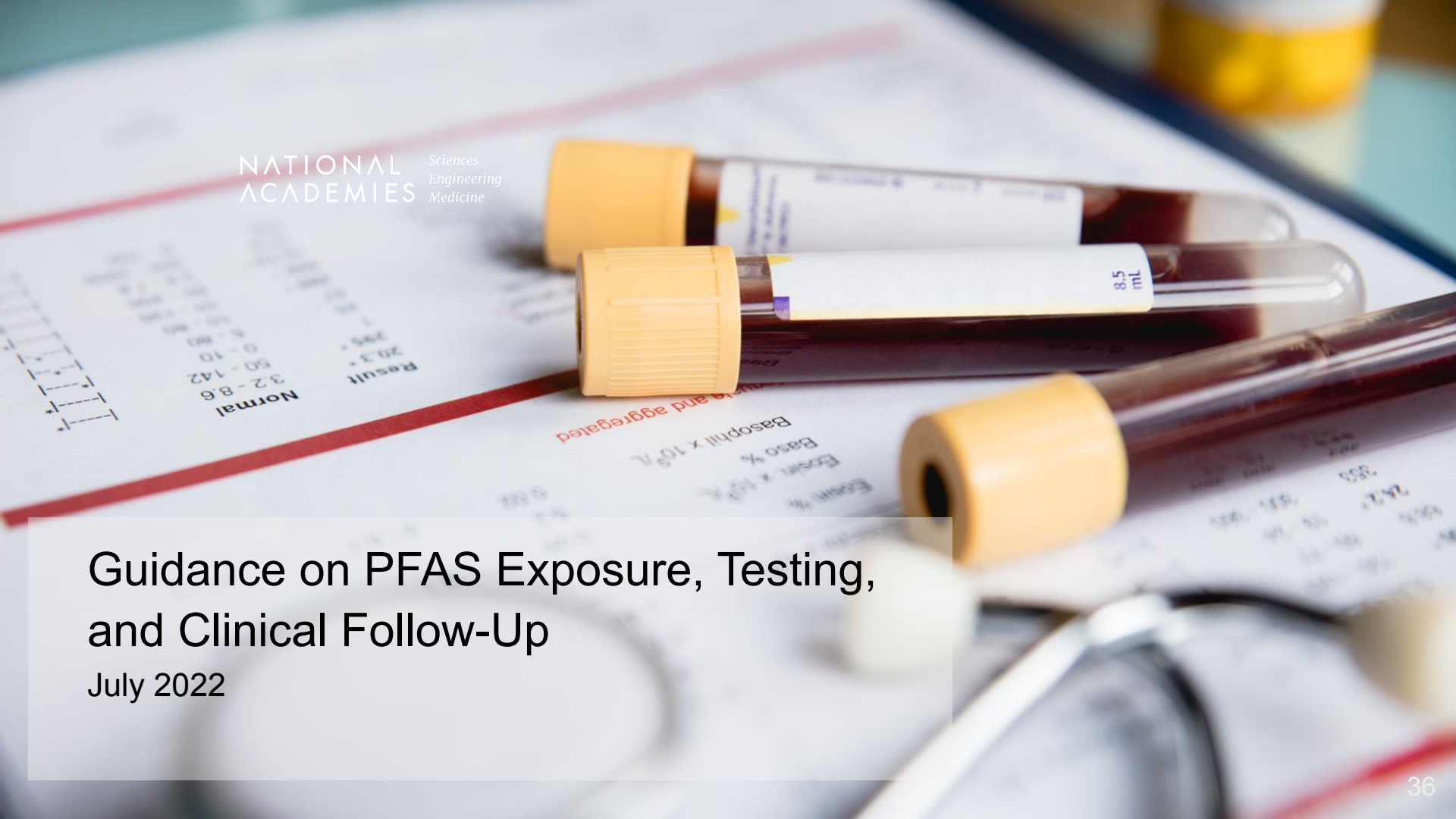
Key Findings

We measured blood samples from over 500 people for 41 different PFAS.

1. On average, levels of PFAS in blood are lower in 2023 than 2020-21
2. Not all people's blood levels went down
3. PFAS blood levels are still higher than most people in the US
4. People throughout the Cape Fear River Basin from Pittsboro to New Hanover and Brunswick Counties are adversely impacted by a variety of PFAS.

What can I do with this information?

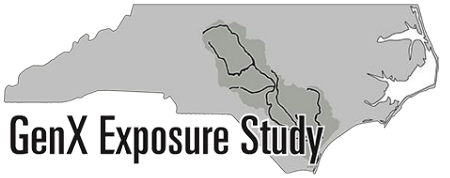
NASEM Recommendations, Study Retention, and Exposure Control



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

July 2022

NASEM 7 in 2023



Sum of 7 serum PFAS
(PFOS, PFOA, PFHxS, PFNA, PFDA, MeFOSAA, PFuNDA)

Does not include
PFHps, Nafion byproduct 2, PFO5DoA

Overall ~20% exceed 20 ng/mL

The fact that levels are now lower doesn't negate the fact that levels were higher.

≥ 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.

What can you do about PFAS exposure and health effects? Study participants

If you're in the study, **please stay in the study.** This lets us learn how the chemicals are moving through our bodies and potential health effects.

If your PFAS levels have increased, think about potential ways you might come into contact with PFAS

- Home grown fruits and vegetables, eggs
- Occupational Exposures

and consider potential changes in your body.

- Weight change
- New medication

What can you do about PFAS exposure and health effects? COMMUNITY RESIDENTS

If you live in a region in the Cape Fear River, consider your potential for PFAS exposure.

Because almost all people in the study were classified at some potential adverse risk, talk to your health care provider about actions you can take to protect your health.

Think about how you may be exposed to PFAS.

- Home grown fruits and vegetables, eggs
- Occupational Exposures

If you want to test for PFAS in your blood:

There are resources on the GenX Study website to help you find the testing you want.

What is next?

Resampling and Scientific Papers

What's next for study? 2024

We plan to resample anyone who enrolled between 2020 and 2023 to ensure that we have two measurements per person.

If we missed you last year, we will be contacting you to make sure we include you this year.

If you've moved, changed your email or phone, please let us know.

genx-exposure-study@ncsu.edu or call us at (855) 854-2641

We'll be sampling those we missed in 2023 in Fayetteville in November.

First weekend or weekend before Thanksgiving

What’s next for the Study: Understanding Exposure

We are currently working on scientific papers describing PFAS levels in

House Dust, Wristbands

PFAS levels throughout the basin over time

We hope to publish these by early 2025 and share these results with you.

If you have ideas for things we should look at, please reach out.

What’s next for the Study: Health effects evaluation

We are currently working on scientific papers looking at how PFAS may affect

- Thyroid hormones
- Liver enzymes

We hope to publish these by early 2025 and share these results with you.

If you have ideas for things we should look at, please reach out.

If you want to learn more: invite your friends

Attend our in-person meetings (details on website)

Wilmington

September 30th, 2024

6:00 p.m. - 8:00 p.m.

Check out our website (genxstudy.ncsu.edu)

Follow our Instagram! @ncsu_genx_study

Email us at genx-exposure-study@ncsu.edu

Slides will be uploaded to our website tomorrow.

Thank you to our funders and partners!

- NC State
- ECU
- Cape Fear River Watch
- Haw River Assembly
- Sustainable Sandhills
- New Hanover County Health Department
- Cumberland County Health Department
- Chatham County Health Department
- New Hanover County NAACP
- Warner Temple AME Zion Church
- Town of Navassa
- Our wonderful study participants

Funding: NIEHS R21 R21ES029353, P42ES031009
CHHE P30ES025128
Matching Funds from NC Policy Collaboratory

GenX Exposure Study

Q&A Session

Notecards and pens are being passed around if you would like your questions to be anonymous.