NC STATE UNIVERSITY

Center for Human Health and the Environment

GenX Exposure Study

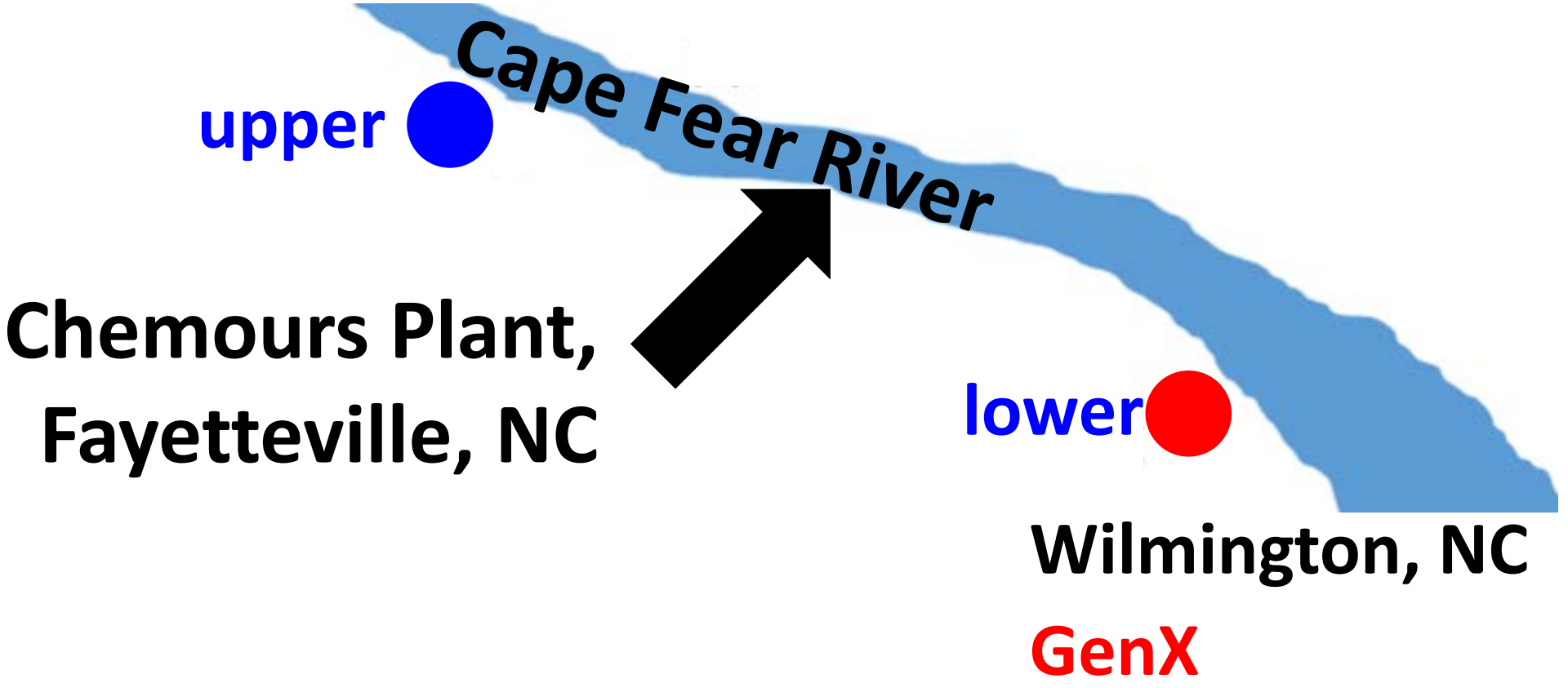
PFAS blood sample results

Wilmington, November 13, 2018

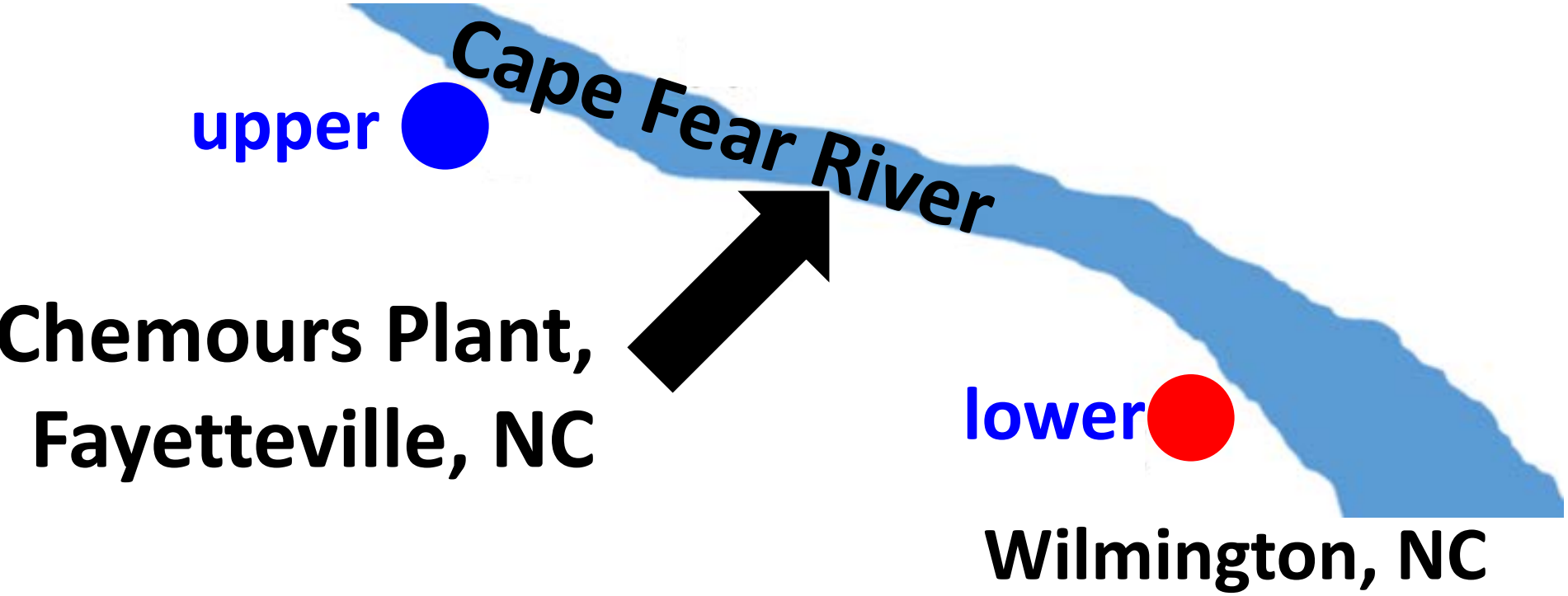
PFAS stands for per- and polyfluoroalkyl substances

1. Group of chemicals (for example: GenX)
2. Used in consumer products (for example: non-stick pans)
3. Can be released to environment by PFAS manufacturers

Newly identified PFAS in Wilmington drinking water



It’s not just GenX



GenX and <u>other poorly-understood PFAS</u>

It’s not just GenX

GenX and <u>other poorly-understood PFAS</u>

The GenX Exposure Study

Assess exposure to GenX and related PFAS in people living in the Lower Cape Fear River Basin.

Look for GenX and other PFAS in drinking water, blood and urine.

The GenX Exposure Study

345 participants (56 children)

310 enrolled in November 2017

35 enrolled in May 2018

Collected tap water, blood and urine

44 participants gave two blood samples

GenX Exposure Study Timeline

Nov 2017	Study funded by NIEHS
	Collected tap water, blood and urine
Nov-Feb, 2017	Analyzed tap water from 198 homes
Mar 2018	Review water letters
Apr 2018	Report water results

Wilmington tap water in Nov 2017

Most tap water with Cape Fear River source had:

1. GenX

Median: 50 parts per trillion GenX

2. Nafion byproduct 2, PFMOAA, PFO2HxA, and PFO4DA

GenX Exposure Study Timeline

Oct 2017	Study funded
Nov 2017	Collected tap water, blood and urine
Nov-Feb, 2017	Analyzed tap water from 198 homes
Mar 2018	Review water letters
Apr 2018	Report water results
May 2018	Blood method development; Update advisory board
Jun 2018	Begin analysis of 388 blood samples
July 2018	Blood sample analysis; Update advisory board
Aug-Sept 2018	Blood sample analysis; Quality controls
Oct 2018	Review blood letters
Nov 2018	Report blood results

PFAS blood results: Key findings

1. GenX was NOT detected

2. Found new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE

3. Levels of historically-used PFAS were higher in Wilmington than United States

Monitored for 23 PFAS in blood

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Newly identified in lower Cape Fear River

GenX
Nafion byproduct 2
PFO3OA
PFO4DA
PFO2HxA

Nafion byproduct 1
Nafion byproduct 4
PFO5DoDA
PEPA
PMPA
NVHOS
Hydro-EVE

Monitored for 23 PFAS in blood

Newly identified in lower Cape Fear River

GenX
Nafion byproduct 2
PFO3OA
PFO4DA
PFO2HxA

Nafion byproduct 1
Nafion byproduct 4
PFO5DoDA
PEPA
PMPA
NVHOS
Hydro-EVE

Historically-used

PFBA
PFPeA
PFHxA
PFHpA
PFOA
PFNA
PFDA
PFBS
PFHxS
PFOS
6:2 FTS

Results for 15 PFAS

Newly identified in lower Cape Fear River	Historically-used
GenX	
Nafion byproduct 2	
	PFHxA
PFO4DA	
	PFOA
	PFNA
Nafion byproduct 1	PFDA
PFO5DoDA	PFHxS
PEPA	PFOS
PMPA	6:2 FTS
Hydro-EVE	

What are the results?

Did we find GenX in blood?

No, we did NOT find GenX in blood samples

Method reporting limit: 2 parts per billion GenX

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GenX was NOT found in blood even though 50 parts per trillion in tap water

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Method reporting limit: 2 parts per billion GenX

GenX was NOT found in blood even though 50 parts per trillion in tap water

GenX was NOT found in blood from 30 people living near the Chemours plant

Blood did NOT have

Newly identified

GenX

Nafion byproduct 1

PMPA

PEPA

Historically-used

PFHxA

6:2 FTS

Four newly-identified PFAS in blood

1. Nafion byproduct 2 (99% of samples)

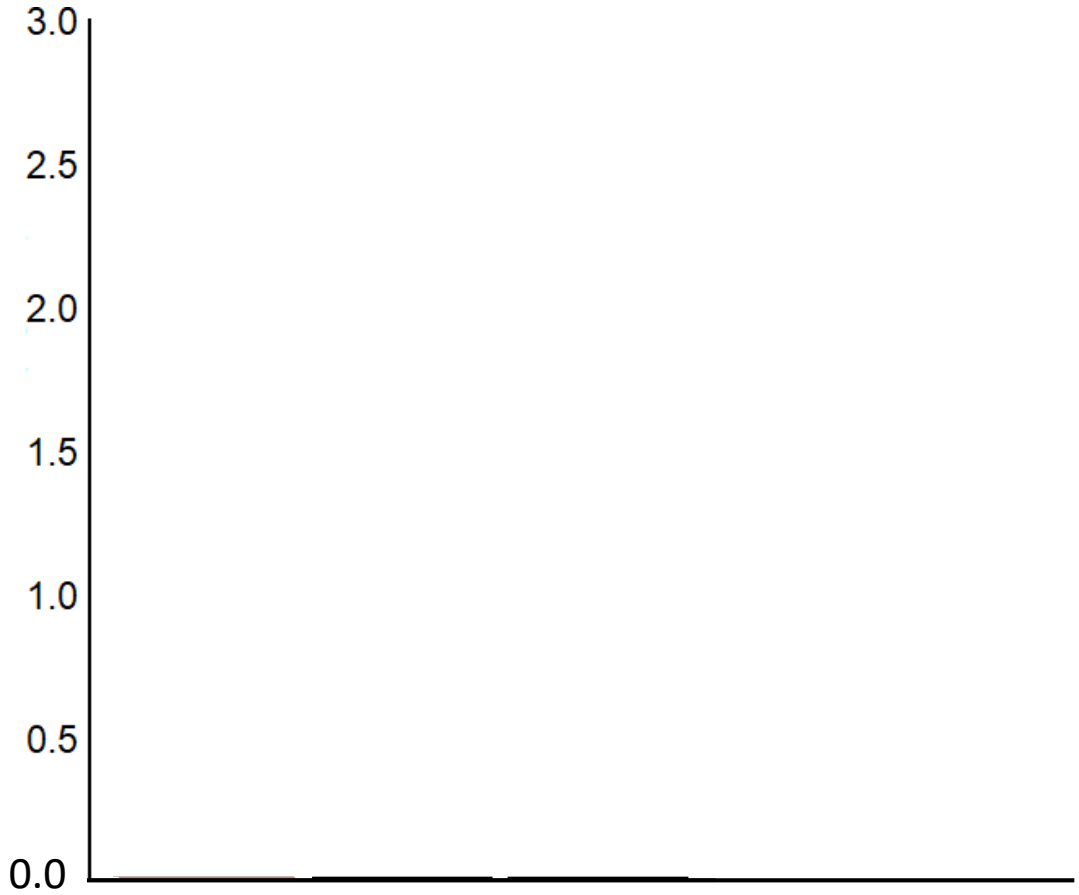
2. PFO4DA (98%)

3. PFO5DoDA (87%)

4. Hydro-EVE (76%)

How much was found?

<u>Median</u> blood concentration (parts per billion)



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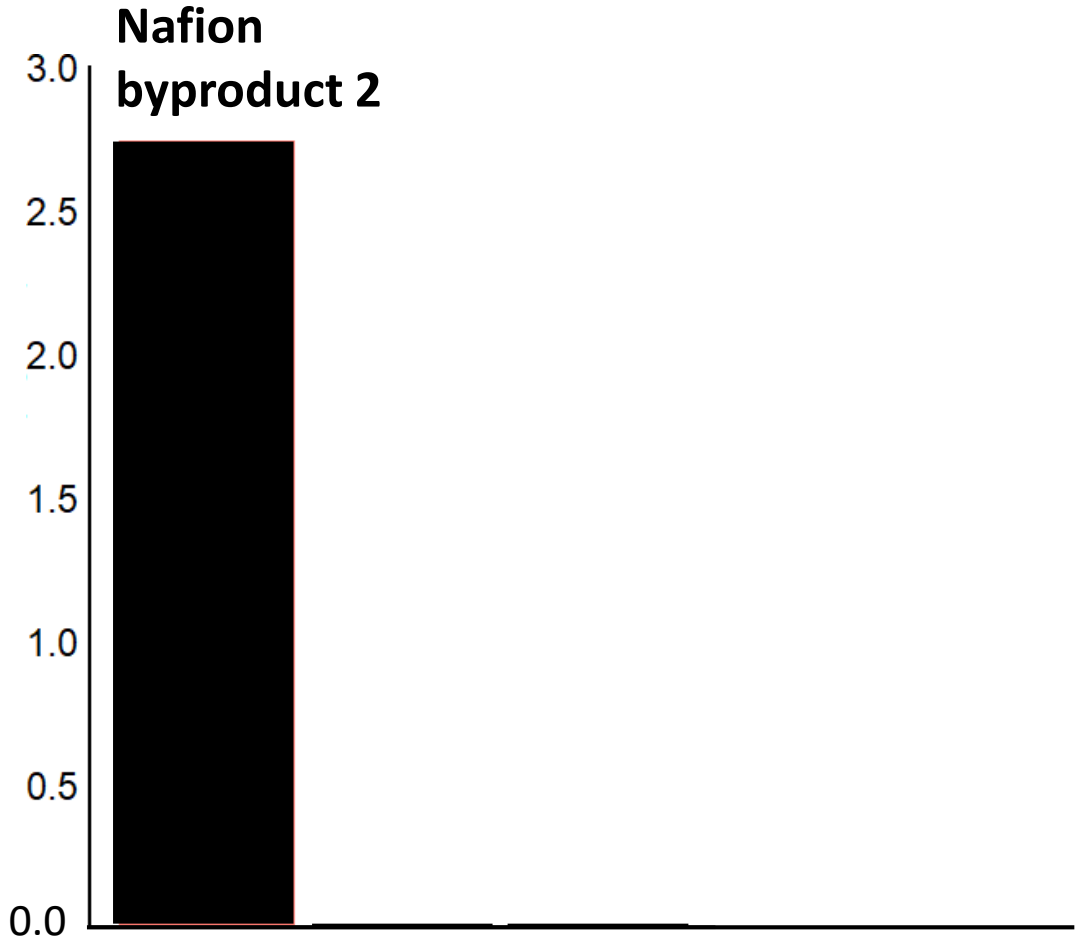

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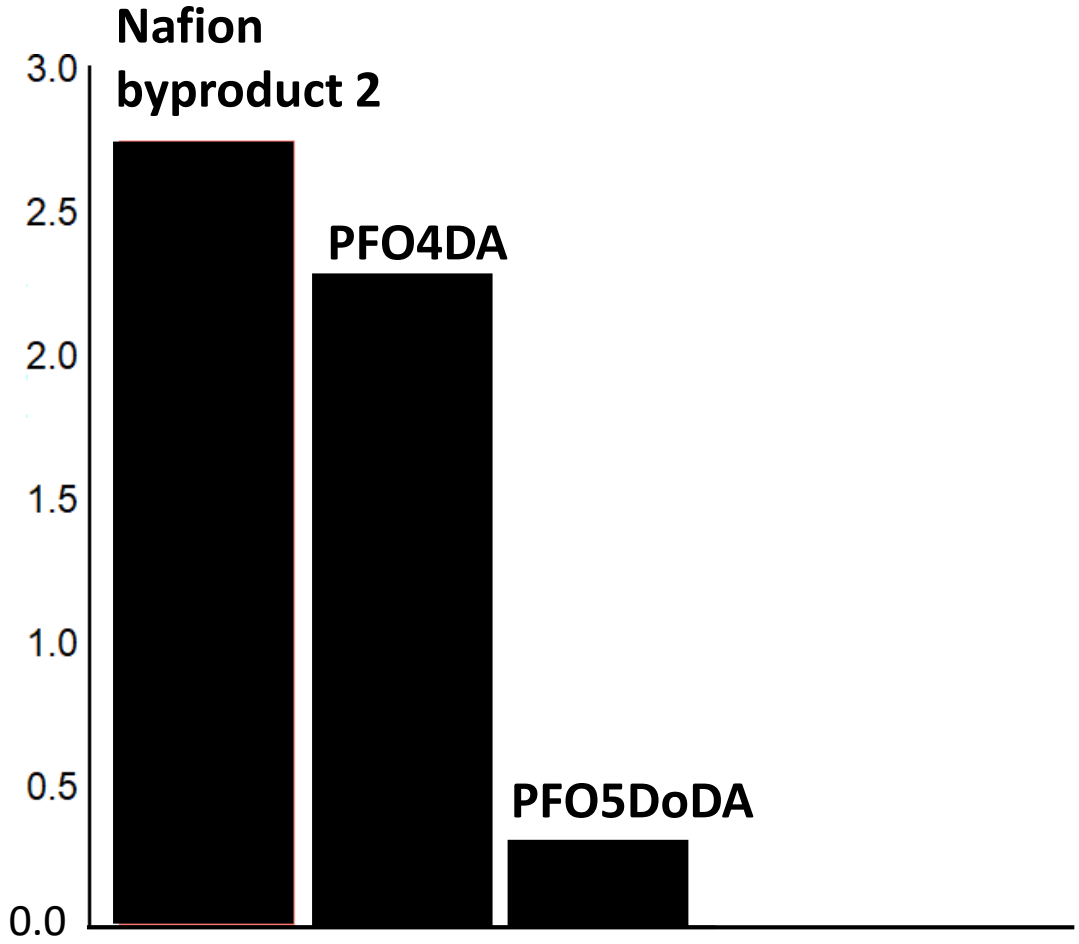

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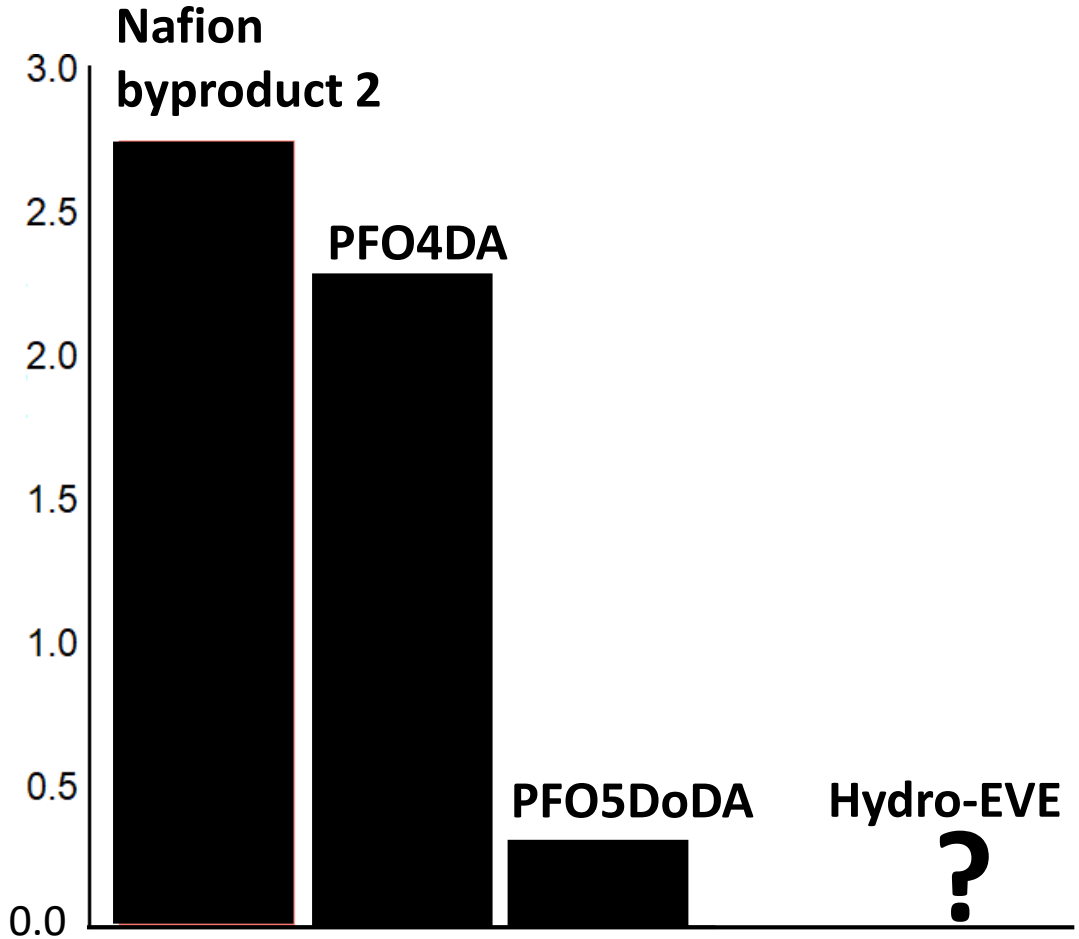

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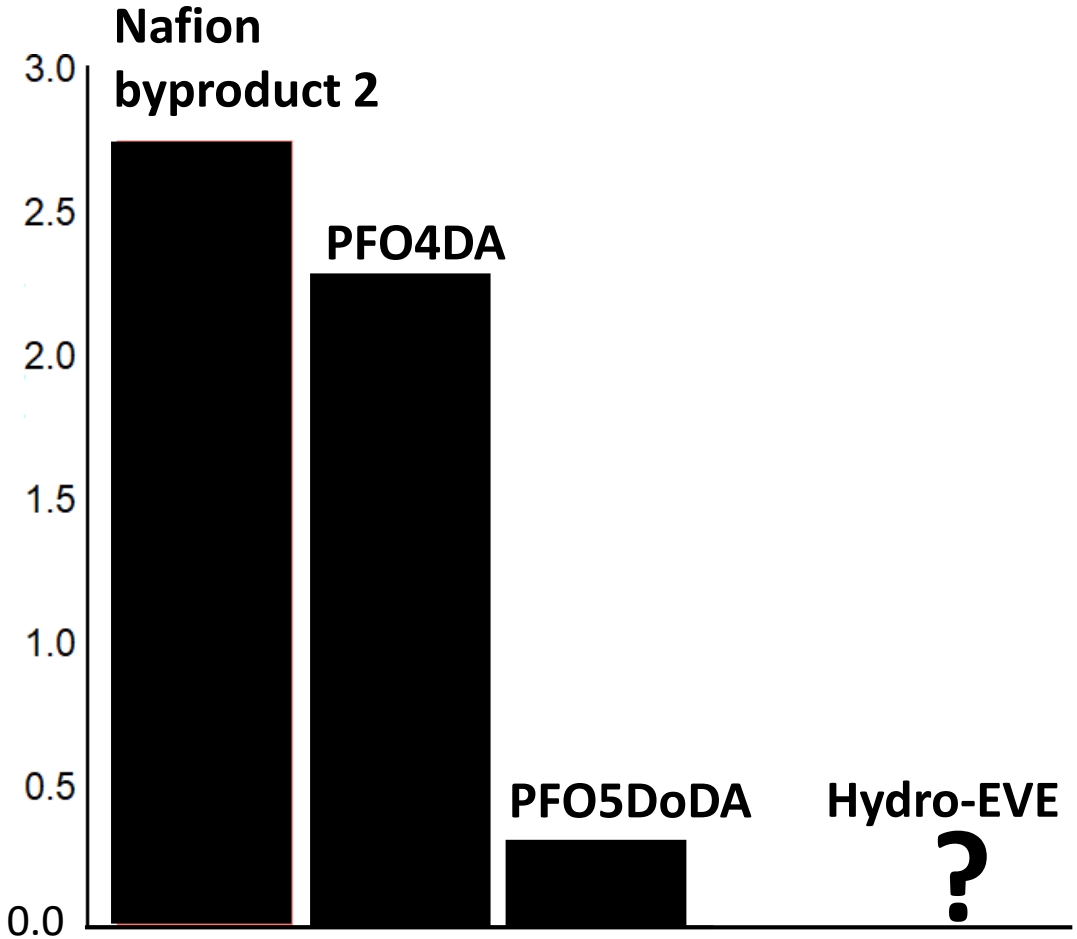

No published health or toxicology data

Are these findings unique to Wilmington?

Yes.

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Yes.

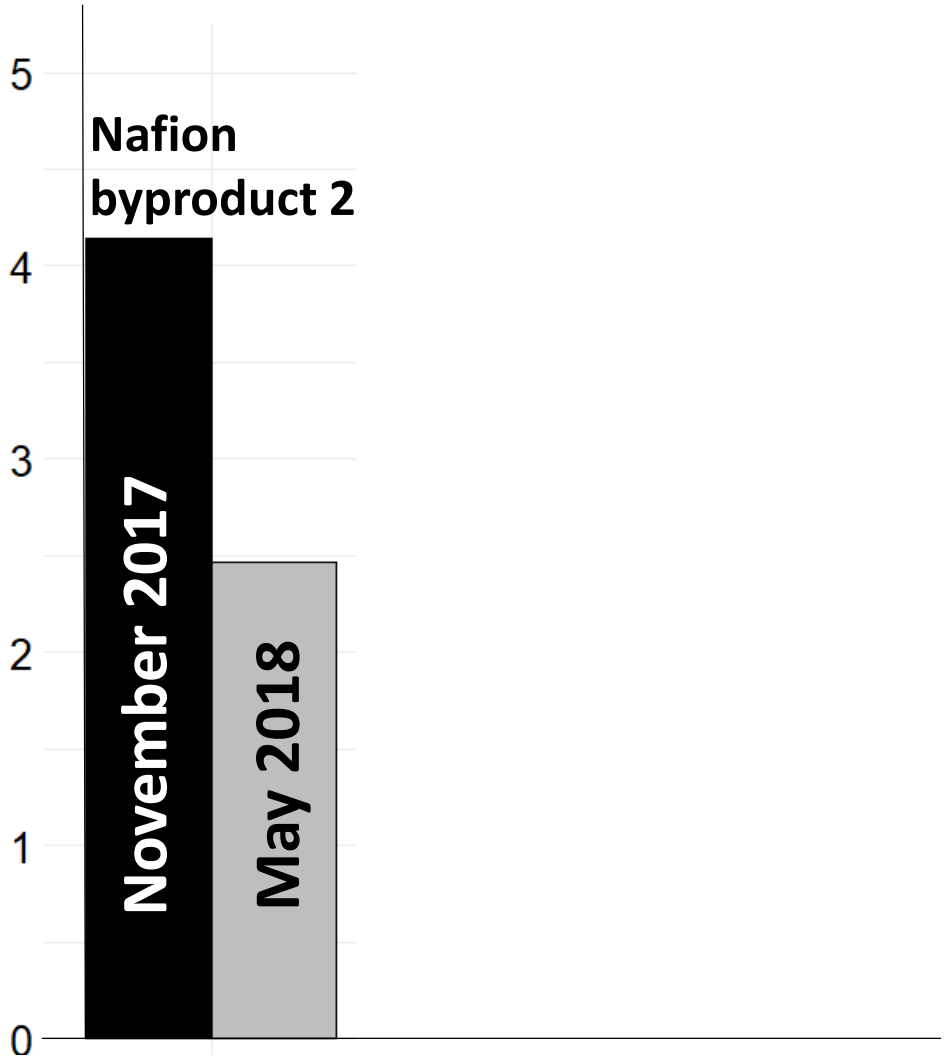
We did not find Nafion byproduct 2, PFO4DA, PFO5DoDA or Hydro-EVE in blood from two other groups.

20 samples. Women, 30-44 years old, in Raleigh, Durham, Chapel Hill, 2008-2009.

24 samples. People in Dayton, OH, with high PFOS exposure, 1992-2014.

Blood concentrations decrease after six months

Median blood concentration for 44 participants (parts per billion)



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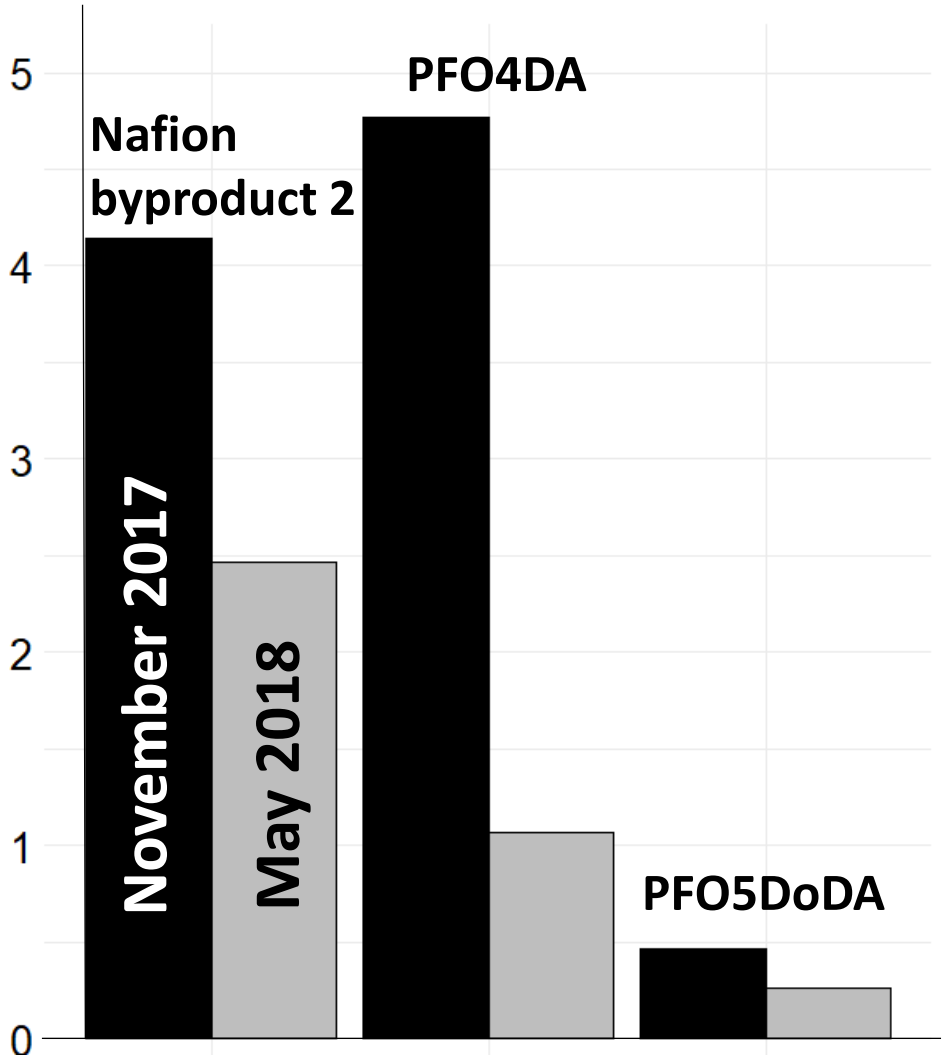


PFAS blood results: Key findings

1. **GenX was NOT detected**

2. **Found four new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE**

   The levels decreased after six months

3. **Levels of historically-used PFAS were higher in Wilmington than United States**

PFAS blood results: Key findings

1. GenX was NOT detected

2. Found new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE
   Their levels decreased after six months

3. Levels of historically-used PFAS were higher in Wilmington than United States

How do we know about other people in United States?

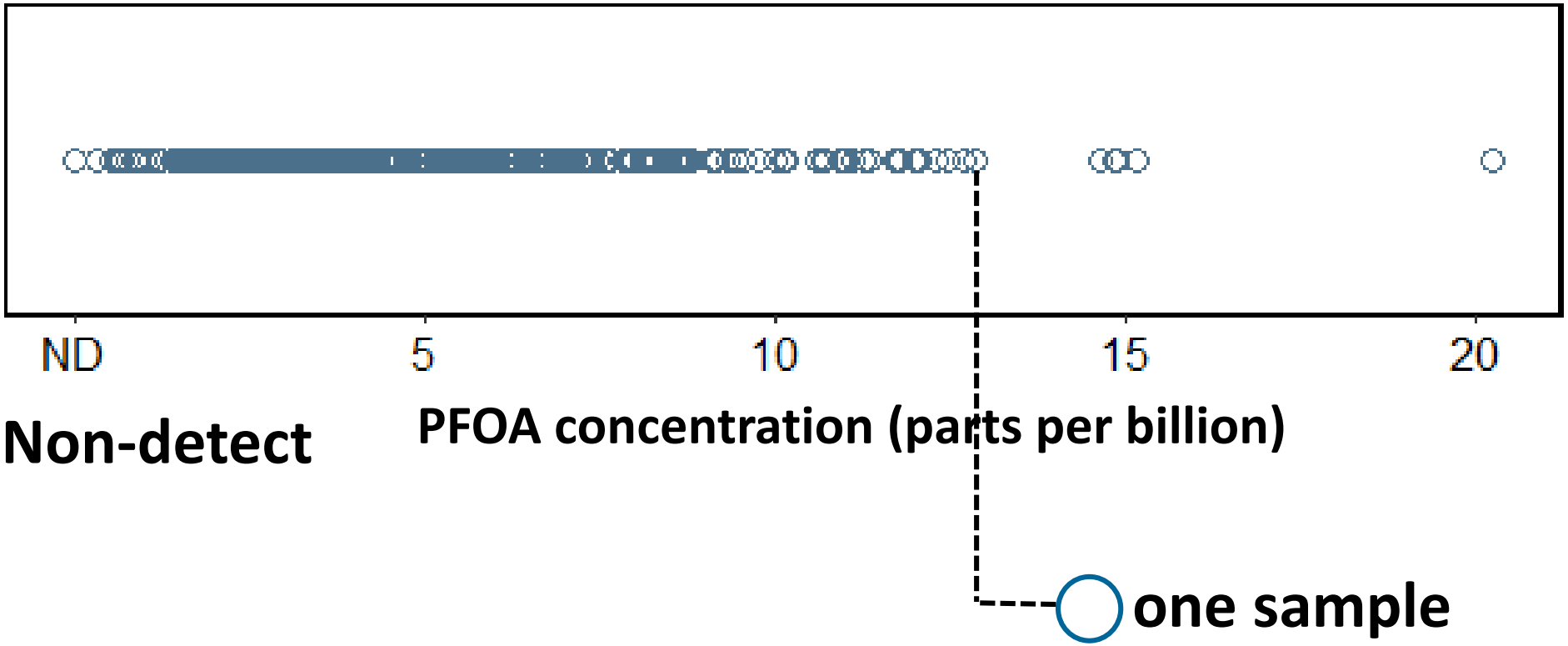
Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES)

PFOA, PFOS, PFHxS, PFNA, PFDA results are publicly-available

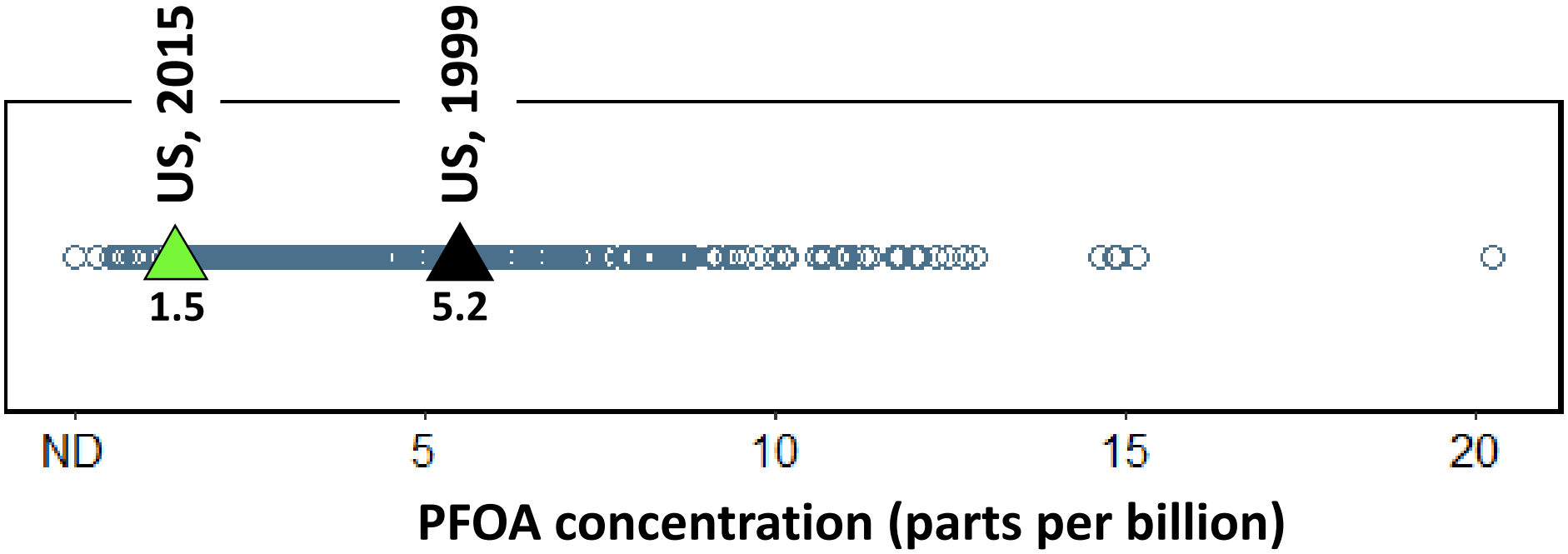
1999-2000 survey

2015-2016 survey

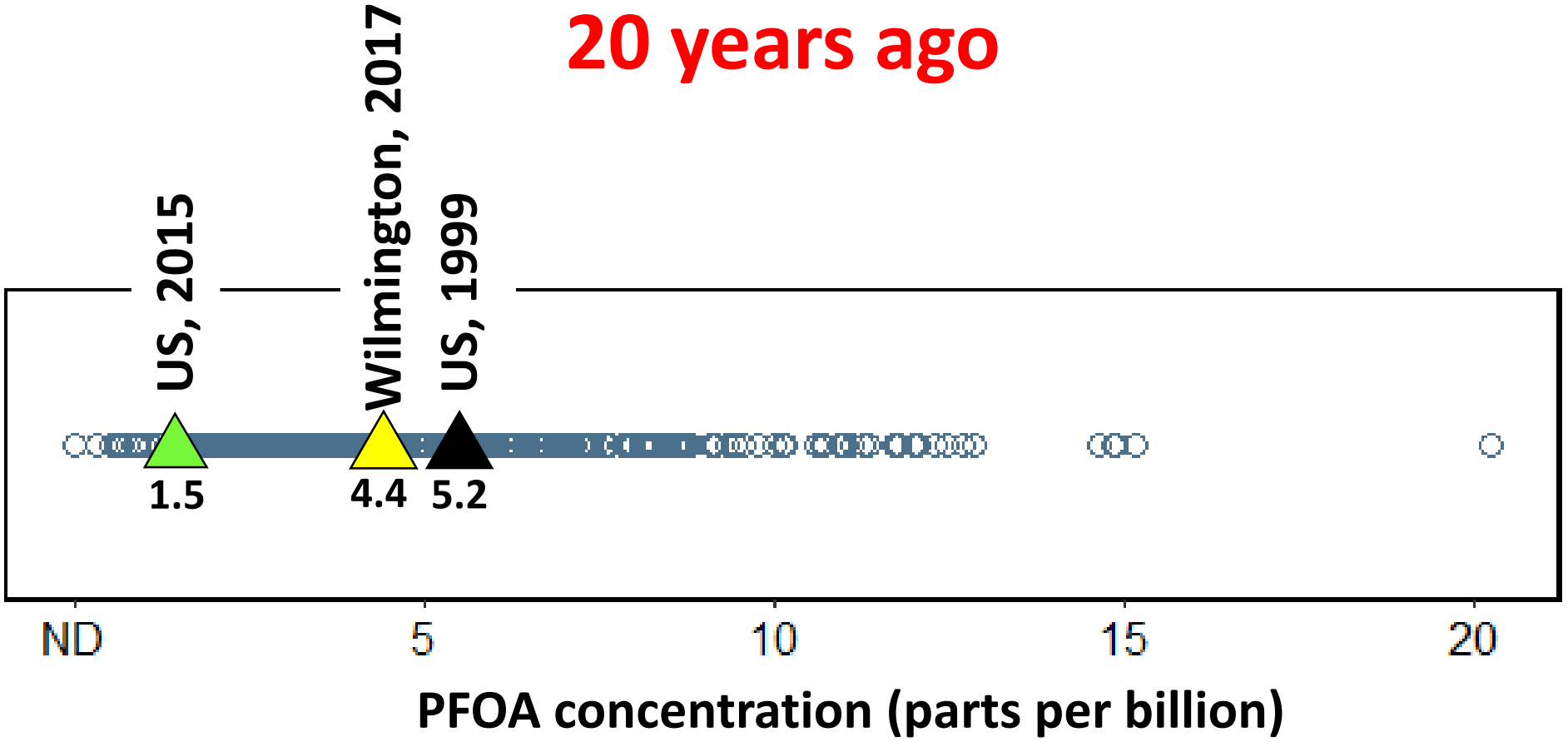
PFOA


ND
5
10
15
20
Non-detect
PFOA concentration (parts per billion)
one sample

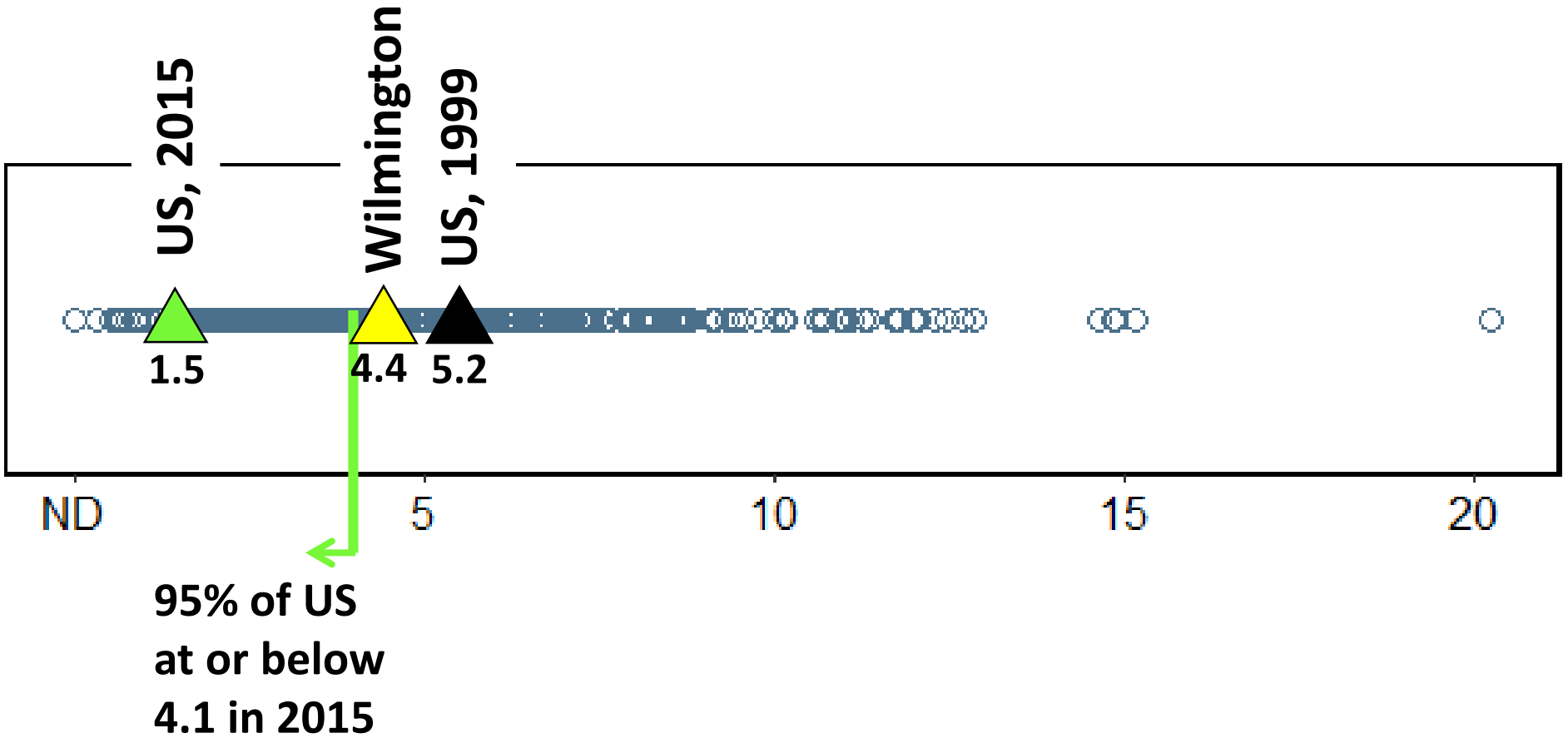
PFOA blood levels in United States have decreased



Wilmington PFOA levels similar to US levels 20 years ago



Half of Wilmington samples above levels for 95% US population in 2015



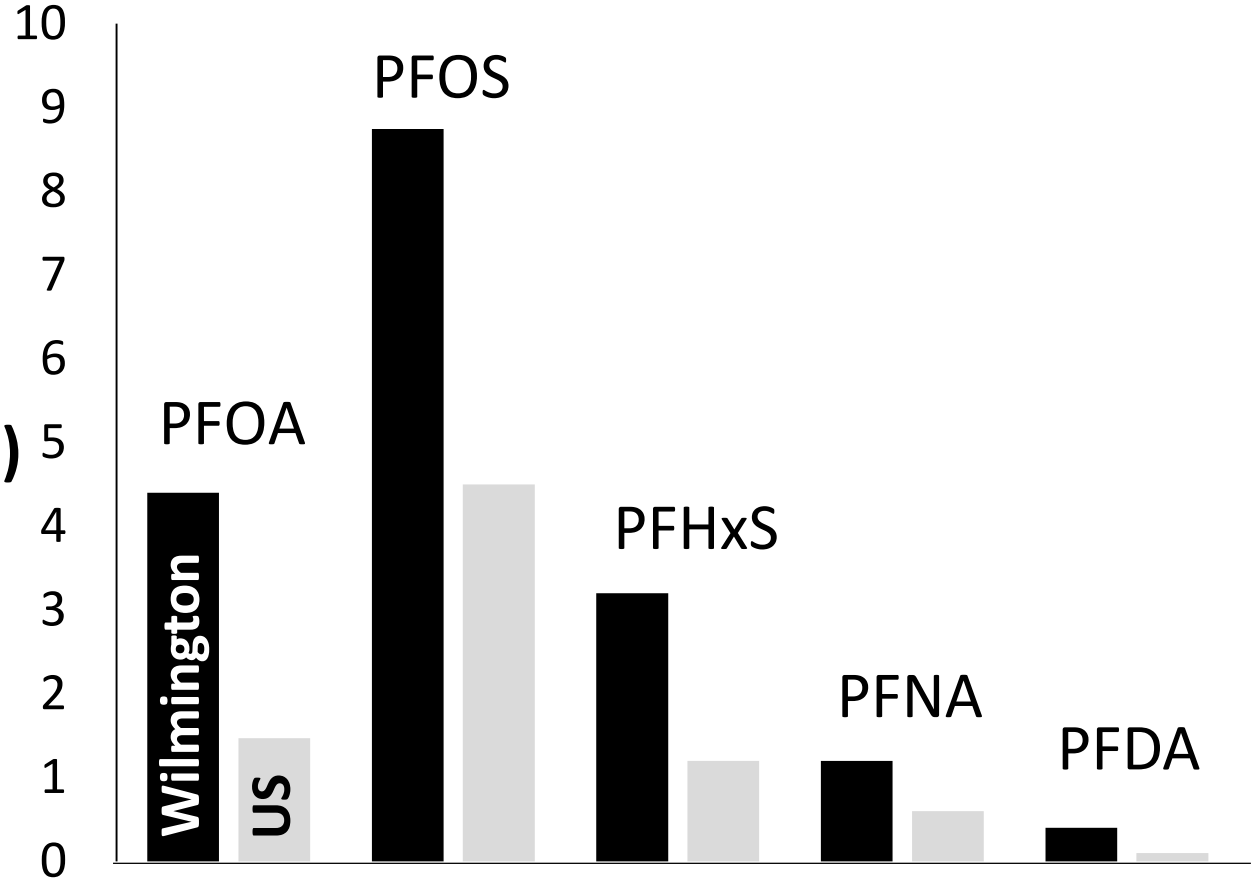
Were other historically-used PFAS levels higher in Wilmington than United States?

Yes.

Were other historically-used PFAS levels higher in Wilmington than United States?

Yes.

Median blood concentration (parts per billion)



What does this mean for Wilmington?

Unusually high exposure to historically-used PFAS compared with United States

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Exposure to historically-used PFAS may result in health effects

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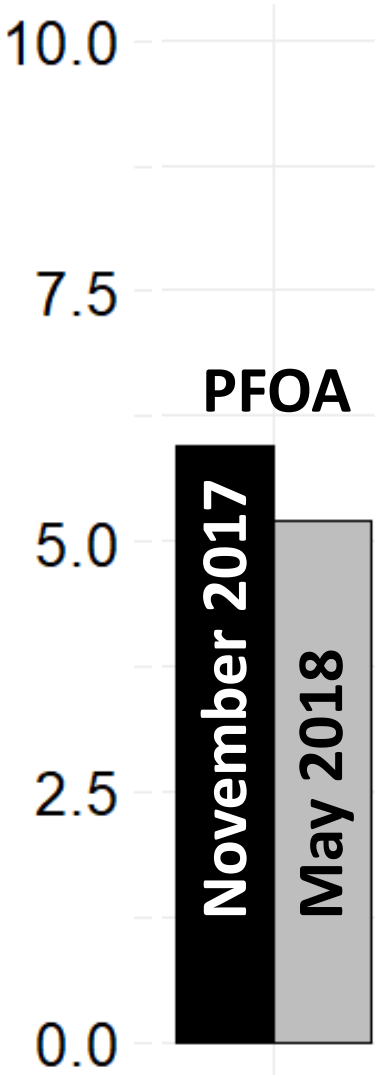
Unusually high exposure to historically-used PFAS compared with United States

Exposure to historically-used PFAS may result in health effects

Do not know what your individual blood level means for your health

Historically-used PFAS levels didn't change much

Median blood concentration for 44 participants (parts per billion)



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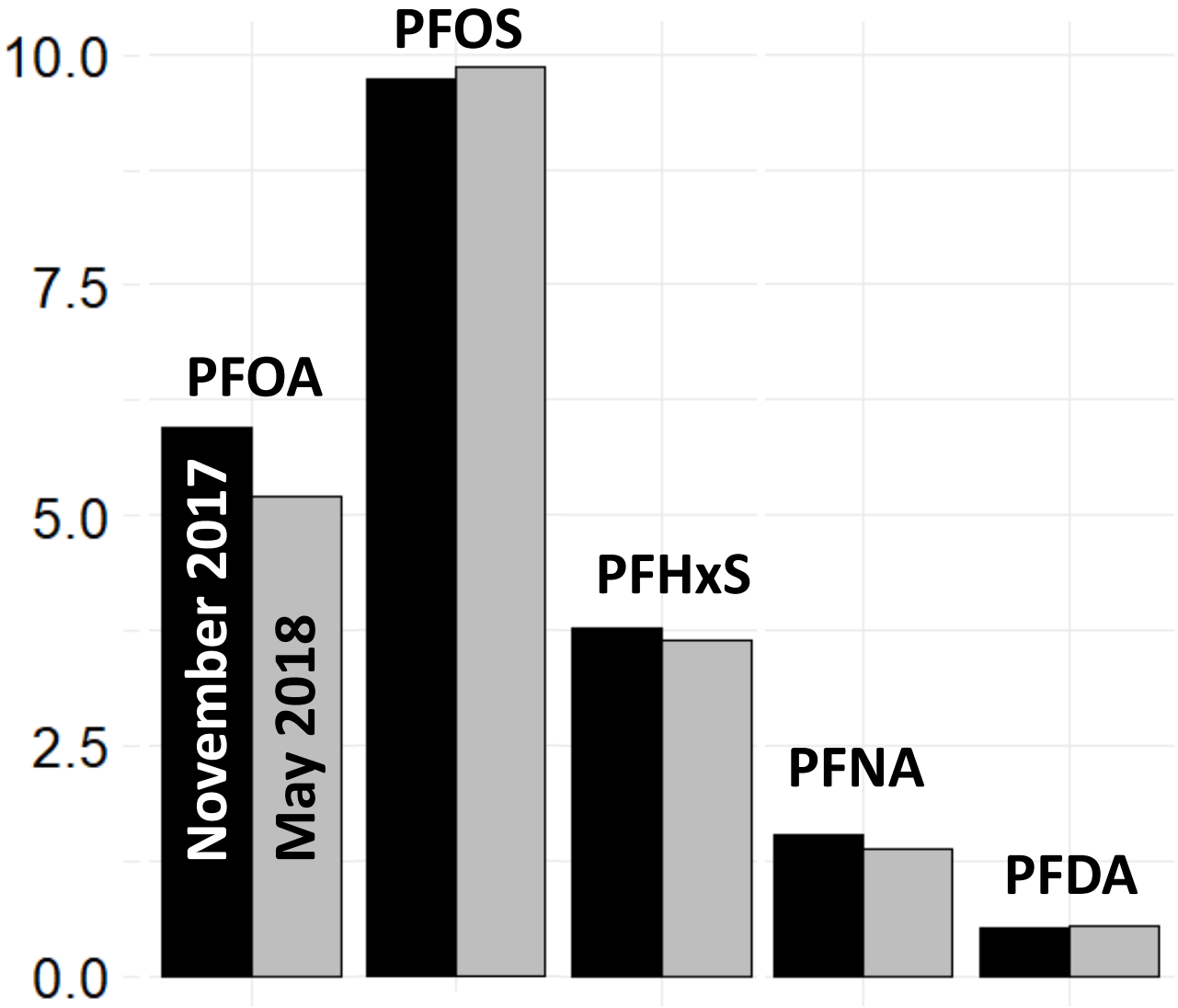

PFAS blood results: Key findings

1. **GenX was not found**
   Even though it was present in tap water

2. Found four new PFAS: Nafion byproduct 2, PFO4DA, PFO5DoDA and Hydro-EVE
   Levels decreased after six months

3. Levels of historically-used PFAS were higher in Wilmington than United States
   Levels didn't change much after six months

Next steps

Test urine samples for PFAS

Identify predictors of PFAS in blood and urine

Analyze PFAS associations with health measures

GenX Exposure Study Team

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- Larry Cahoon

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Thank you to GenX Exposure Study participants