

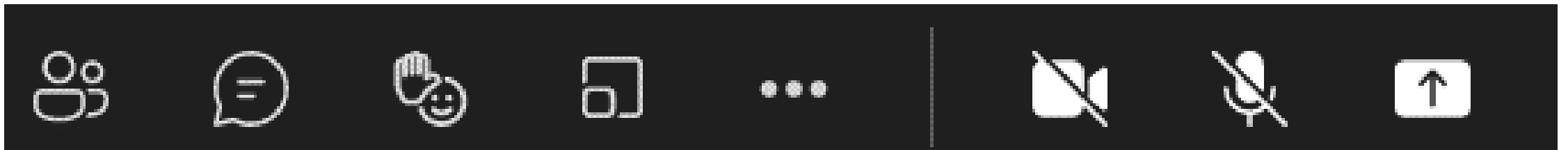


# MPART Citizens Advisory Workgroup

March 12, 2024

# Housekeeping

- Please keep your mic/phone muted unless speaking
- Only use the “raise hand” and/or “chat” function for questions or to request to speak
- Cameras are optional
- This meeting is being recorded



**MPART**

MICHIGAN PFAS ACTION RESPONSE TEAM

# Agenda

- Roll Call – Community Updates
- Subcommittee Reports
- Membership Survey
- DHHS Findings of Health Studies
- MPART Updates
- Schedule of Meetings



**MPART**

MICHIGAN PFAS ACTION RESPONSE TEAM

Roll Call and local updates/events/sharing from communities



**MP**

MICHIGAN PFAS ACTION RESPONSE TEAM

# CAWG Subcommittee's



WEBSITE REVIEW  
SUBCOMMITTEE



PREVENTATIVE MEASURES  
SUBCOMMITTEE

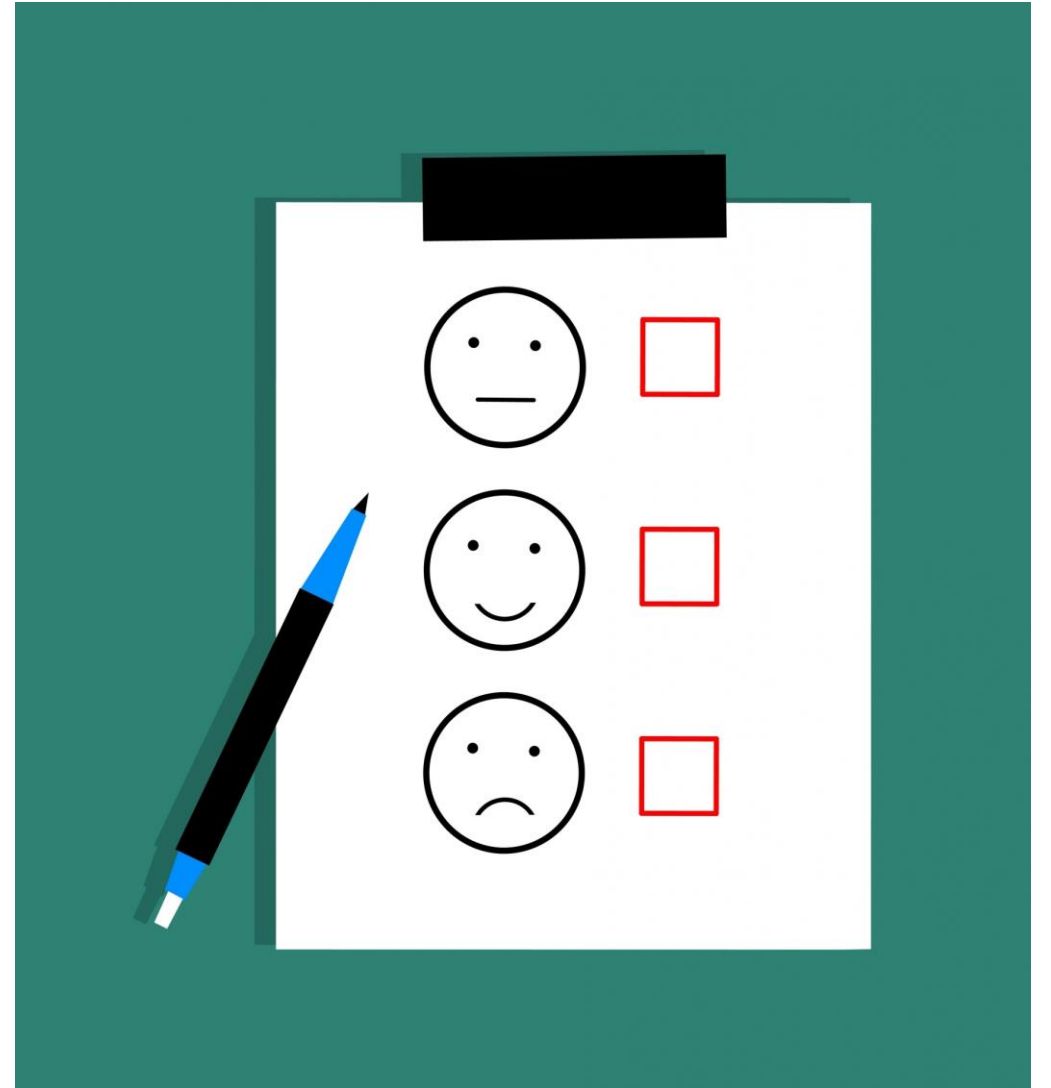


ENGAGING THE PUBLIC  
SUBCOMMITTEE



MEMBERSHIP  
SUBCOMMITTEE

# CAWG Member Survey



# North Kent County PFAS Exposure Assessment (NKCEA)

Presentation of the Second Report

03/12/2024



1/10/2024

**Drinking Water PFAS  
Concentrations and  
Exposure Factors  
Influencing Measured and  
Predicted Serum PFAS  
Concentrations**

Report 2 of the North Kent County Exposure  
Assessment



**SCAN ME**



# Read the Second Report

The full North Kent County PFAS  
Exposure Assessment (NKCEA) report is  
available at: [Michigan.gov/DEHBio](https://Michigan.gov/DEHBio).



# North Kent County PFAS Exposure Assessment (NKCEA)

## Background and Purpose

Rachel Long,  
Epidemiologist



# Background

- PFAS (per- and polyfluoroalkyl substances) were discovered in private drinking water wells in this region.
- MDHHS applied CDC-ATSDR methods<sup>[1]</sup> to **investigate the public health risks** from environmental chemical releases.
- The Belmont-Rockford community's chemical exposure was investigated by **blood testing** and **questionnaires** in the **North Kent County PFAS Exposure Assessment (NKCEA)**.
- NKCEA is **one step** in MDHHS's **continuing** public health investigation.

1: <https://www.atsdr.cdc.gov/pfas/activities/assessments/peatt.html>

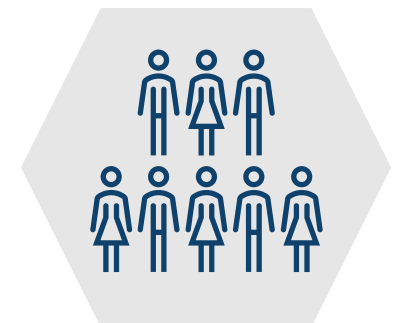
# Second Report Objectives 1 & 2

**Objective 1:** Summarize the PFAS blood concentrations of NKCEA participants.

- Report 1 covered ages 12+ only.
- Report 2 covers all ages and by age group.

**Objective 2:** Compare blood PFAS concentrations of NKCEA participants to NHANES participants.

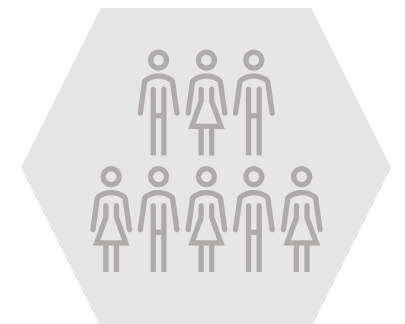
- Report 1 covered ages 12+ only.
- Report 2 covers all ages and by age group.



# Second Report Objectives 3 & 4

**Objective 3:** Examine the connection between drinking water PFAS concentrations and blood PFAS concentrations.

**Objective 4:** Identify factors that can affect blood PFAS concentrations.



# Households Were Eligible if They:

- Were on a **private drinking water well** tested by, or at the direction of, the Department of Environment, Great Lakes, and Energy (EGLE).



and

- Had a **detectable levels of PFAS** as reported to MDHHS from EGLE.



# Household Selection

## Group 1

**Less than 70 ppt total PFAS in well water**

**591 households**

**235 (40%) selected**

## Group 2

**Greater than or equal to 70 ppt total PFAS in well water**

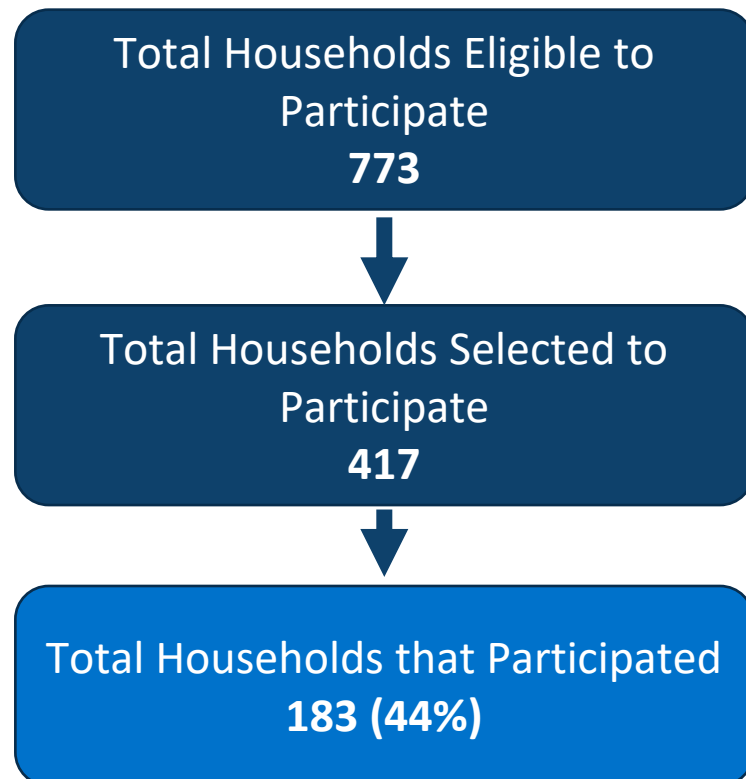
**182 households**

**182 (100%) selected**

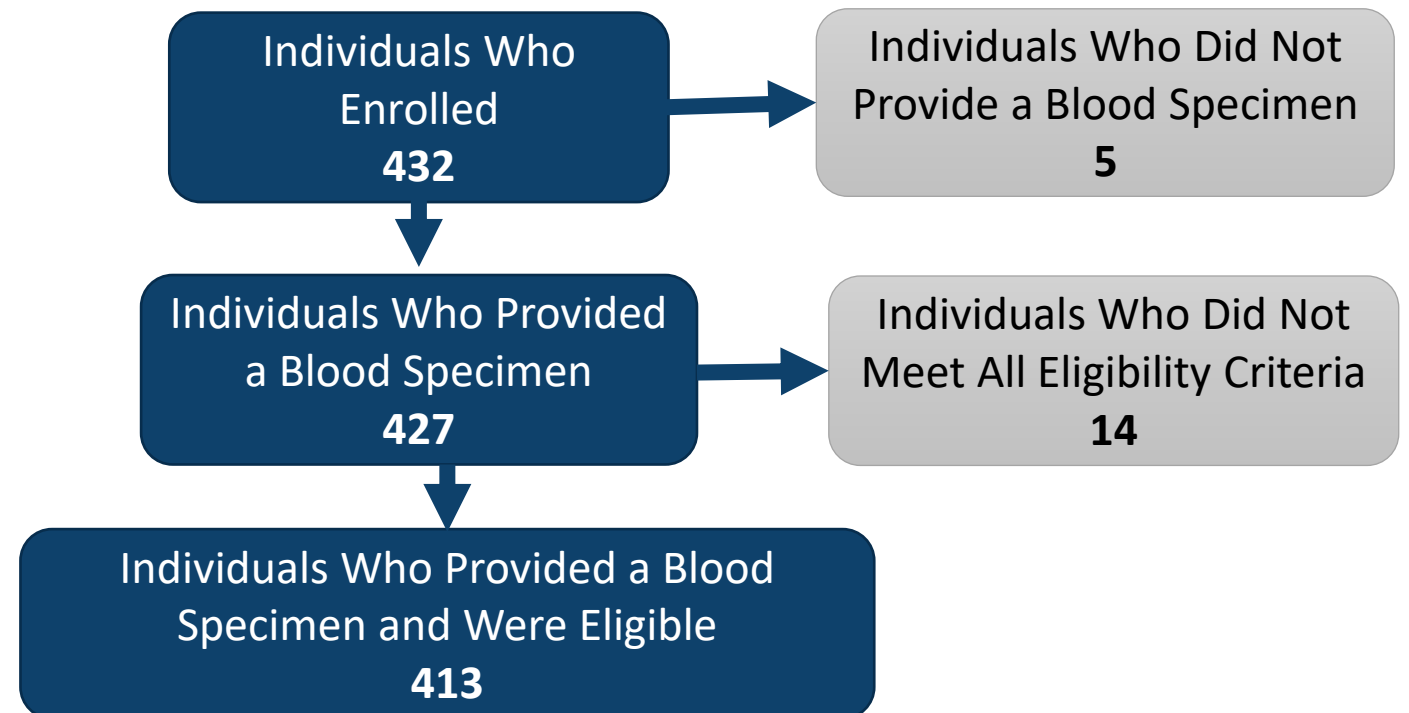
**ppt = parts per trillion (nanograms per liter [ng/L])**

# Participants in NKCEA

## Households



## Individuals



# What Data Did We Collect in the Questionnaire?

## All Participants (Adults and Minors)

- History of living in North Kent County.
- Water consumption.
- Dietary habits
  - (local foods)
- Demographics.

### Adults

- Factors affecting PFAS excretion
  - e.g., diabetes, kidney disease, pregnancy, menstruation.
- Job history in PFAS-related industries and in affected area.

### Adults with Children

- Breastfeeding and formula feeding.
- Schools and daycares in affected area.



# PFAS Measured in Blood and Water

PFOA**	L-PFOA*	Br-PFOA*	PFOS**	L-PFOS*	Br-PFOS*
PFHxS**	L-PFHxS*	Br-PFHxS*	PFNA	PFBS	PFTeA
PFTriA	PFDoA	PFUnA	PFDA	PFHpA	PFHxA
PFPeA	PFBA	PFDS	PFNS	PFHpS	PFPeS
PFOSA	FTS 8:2	FTS 6:2	FTS 4:2	EtFOSAA	MeFOSAA

\*Linear (L) and branched (Br) isomers

\*\*Total sum of branched and linear

# Objective 2: Summary

The blood PFAS concentrations found in certain ages of NKCEA participants were **higher** than the NHANES 95<sup>th</sup> percentile for some PFAS:

## Ages 3-11

- PFOA
- L-PFOA
- Br-PFOA
- PFOS
- Br-PFOS
- PFHxS
- PFHpA

## Ages 12 and Older

- PFOA
- L-PFOA
- PFOS
- L-PFOS
- Br-PFOS
- PFHxS
- PFNA
- PFHpS
- MeFOSAA



# North Kent County PFAS Exposure Assessment: Objective 3

Examine the **connection** between drinking water PFAS concentrations and serum (blood) PFAS concentrations.



Joost van 't Erve,  
Toxicologist



# Summary of Select PFAS Water Results

- Filtered and unfiltered water was collected from all 183 households in the study.
- 29 of the 30 measured PFAS were found in at least some of the unfiltered samples (all except PFTeA).
- Filtered samples had much lower detection frequencies (or number of times PFAS was found) and concentration of PFAS.

Analyte	Unfiltered drinking water detection frequency (%)	Maximum concentration (ppt)	Geometric Mean (ppt)
PFOA	54	13,184	14.97
PFOS	41	46,048	10.35
PFHxS	54	8,691	11.62

Analyte	Filtered drinking water detection frequency (%)	Maximum Concentration (ppt)
PFOA	1	5
PFOS	3	31
PFHxS	2	19

# PFAS Included in Analysis

In this report, we studied the PFAS bolded and highlighted in green because we found that more than half of the NKCEA participants had these PFAS in their blood.

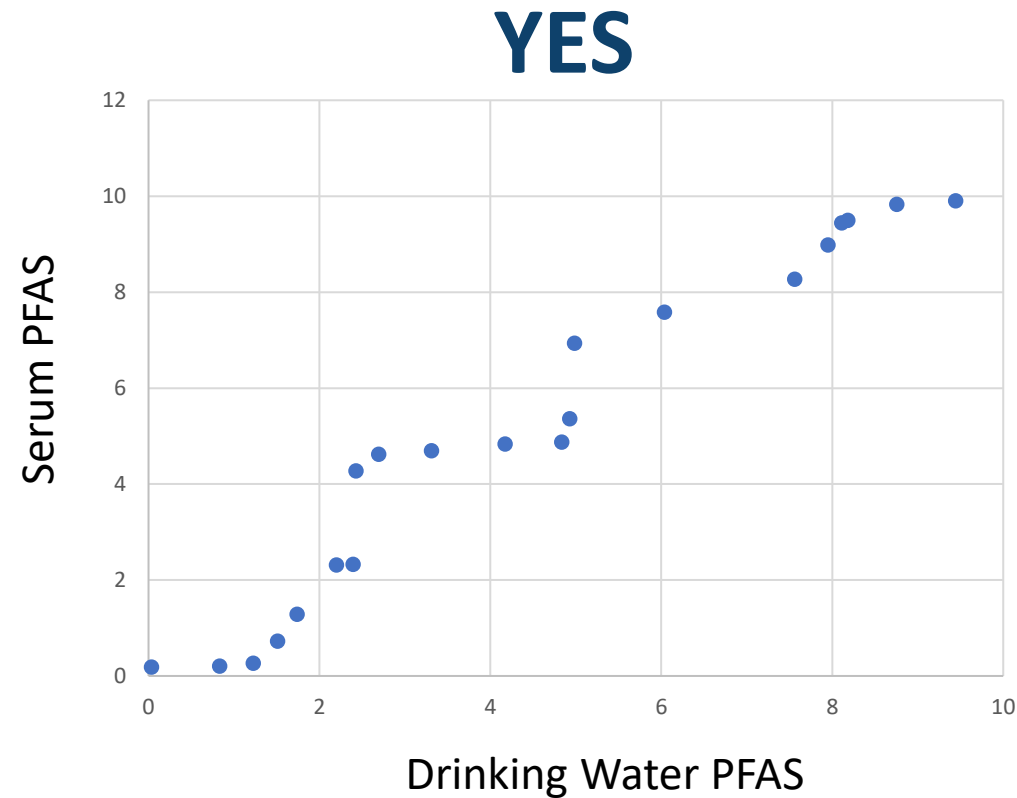
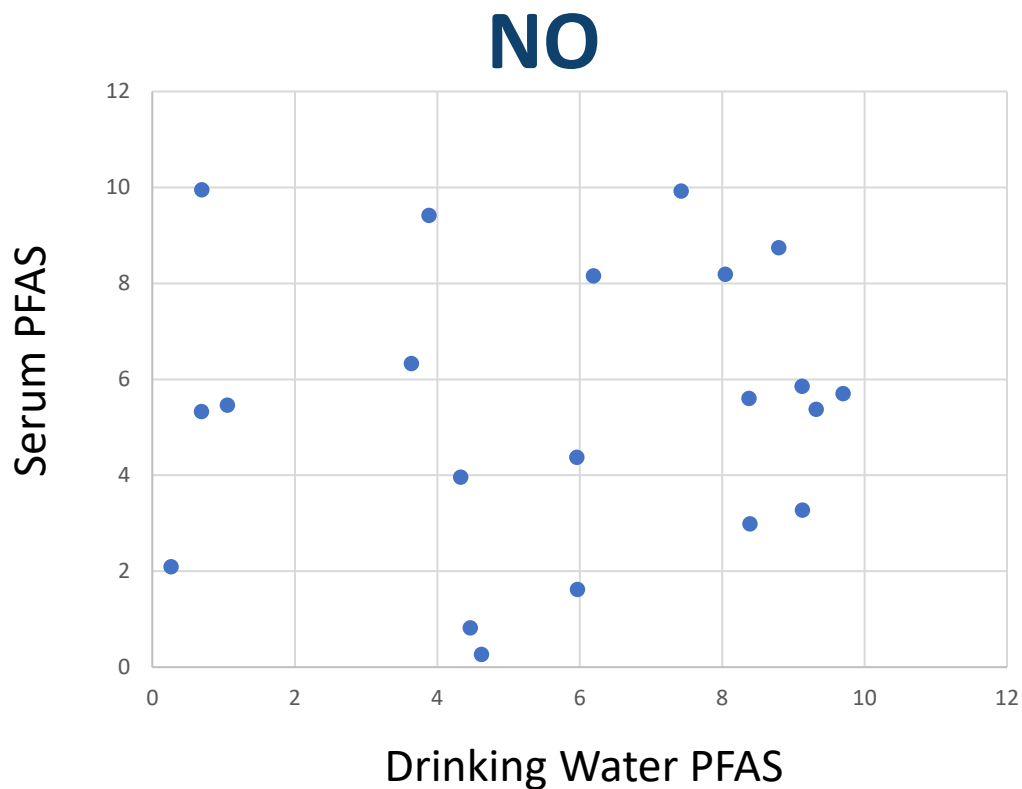
<b>PFOA</b>	<b>L-PFOA</b>	Br-PFOA	<b>PFOS</b>	<b>L-PFOS</b>	<b>Br-PFOS</b>
<b>PFHxS</b>	<b>L-PFHxS</b>	<b>Br-PFHxS</b>	PFNA	PFBS	PFTeA
PFTriA	PFDoA	PFUnA	PFDA	<b>PFHpA</b>	PFHxA
PFPeA	<b>PFBA</b>	PFDS	PFNS	<b>PFHpS</b>	<b>PFPeS</b>
PFOSA	FTS 8:2	FTS 6:2	FTS 4:2	EtFOSAA	MeFOSAA



<b>PFOA</b>	<b>L-PFOA</b>	<b>PFOS</b>
<b>L-PFOS</b>	<b>Br-PFOS</b>	<b>PFHxS</b>
<b>L-PFHxS</b>	<b>Br-PFHxS</b>	<b>PFHpA</b>
<b>PFBA</b>	<b>PFHpS</b>	<b>PFPeS</b>

# Understanding Results: Looking for Associations

- Is there a connection or “association” between PFAS in serum (blood) and drinking water at the time of study?

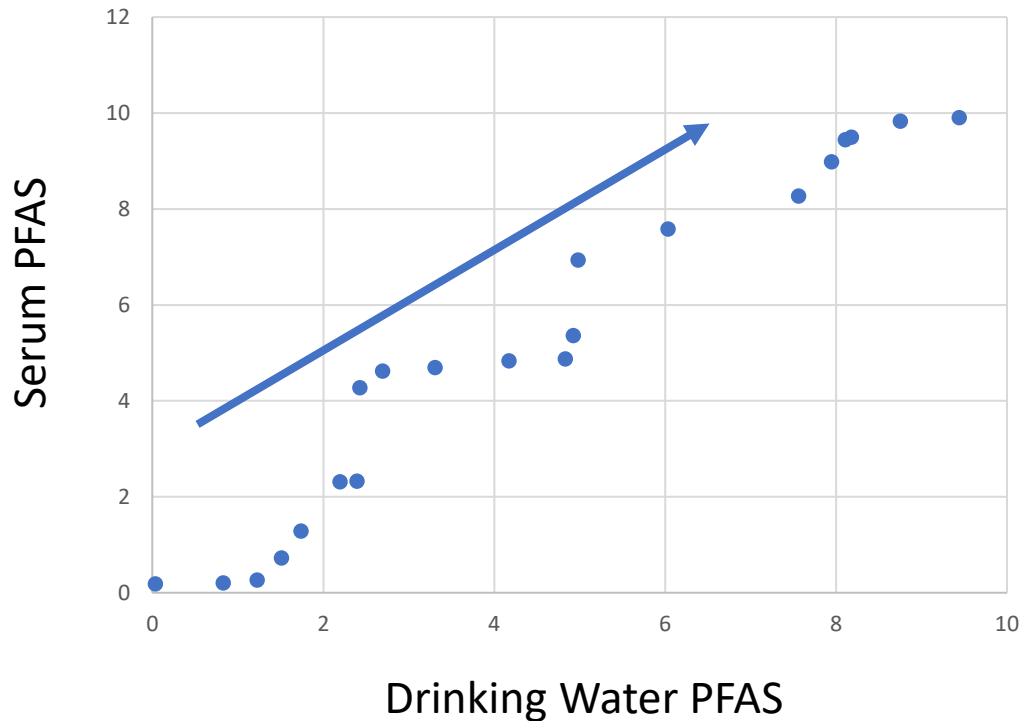


NOTE: Data is simulated and does not represent individuals in this study.

# Understanding Results: Positive and Negative Associations

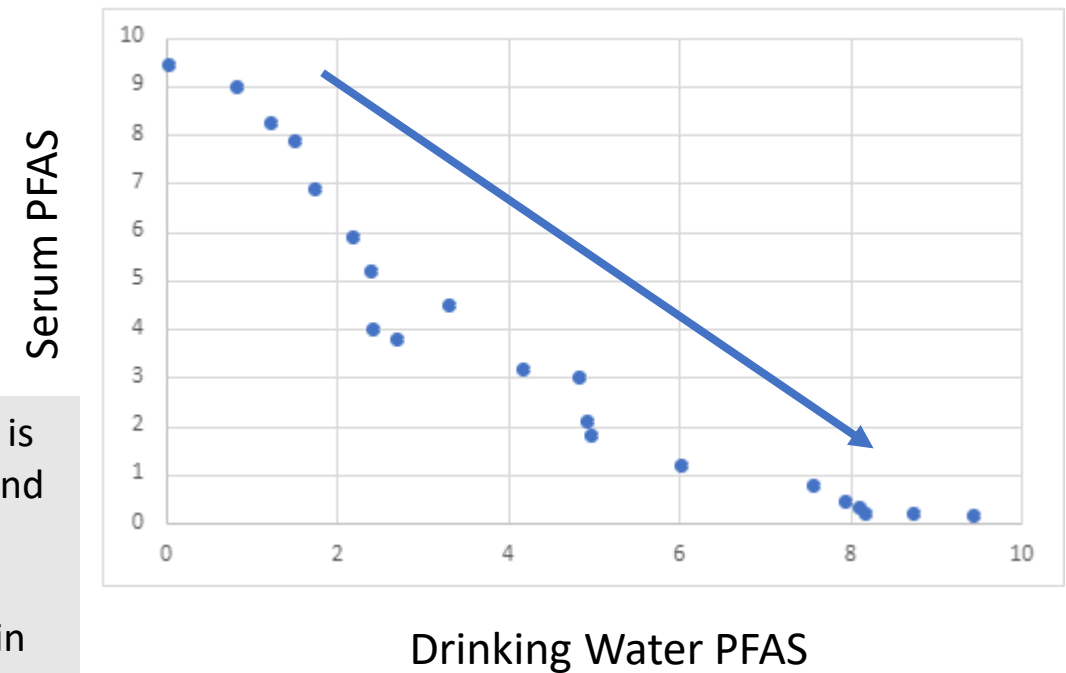
There are two types of associations discussed in this report.

## Positive Association



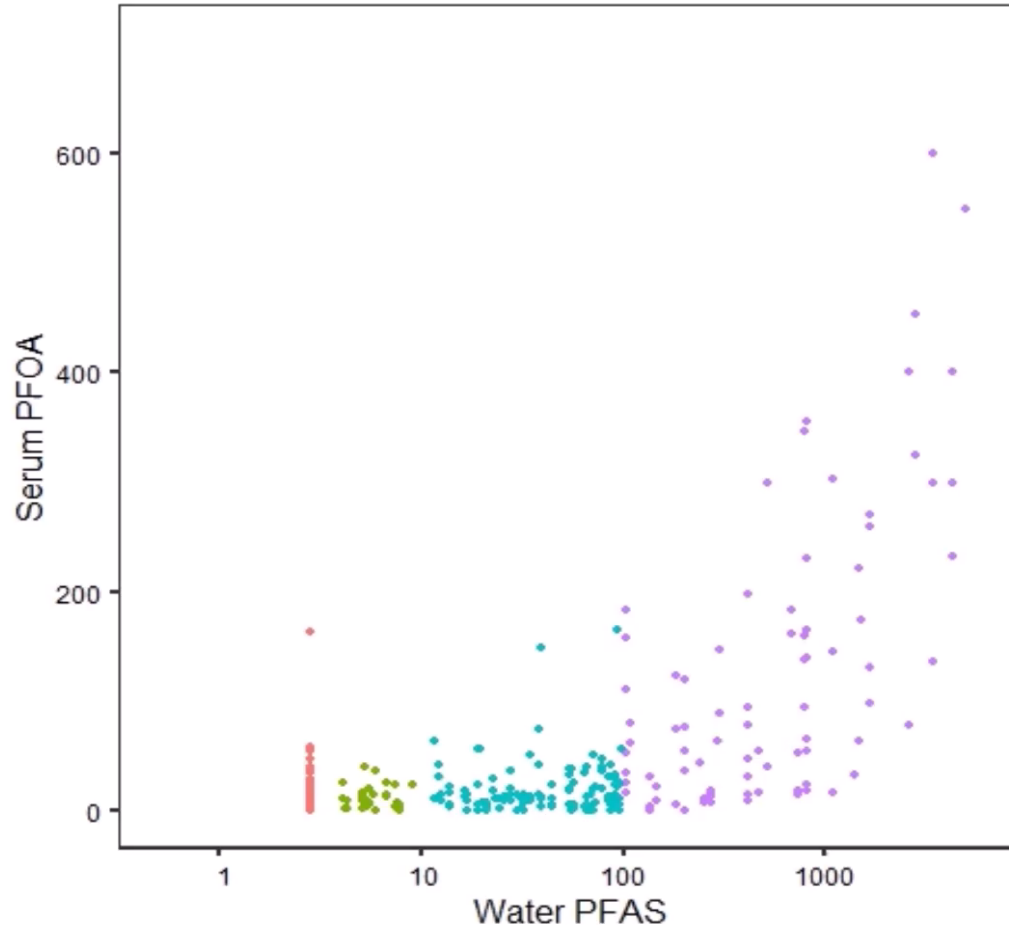
NOTE: Data is simulated and does not represent individuals in this study.

## Negative Association



# Understanding Results: Going from Raw Data to Groupings and Statistics

1. Grouping data
2. Visual of group distribution
3. Calculating group statistics
  - Geometric mean (average)
  - 5<sup>th</sup> percentile (bottom 5%)
  - 95<sup>th</sup> percentile (top 5%)
4. Comparing between groups

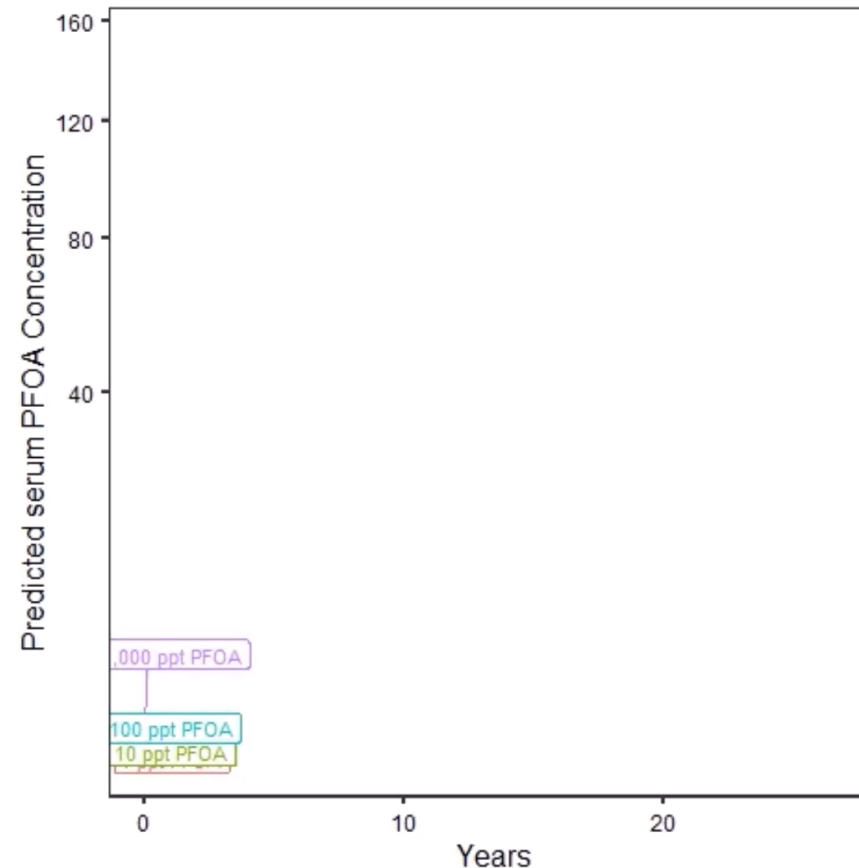


NOTE: Data is simulated and does not represent individuals in this study.



# Estimating Serum (Blood) PFAS Concentrations for People Drinking Water with High PFAS Concentrations

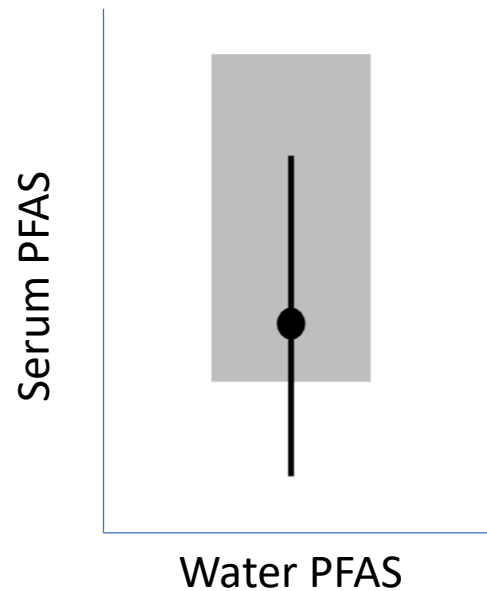
1. Simulating lifetime of PFAS exposure
2. Use maximum values to display boundaries
3. Shuffle axis to align with other graphs



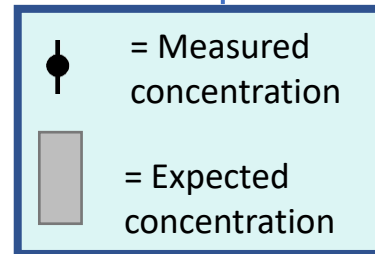
NOTE: Data is ideal simulation and does not represent individuals in this study.

# Understanding Results: Comparing Predicted to Measured Serum (Blood) PFAS Concentrations

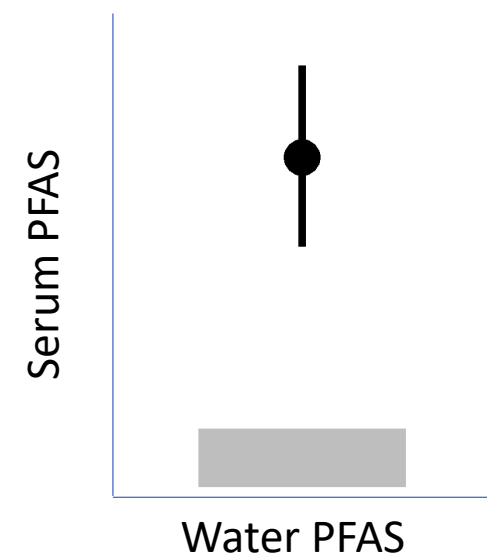
## Good prediction or slight overprediction



Exposure through the drinking water pathway is likely the major water source.



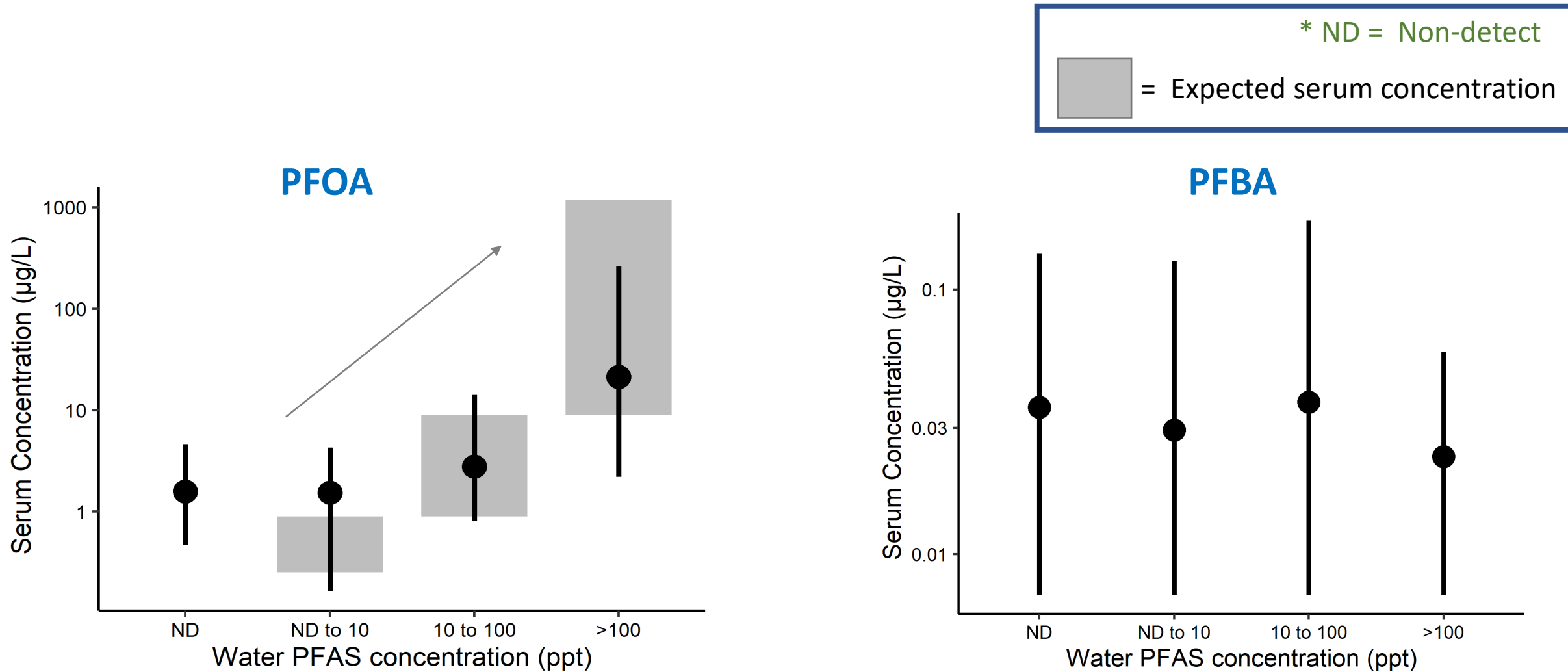
## Underprediction



Sources of PFAS exposure other than drinking water are major sources.

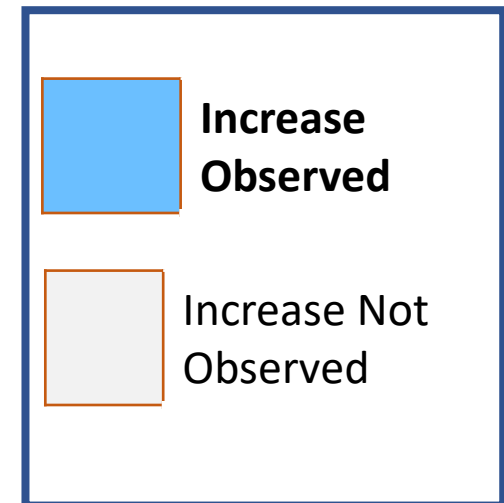
NOTE: Data is simulation and does not represent individuals in this study.

# Measured and Estimated Serum (Blood) PFAS Concentrations in Unfiltered Drinking Water

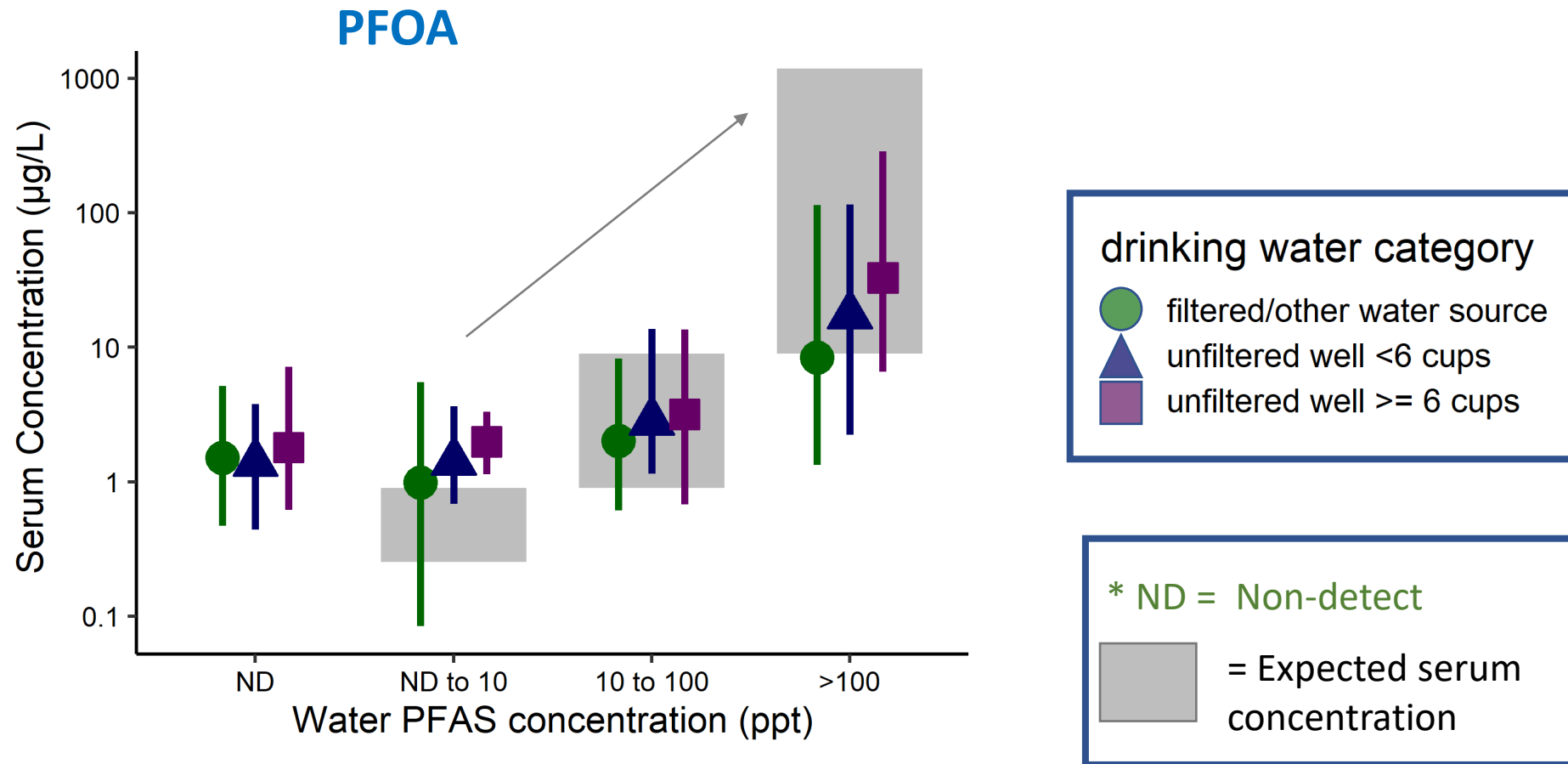


# Increase in Serum (Blood) PFAS Concentrations with Greater Unfiltered Drinking Water PFAS Concentrations

<b>PFOA</b>	<b>L-PFOA</b>	<b>PFOS</b>
<b>L-PFOS</b>	<b>Br-PFOS</b>	<b>PFHxS</b>
<b>L-PFHxS</b>	<b>Br-PFHxS</b>	PFHpA
PFBA	<b>PFHpS</b>	<b>PFPeS</b>

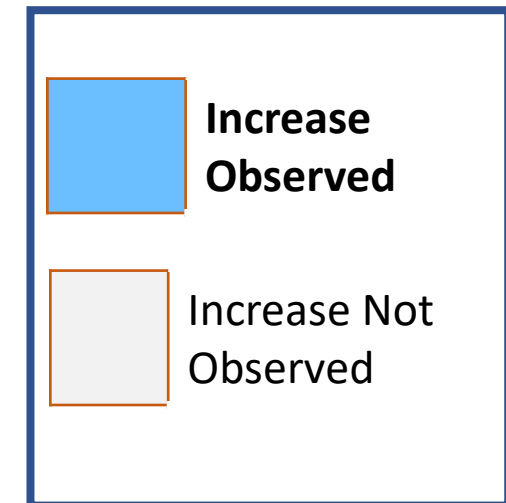


# How Drinking Unfiltered Water Versus Filtered Water at Different Concentrations Affects Serum (Blood) PFAS Concentrations



# Influence of Unfiltered Drinking Water Consumption Amount and Filter Use on Serum (Blood) PFAS

<b>PFOA</b>	<b>L-PFOA</b>	<b>PFOS</b>
<b>L-PFOS</b>	<b>Br-PFOS</b>	<b>PFHxS</b>
<b>L-PFHxS</b>	<b>Br-PFHxS</b>	PFHpA
PFBA	<b>PFHpS</b>	<b>PFPeS</b>



# Combining PFAS Concentration and Drinking Water Amount Into One Metric

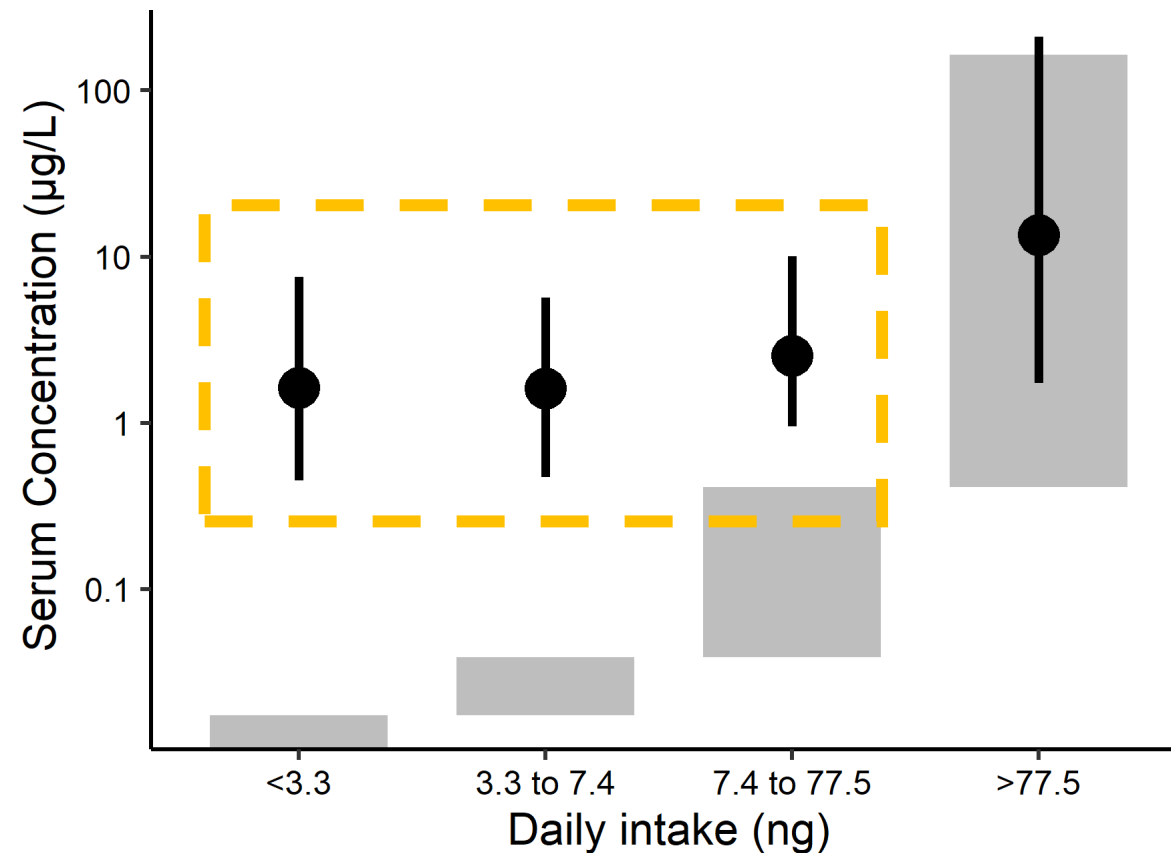
- Use participant-provided survey responses and exposure history to calculate average amount of PFAS consumed per day.
  - Assumptions are that drinking bottled water or using a filter does not add to PFAS exposure for the time reported.
  - Considers people who drink a lot of water with low PFAS concentrations or people who don't drink as much water but have higher PFAS water concentrations.

$$\text{Daily intake} = \text{Water Concentration} \left( \frac{\text{ng}}{\text{L}} \right) \times \text{Water consumption amount} \left( \frac{\text{L}}{\text{day}} \right)$$

Example	Daily intake (ng/day)	Water concentration (ng/L or ppt)	Water consumption amount (L/day)
1	28	20	1.4
2	28	10	2.8
3	30	50	0.6

# Average Daily Intake from Drinking Water and Blood PFAS


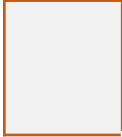
- Modeled and measured PFAS blood concentrations are very similar for higher daily intake from drinking water.
- At lower drinking water intake, other exposure sources also significantly contribute (yellow box).





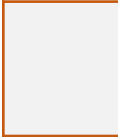
# Increase in Daily Intake and Serum (Blood) PFAS

<b>PFOA</b>	<b>L-PFOA</b>	<b>PFOS</b>
<b>L-PFOS</b>	<b>Br-PFOS</b>	<b>PFHxS</b>
<b>L-PFHxS</b>	<b>Br-PFHxS</b>	<b>PFHpA</b>
<b>PFBA</b>	<b>PFHpS</b>	<b>PFPeS</b>

	<b>Increase Observed</b>
	<b>Increase Not Observed</b>

# Daily Intake and Residence Duration

PFOA	L-PFOA	PFOS
L-PFOS	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	<b>PFHpA</b>
PFBA	PFHpS	PFPeS

	Increase Observed
	Increase Not Observed

# Summary of Objective 3

- For almost all PFAS, we saw higher concentrations in serum (blood) with increasing concentrations in the drinking water.
- Determining the average daily intake of PFAS in the drinking water best describes the expected serum concentrations.
- Drinking from a well with PFAS for a longer period does not necessarily further increase serum PFAS concentrations.
- These are very important for determining further influences (Objective 4) since participants' drinking water exposure varied widely.



# North Kent County PFAS Exposure Assessment: Objective 4

- **Identify factors** that can affect how much PFAS is in people's blood.
- Factors beyond drinking water include **demographic, diet, occupational history, and health conditions.**



Rachel Long,  
Epidemiologist



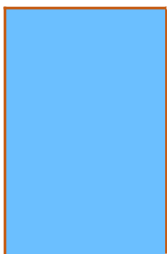
# Demographic Characteristics: Age and Sex and Serum (Blood) PFAS

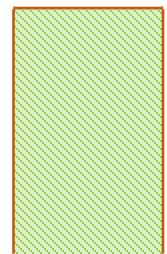
## Age

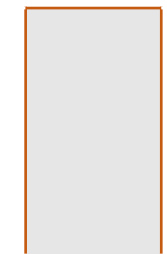
PFOA	L-PFOA	<b>PFOS</b>
<b>L-PFOS</b>	<b>Br-PFOS</b>	PFHxS
L-PFHxS	Br-PFHxS	<b>PFHpA</b>
PFBA	<b>PFHpS</b>	PFPeS

## Sex - Males

<b>PFOA</b>	<b>L-PFOA</b>	<b>PFOS</b>
<b>L-PFOS</b>	<b>Br-PFOS</b>	<b>PFHxS</b>
<b>L-PFHxS</b>	Br-PFHxS	PFHpA
PFBA	<b>PFHpS</b>	PFPeS

 **Significant Positive Association**  
(meaning being older and/or male are linked to **higher** blood PFAS concentrations)

 **Significant Negative Association**  
(meaning being older and/or male are linked to **lower** blood PFAS concentrations)

 **No Significant Association**  
(meaning being older and/or male are **not linked** to PFAS concentrations at all)

# Eating Fish Caught from Ponds, Lakes, or Rivers and Serum (Blood) PFAS

## Wild-caught fish from anywhere

PFOA	L-PFOA	<b>PFOS</b>
<b>L-PFOS</b>	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	PFHpA
<b>PFBA</b>	PFHpS	PFPeS

## Wild-caught fish from inside study area

PFOA	L-PFOA	PFOS
<b>L-PFOS</b>	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	PFHpA
PFBA	PFHpS	PFPeS

**Significant Positive Association**  
(wild-caught fish from anywhere/wild-caught fish from inside study area is linked to **higher** blood PFAS concentrations)

**Significant Negative Association**  
(wild-caught fish from anywhere/wild-caught fish from inside study area is linked to **lower** blood PFAS concentrations)

**No Significant Association**  
(wild-caught fish from anywhere/wild-caught fish from inside study area is **not linked** to PFAS concentrations at all)

# Eating Deer and Serum (Blood) PFAS

Second Report Page 42 (Table 7) for full results.

## Deer hunted anywhere

PFOA	L-PFOA	PFOS
<b>L-PFOS</b>	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	PFHpA
PFBA	PFHpS	PFPeS

## Deer hunted inside study area

PFOA	L-PFOA	PFOS
L-PFOS	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	<b>PFHpA</b>
PFBA	PFHpS	PFPeS

**Significant Positive Association**  
(deer hunted anywhere/deer hunted inside study area is linked to **higher** blood PFAS concentrations)

**Significant Negative Association**  
(deer hunted anywhere/deer hunted inside study area is linked to **lower** blood PFAS concentrations)

**No Significant Association**  
(deer hunted anywhere/deer hunted inside study area is **not linked** to PFAS concentrations at all)

# Connection Between Eating Certain Foods within the NKCEA Study Area and Blood (Serum) PFAS Concentrations

- The following foods from **inside the NKCEA area** had no important affect on blood PFAS concentrations:
  - Hunted game.
  - Chicken eggs.
  - Vegetables grown.





# Other Factors Specific to Adult NKCEA Participants: Kidney Disease and Blood and Plasma Donation

## Kidney Disease

PFOA	L-PFOA	PFOS
L-PFOS	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	PFHpA
PFBA	PFHpS	PFPeS

## Blood/Plasma Donation

PFOA	L-PFOA	PFOS
L-PFOS	Br-PFOS	PFHxS
L-PFHxS	Br-PFHxS	PFHpA
PFBA	PFHpS	PFPeS

**Significant Positive Association**  
(kidney disease/ blood & plasma donation is linked to **higher** blood PFAS concentrations)

**Significant Negative Association**  
(kidney disease/ blood & plasma donation is linked to **lower** blood PFAS concentrations)

**No Significant Association**  
(kidney disease/ blood & plasma donation is **not linked** to PFAS concentrations at all)

# Other Factors Specific to NKCEA Adult Participants

- The following factors **were not linked** to higher or lower blood PFAS concentrations:
  - Anemia.
  - Ever having worked in an industry that uses PFAS, such as firefighting.
- Having diabetes was linked to higher blood PFHpA concentrations.



# Pregnancy and Menstruation and Blood PFAS Among Adult Female NKCEA Participants

These factors were generally linked to **lower** blood PFAS concentrations:

- **Greater number of births.**
- **Menstruating in the past three years.**

\*However, these relationships were not statistically significant.



# Breastfeeding and Blood PFAS

- Total months adult female participants spent breastfeeding children was linked to **lower** blood PFAS.
- Total months minor participants were breastfed was linked to **higher** blood PFAS.

\*However, these relationships were not statistically significant.



# Summary of Objective 4 – Significant Results

- For some PFAS, **increased age and male sex** were associated with **higher** blood PFAS concentrations.
- **Eating wild-caught fish from anywhere** was associated with **higher** blood PFOS, L-PFOS, and PFBA concentrations.
- **Eating wild-caught fish from the study areas** was only associated with **higher** blood L-PFOS concentrations.
- **Kidney disease and blood donation** were associated with **lower** blood PFAS concentrations for many PFAS.



# Summary of Objective 4, Continued

These factors were not linked to higher or lower blood PFAS concentrations in participants:

- Eating hunted game, chicken eggs, or vegetables inside the study area.
- Anemia.
- Ever having worked in an industry that uses PFAS.
- Pregnancy.
- Menstruation.
- Breastfeeding a child (women).
- Being breastfed (children).



# Conclusions

- Participants in the North Kent County Exposure Assessment had higher concentrations for PFOA, PFOS, PFHxS, PFHpS, and MeFOSAA than the general U.S. population.
- Water PFAS concentrations in private drinking water wells varied greatly.
- Exposure via the wells had been greatly reduced at the time the study took place due to implementation of filters.



# Conclusions, Continued

For certain PFAS, high blood PFAS concentrations can be caused by drinking water with high levels of PFAS.

- For NKCEA participants with low concentrations of PFAS found in their drinking water, other sources of PFAS exist, which can increase blood PFAS concentrations.
- Other significant predictors of **higher** blood PFAS concentrations were:
  - Increasing age.
  - Male sex.
  - Eating wild caught fish.
- Significant predictors of **lower** blood PFAS concentrations were blood/plasma donation and kidney disease (adults).





# North Kent County PFAS Exposure Assessment (NKCEA)

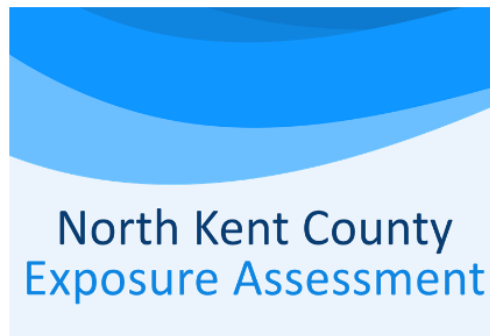
## Future: Looking Ahead

Joost van 't Erve,  
Toxicologist



# More MDHHS Studies

## Exposure Assessment



## Two Health Studies



**MiChEM**  
Michigan Chemical  
Exposure Monitoring

- Determine average concentrations of PFAS in Michigan adults.
- Will help interpret NKCEA data.

# Goal of MDHHS Health Studies



**The goal of these research studies is to learn how drinking water that contains PFAS may affect health.**

# The Michigan PFAS Exposure and Health Study (MiPEHS)



[Michigan.gov/DEHBio](https://Michigan.gov/DEHBio)

- MiPEHS started in **2020** and people can still join for one more study visits -- in 2025.
- We invited eligible people from **City of Parchment/Cooper Township** and **Belmont/Rockford area**.
  - In January 2025, we'll be asking people to return for their next visit or join for the first time.
- Learning more about PFAS and health in these communities will **benefit** the health of **all Michiganders**.

# THANK YOU!

MDHHS and KCHD thank the NKCEA participants and staff for their time and effort on this study!



# MPART Updates

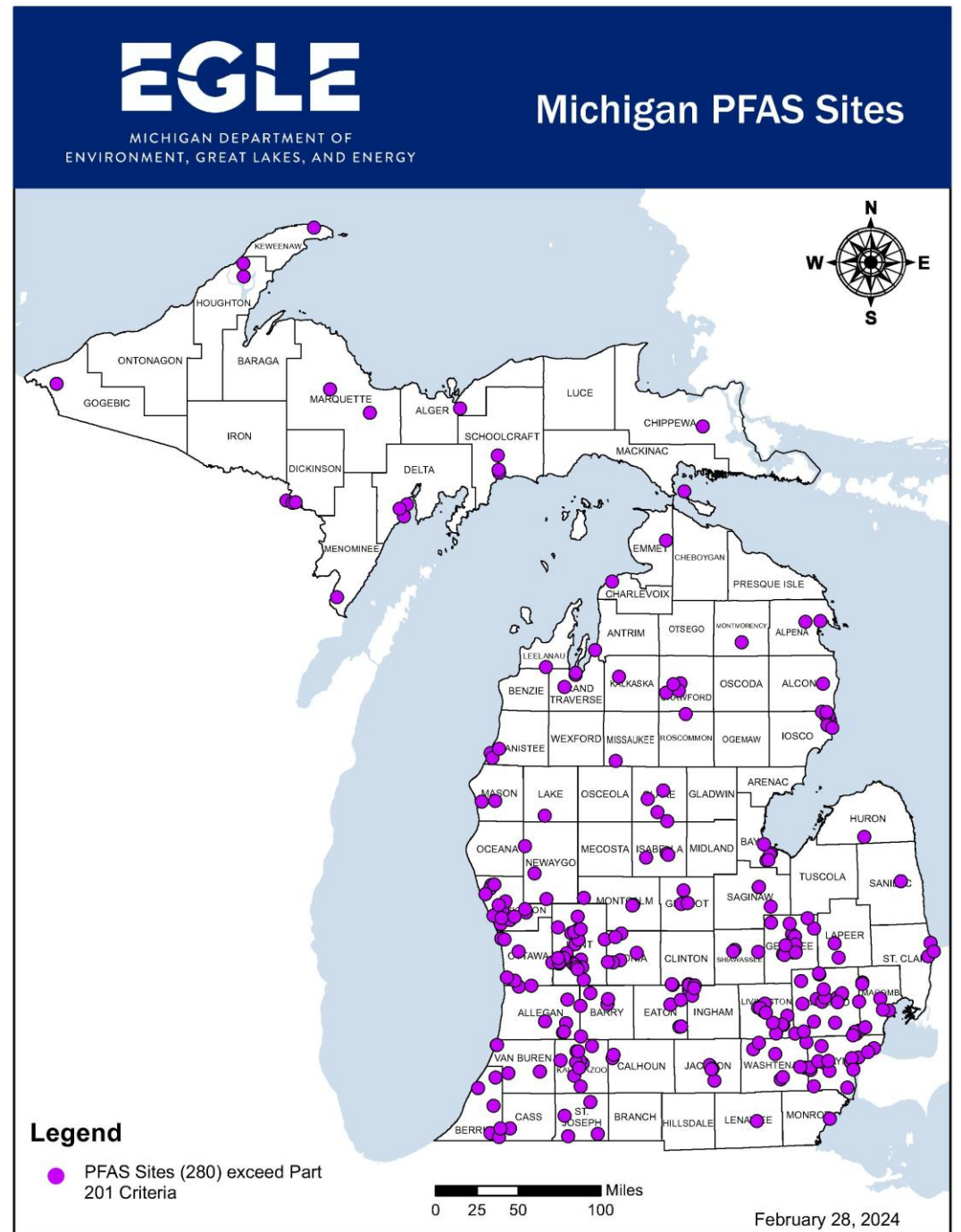
- Annual PFAS Summit planning – December 3rd - 5th
  - Call for abstracts will go out in May – due in July
- Senator Bayer PFAS Labeling Legislation
  - [Senate Bill No. 735](#)
- EPA announced a method February 15<sup>th</sup> to detect low level of PFAS in plastic containers and can also be used for fabric packaging paper and more

# New MPART Sites / Areas of Interest

- Ben Powell Landfill  
Clarkston, Oakland County
- Lacks Barden Plating Facility  
Grand Rapids, Kent County
- 444 East South Street  
Jackson, Jackson County
- 916 South Main Street  
Eaton Rapids, Eaton County

**MPART**

MICHIGAN PFAS ACTION RESPONSE TEAM



Next Meeting  
April 9, 2024



**MPART**

MICHIGAN PFAS ACTION RESPONSE TEAM



# MICHIGAN PFAS ACTION RESPONSE TEAM (MPART)

[www.Michigan.gov/PfasResponse](http://www.Michigan.gov/PfasResponse)

The logo for the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The letters 'EGLE' are rendered in a bold, sans-serif font. The 'E' and 'L' are green, while the 'G' and 'E' are blue.

MICHIGAN DEPARTMENT OF  
ENVIRONMENT, GREAT LAKES, AND ENERGY



# MPART

MICHIGAN PFAS ACTION RESPONSE TEAM