North Kent County Exposure Assessment

MiPEHS Michigan PFAS Exposure & Health Study

Multi-site Health Study

From Local Concerns to Federal Studies — Understanding PFAS and their Health Effects

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Overview

What are PFAS?

PFAS and Health

Michigan PFAS Projects

Q&A

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What are Per- and Polyfluoroalkyl Substances (PFAS)?

PFAS are a large group of about 5,000 human-made chemicals

Waterproof, grease-proof, very stable

Widely used

Do not break down easily in the environment

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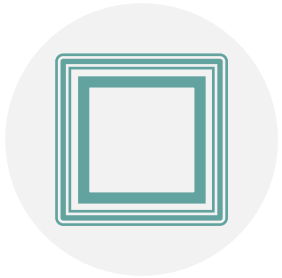
How are people exposed to PFAS?

DRINKING WATER CONTAMINATION

FOOD OR FOOD PACKAGING



STAIN OR WATER-RESISTANT CARPETING

STAIN OR WATER-RESISTANT CLOTHING

OCCUPATIONAL EXPOSURE

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PFAS and health

Studies have found exposure to some PFAS are associated with increased risks of health problems[1], including:

- Decreased chance of a woman getting pregnant[2]
- Increased chance of high blood pressure in pregnant women[3]
- Increased chance of thyroid disease[4]
- Changed immune response[5]
- Increased cholesterol concentrations[6]
- Increased chance of cancer, especially kidney and testicular cancers[7]

1. https://www.atsdr.cdc.gov/ToxProfiles/tp200.pdf
2. Bach CC, Vested A, Jørgensen KT, Bonde JPE, Henriksen TB, Toft G. Perfluoroalkyl and polyfluoroalkyl substances and measures of human fertility: a systematic review. *Critical Reviews in Toxicology*. 2016;46(9):735-755. doi:10.1080/10408444.2016.1182117
3. Avanasi R, Shin HM, Vieira VM, Savitz DA, Bartell SM. Impact of Exposure Uncertainty on the Association between Perfluorooctanoate and Preeclampsia in the C8 Health Project Population. *Environ Health Perspect*. 2016;124(1):126-132. doi:10.1289/ehp.1409044
4. Ballesteros V, Costa O, Iñiguez C, Fletcher T, Ballester F, Lopez-Espinosa MJ. Exposure to perfluoroalkyl substances and thyroid function in pregnant women and children: A systematic review of epidemiologic studies. *Environment International*. 2017;99:15-28. doi:10.1016/j.envint.2016.10.015
5. Chang ET, Adami HO, Boffetta P, Wedner HJ, Mandel JS. A critical review of perfluorooctanoate and perfluorooctanesulfonate exposure and immunological health conditions in humans. *Crit Rev Toxicol*. 2016;46(4):279-331. doi:10.3109/10408444.2015.1122573
6. Sunderland EM, Hu XC, Dassuncao C, Tokranov AK, Wagner CC, Allen JG. A review of the pathways of human exposure to poly- and perfluoroalkyl substances (PFASs) and present understanding of health effects. *J Expo Sci Environ Epidemiol*. 2019;29(2):131-147. doi:10.1038/s41370-018-0094-1
7. Steenland K, Winquist A. PFAS and cancer, a scoping review of the epidemiologic evidence. *Environmental Research*. 2021;194:110690. doi:10.1016/j.envres.2020.110690

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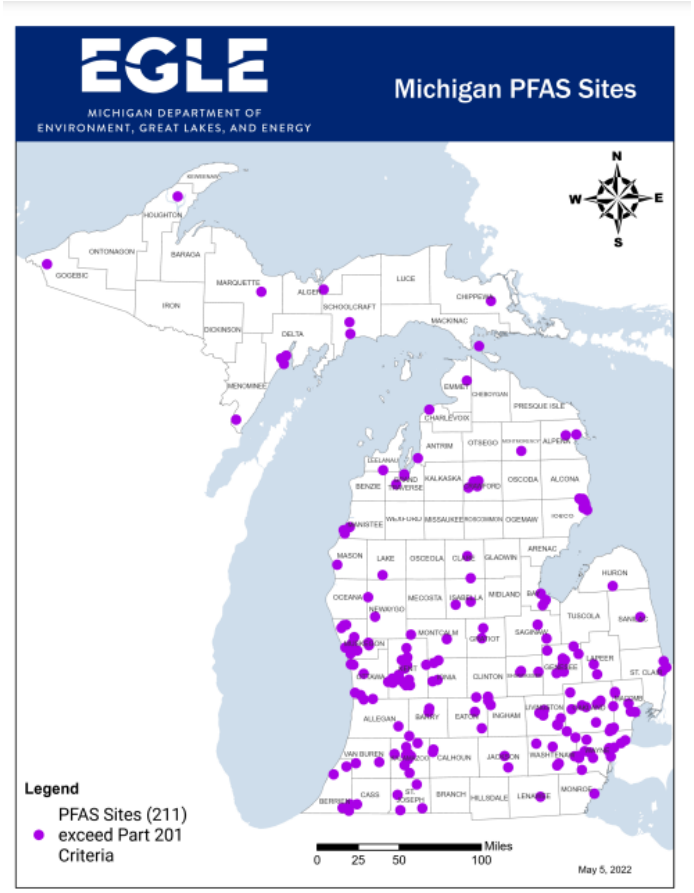
PFAS contamination in Michigan

- Ground/drinking water
  - 211 sites
- Surface water
- Deer and other wildlife
- Fish
- PFAS foam



Michigan.gov/PFASResponse

https://www.michigan.gov/pfasresponse/investigations/sites-aoi

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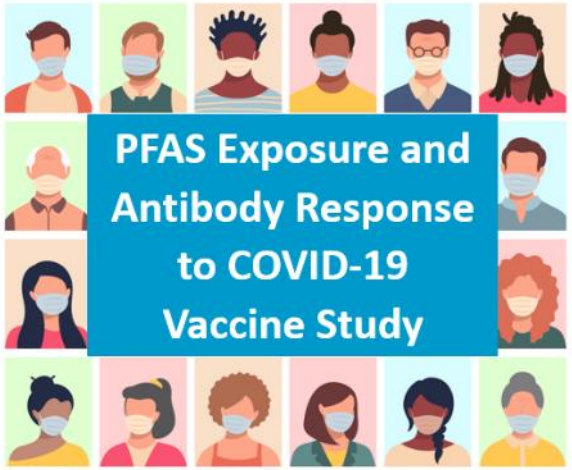
MDHHS PFAS projects in Michigan

North Kent County
Exposure Assessment

MiPEHS
Michigan PFAS
Exposure &
Health Study

Multi-site
Health Study



MiChEM
Michigan Chemical
Exposure Monitoring

PFOMS
PFAS in Firefighters of
Michigan Surveillance

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Timeline for MDHHS PFAS research studies

2018	2019	2020	2021	2022	2023	2024	2025
North Kent County Exposure Assessment	Data Collection: 2018-2019						
		MiPEHS Michigan PFAS Exposure & Health Study	Data Collection: 2020-2021		Data Collection: 2023		Data Collection: 2025
			Multi-site Health Study		Michigan Data Collection: 2021-2023		

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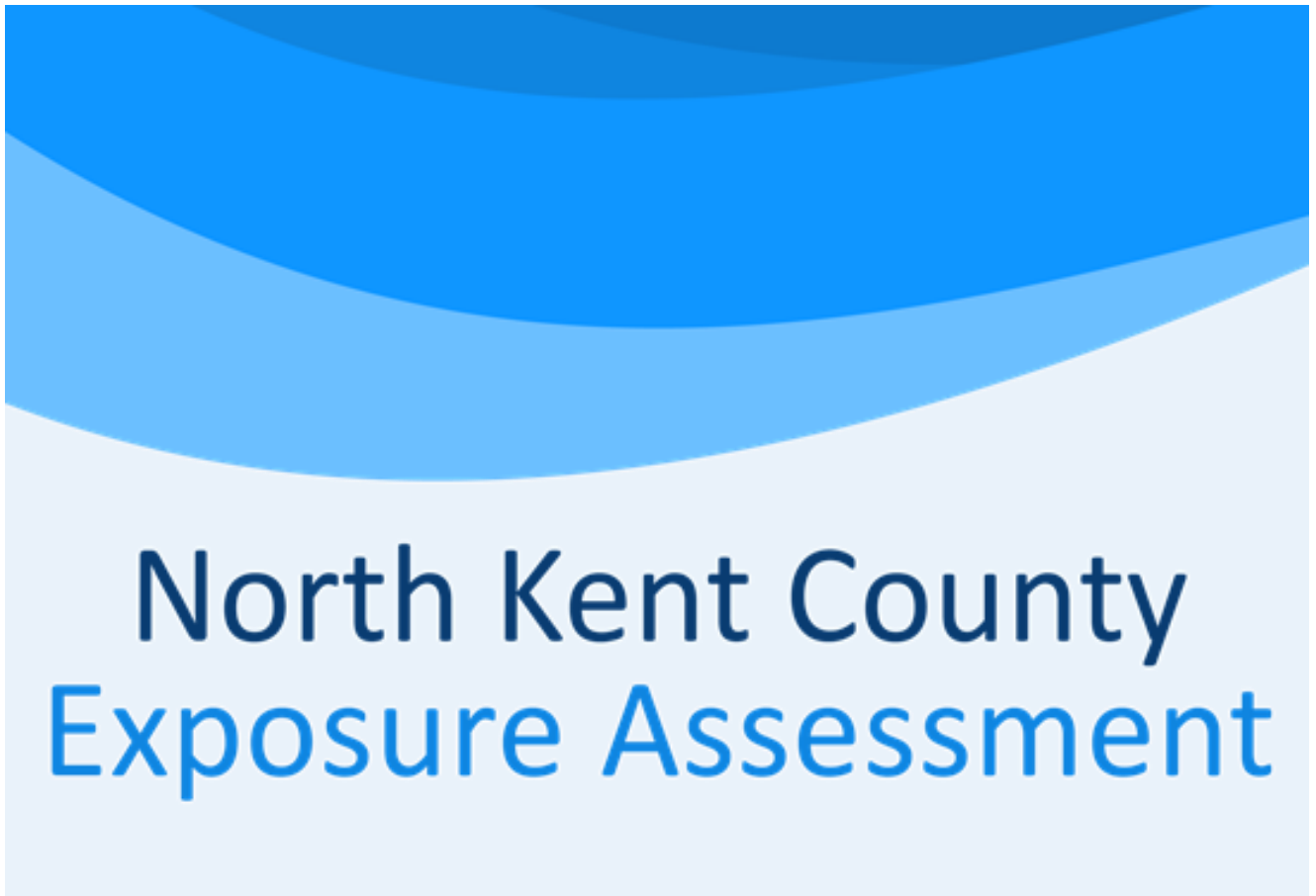

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Public Health Response to PFAS Contamination in Kent County

PFAS investigation and response

- Kent County Health Department (KCHD)
- Michigan Department of Environment, Great Lakes, and Energy (EGLE)
- Michigan Department of Health and Human Services (MDHHS)
- Michigan PFAS Action Response Team (MPART)
- U.S. Environmental Protection Agency (US EPA)
- Centers for Disease Control and Prevention (CDC)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- Wolverine World Wide

North Kent County Exposure Assessment

- Co-PIs: MDHHS, KCHD
- Technical assistance from ATSDR

Investigation and Public Health Response in Kent County

- Town hall meetings – KCHD, MDHHS, EPA, ATSDR
- Websites – KCHD, MPART
- 211 – KCHD
- Private drinking water well PFAS test results – EGLE, KCHD
- Filter distribution – EGLE, Wolverine World Wide

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North Kent County Exposure Assessment (NKCEA): Aims

- Determine concentrations of PFAS in blood of NKCEA participants
- Compare concentrations of PFAS in blood of NKCEA participants to National Health and Nutrition Examination Survey (NHANES) participants
- Determine the association between concentrations of PFAS in drinking water and concentrations of PFAS in blood
- Identify factors that can affect PFAS concentrations in blood

NKCEA: Collaborations

North Kent County Exposure Assessment

Federal government

- Provide expertise and guidance

State government

- Project planning and implementation
- Funding
- Logistics and data analysis

Local government and citizens

- Collaboration with local health department (clinic site and staff)
- Engaged citizens
- Local health professionals (e.g., clinicians)

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NKCEA: Households were eligible if they:

North Kent County Exposure Assessment

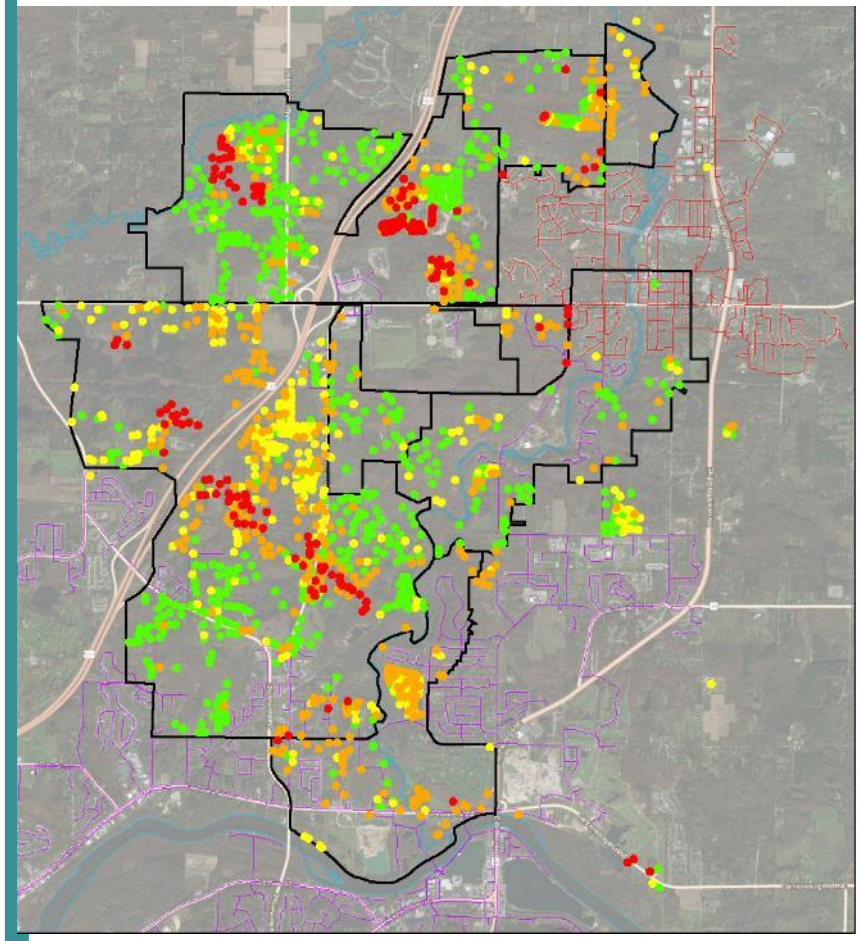
Were on a private well tested by or at the direction of EGLE

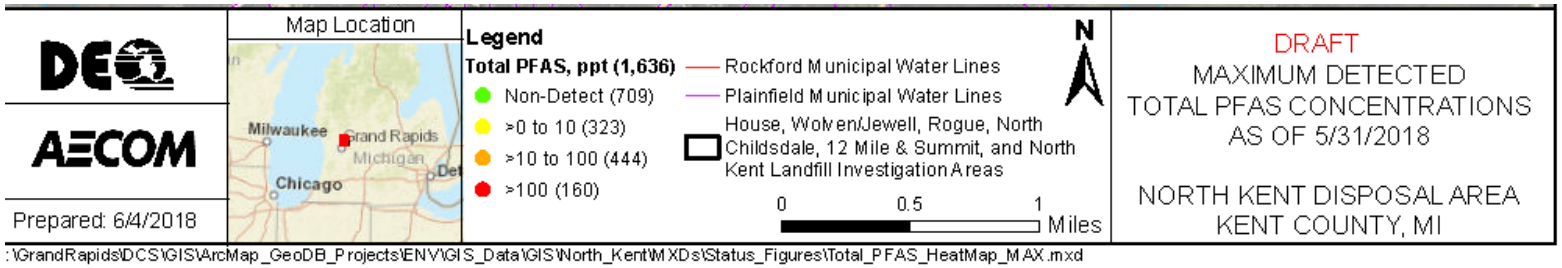
AND

Had a detectable amount of PFAS as reported to MDHHS from EGLE

Total PFAS (ppt)

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





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NKCEA: Household selection

North Kent County Exposure Assessment

Group 1

> ND - 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

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NKCEA: Individual eligibility

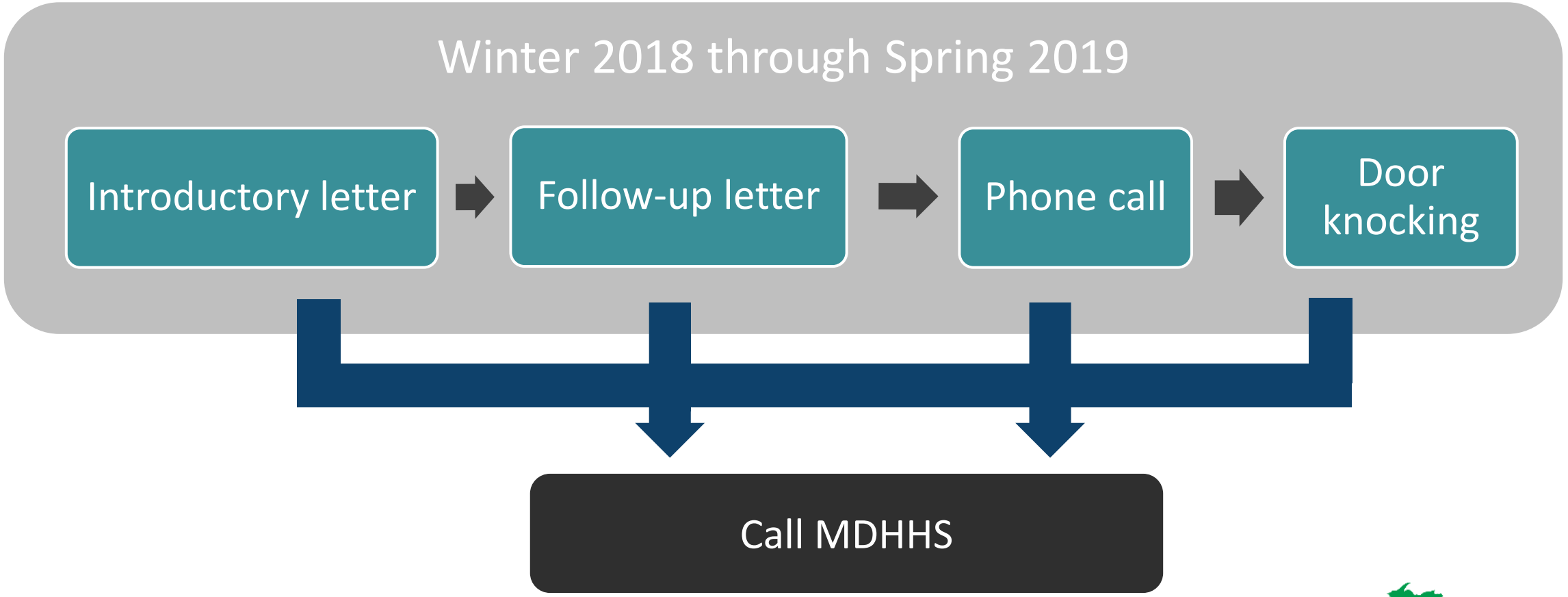
Anyone living in a **selected** household was eligible to participate if they:

Lived in the home at time of recruitment *and* lived in the home before January 1, 2018

+

Used private well water as drinking water

NKCEA: Direct recruitment



NKCEA: Indirect recruitment

North Kent County Exposure Assessment

- November 27, 2018: Public kickoff meeting at Northview High School auditorium
  - ~65 residents attended, 1,000 views of recording on Facebook
- Press release and kickoff media availability session
- Newsletter articles – KCHD, Plainfield Township
- Booths and staff presence at other EGLE and MDHHS public meetings
- Outreach at farmer's market by MDHHS staff and volunteer residents
- Media availability session with one of the participants; interviews by WZZM - 13 and Bridge Magazine

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NKCEA: Clinician outreach

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MDHHS and KCHD medical director planned outreach

- Packets were sent to Kent County physicians with ATSDR PFAS clinician guidance, cover letter, and factsheets
- June 2019: Grand Rounds presentation at Mercy Health was given by MDHHS and KCHD staff, ~20 attendees
- July 2019: Grand Rounds presentation at Spectrum Health in Grand Rapids, ~51 attendees

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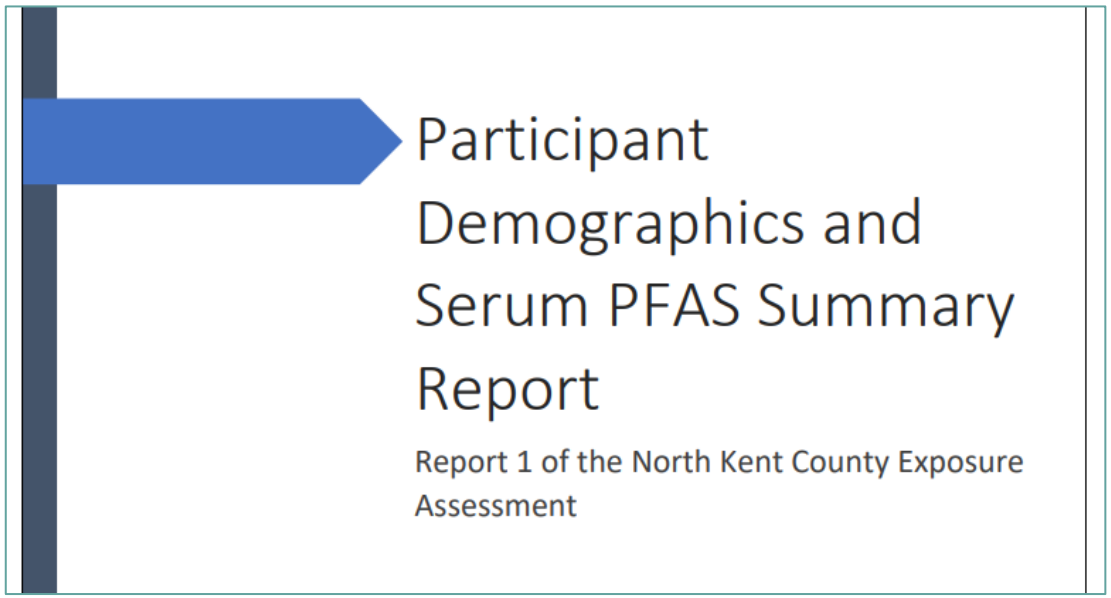
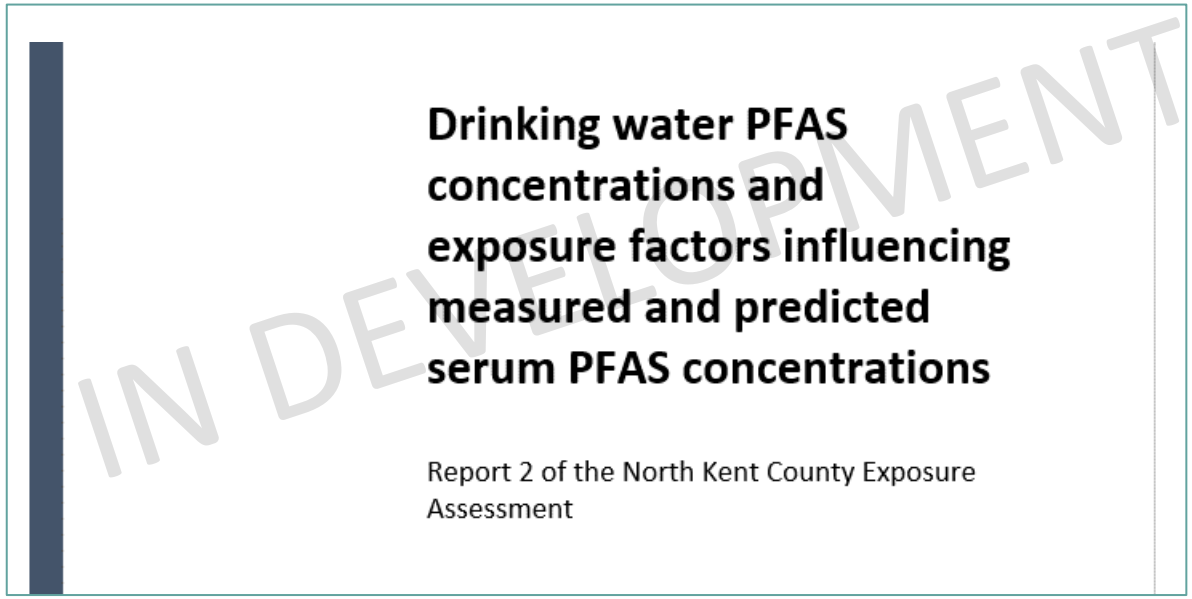
NKCEA: Reporting of results for PFAS in serum and drinking water

North Kent County Exposure Assessment

- Letters with serum results sent to individuals (413); letters with water results sent to adult household contact (>183)
- One state report released, one in development





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NKCEA: Concentration of Serum PFAS in NKCEA participants as compared to those reported in NHANES

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Could Not Compare

PFBA
PFPeA
PFHxA
PFDoA
PFBS
PFTriA
Br-PFOA*
PFTeA
L-PFHxS*
PFHpS
PFPeS
PFOSA
PFNS
PFDS
4:2 FTS
6:2 FTS
8:2 FTS
Br-PFHxS*

Not Higher

PFDA
PFUnA
PFHpA
EtFOSAA
PFNA

Higher than expected

Total-PFHxS*
Total-PFOS*
L-PFOS*
Br-PFOS*
Total-PFOA*
L-PFOA*
MeFOSAA

*Linear (L) and branched (Br) isomers are different shapes; Total = sum of branched and linear

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NKCEA: Comparison of number of participants with concentrations greater than NHANES 95th percentile

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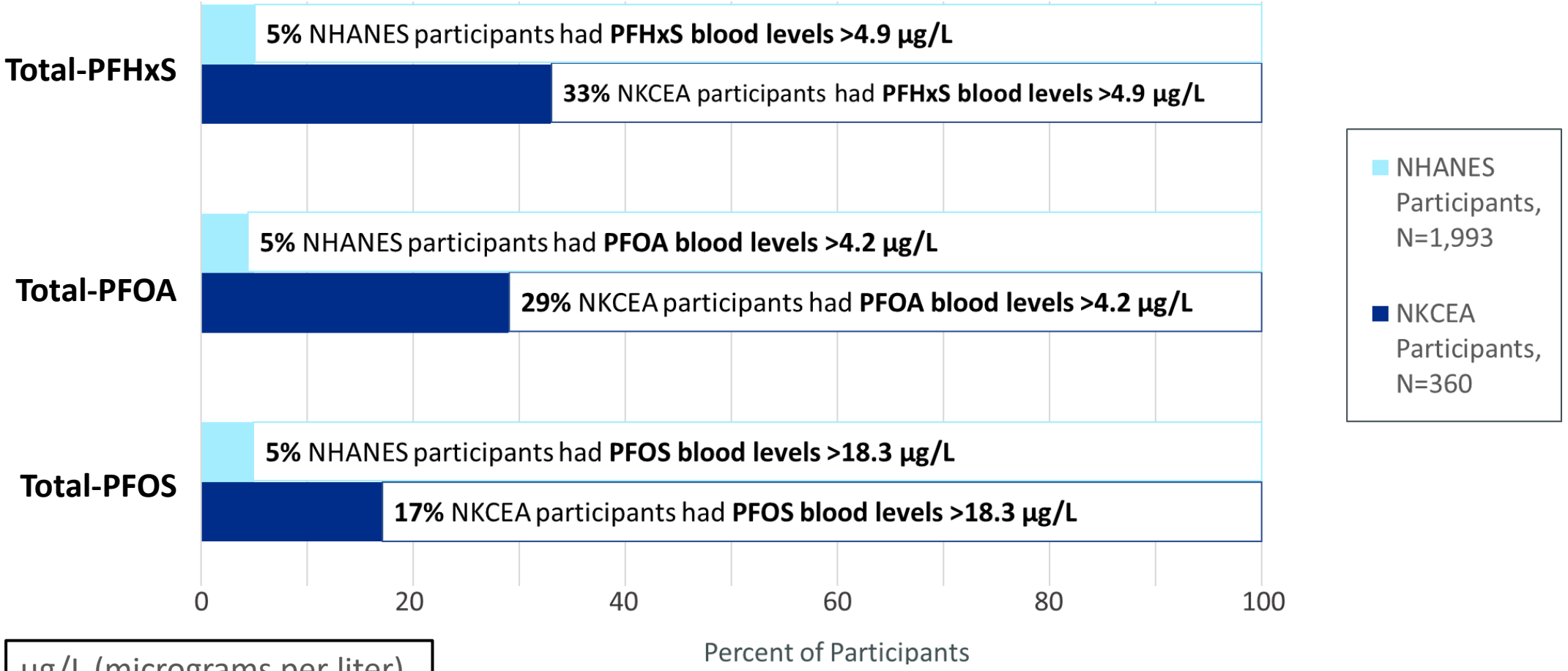

µg/L (micrograms per liter) = ppb (parts per billion)

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NKCEA: How collaborations led to success

North Kent County Exposure Assessment

- 432 participants with complete data
- First PFAS exposure assessment with human specimens in Michigan
- Gained experience, established partnerships and collected data – all of which contributed to a successful grant award: Multi-site Health Study (MSS)

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NKCEA: Challenges and lessons learned

North Kent County Exposure Assessment

Recruitment

- No incentives
- Obtaining census from non-participating households
- Family members who do not meet eligibility requirement

Clinic operations

- Assenting minors for blood draw
- Modifying consent procedures

Staffing

- Staff filling non-traditional roles

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North Kent County Exposure Assessment

MiPEHS Michigan PFAS Exposure & Health Study

Multi-site Health Study

Community Collaborations: From NKCEA to MiPEHS and MSS

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MiPEHS and MSS: Stakeholder groups

- Parchment and Cooper Township stakeholder group formed in spring of 2019
- Belmont/Rockford area stakeholder group formed in fall of 2020

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Multi-site Health Study

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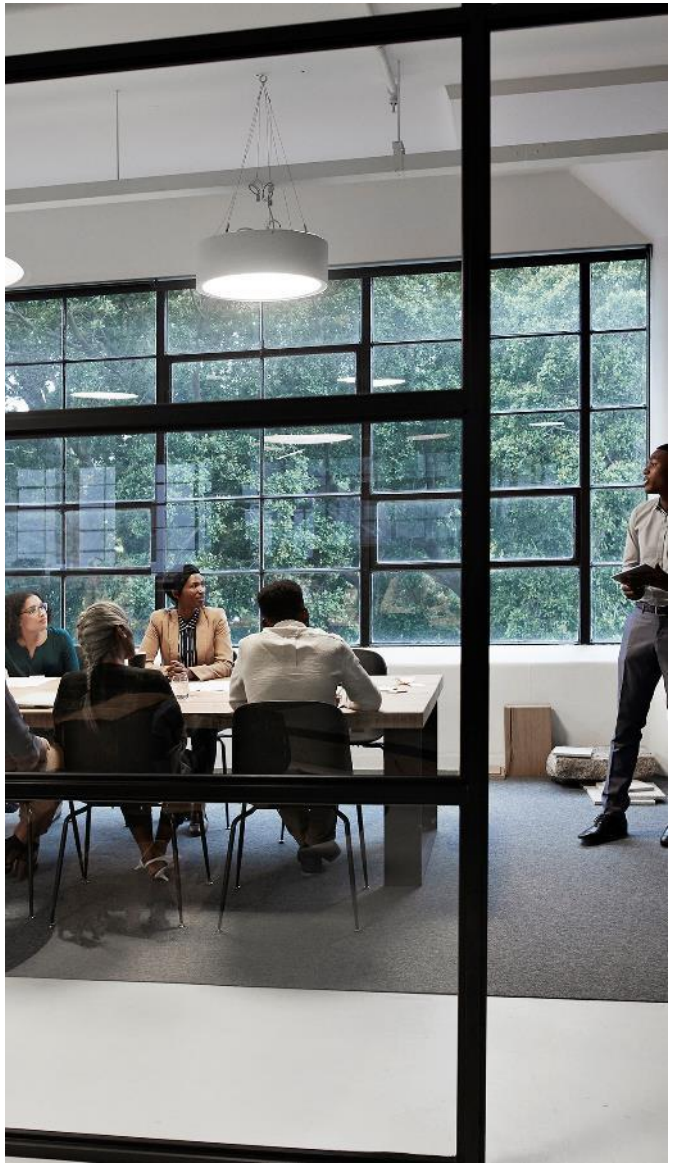

MiPEHS and MSS: Stakeholder groups

Scope:

- Opportunity for stakeholders to:
  - Provide perspective of their agencies on how best to engage with the broader community
  - Provide feedback on study materials/messaging
  - Share concerns from the community
- Opportunity for study team to:
  - Provide study updates
  - Respond to questions or concerns

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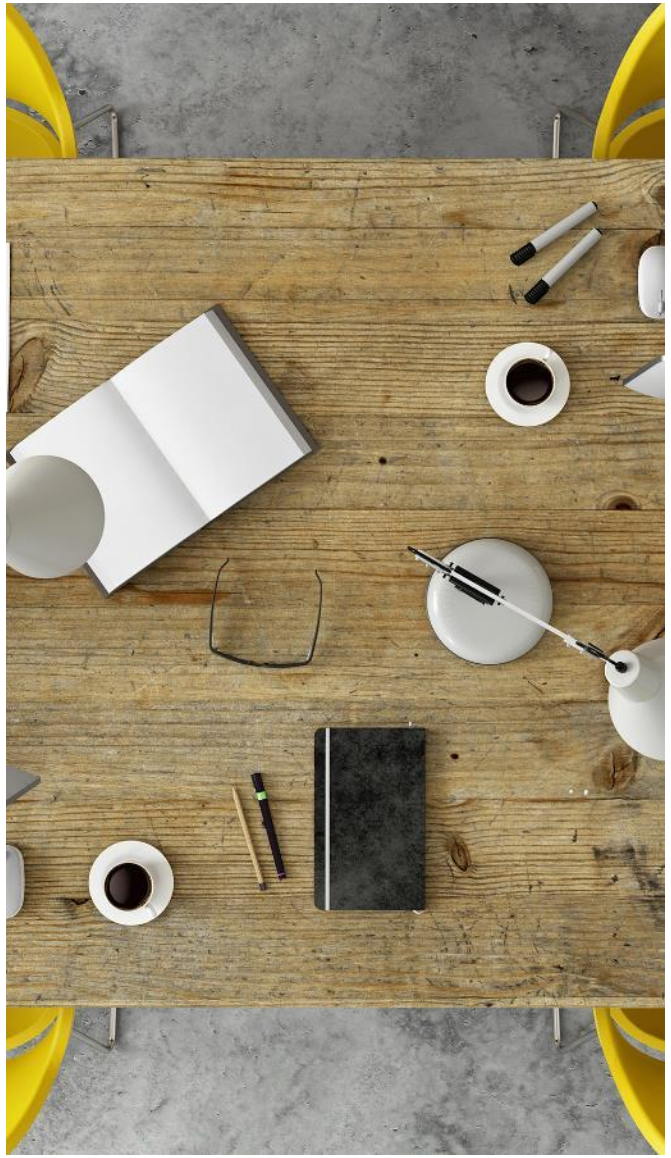

MiPEHS and MSS: Stakeholder groups

Attendees include:

- LHD administration, medical directors, Public Information Officers
- Local officials, both elected and non-elected
- Area school superintendents/representatives
- Interested community members
- EGLE

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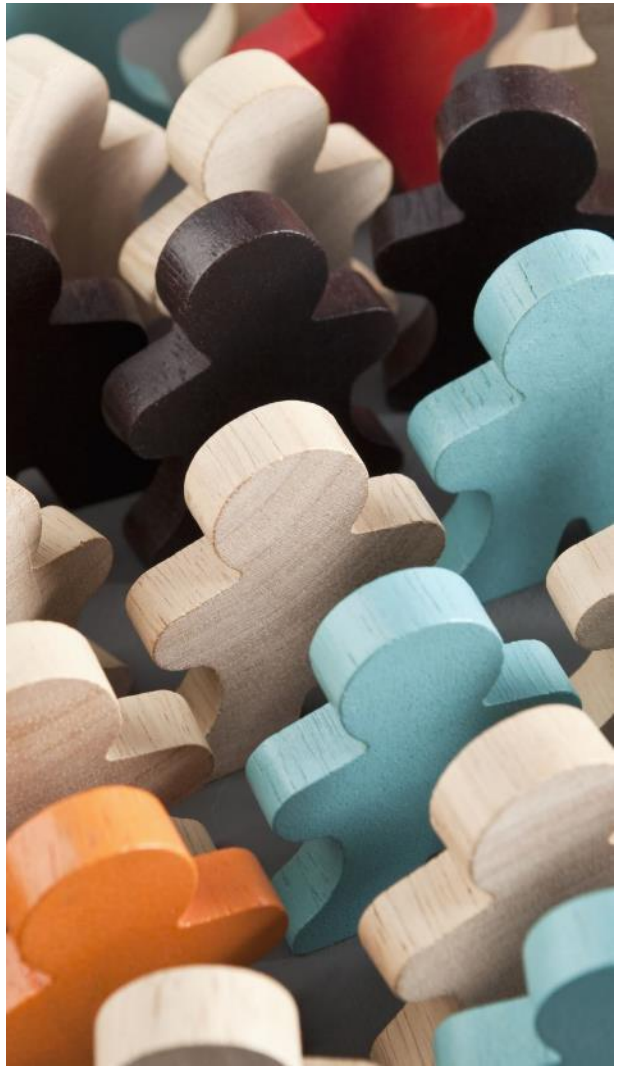

MiPEHS and MSS: Community outreach

Study team…

- Study staff attended local community group meetings (virtually):
  - Wolverine Community Advisory Group (CAG)
  - Parchment Action Team
- Established relationships with:
  - Local libraries
  - Local schools
- Attended in-person events (as pandemic allowed)

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Multi-site Health Study

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MiPEHS and MSS: Stakeholder group challenges and lessons learned

- Staff capacity
- COVID-19
- Are the right people ‘at our table’? Whose table can we join? Whose voices are missing from either? How do we engage those voices?

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MiPEHS: Goals and Design

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Michigan PFAS Exposure & Health Study

Goal:

- Understand how community exposure to PFAS relates to certain health conditions in humans

Design:

- Longitudinal cohort study in Parchment, Cooper Township, and the Belmont/Rockford area
  - High, recent range of exposures to PFAS via drinking water
- Blood draw (venous) and finger poke (capillary) to measure 45 PFAS, 38 biomarkers, PCBs
  - Adults and minors ages 12+
- Self-administered health and exposure survey
- Water sample(s) to measure 45 PFAS in “past” and current water samples

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MiPEHS: Collaborations

State government (within MDHHS)

- Study design and data analysis
- Community outreach
- Bureau of Labs
- Community Health Emergency Coordination Center (CHECC)

Local government and citizens

- Leaders from local health departments, local government, school district, police, city council
- Engaged citizens
- Local health professionals (e.g., clinicians)

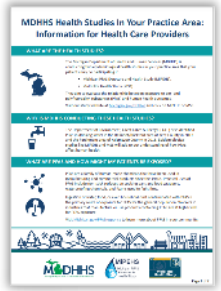
Research partners

- RTI International
- Frontline National
- Project implementation, “boots on the ground”

Scientific guidance panel

- Includes researchers and medical professionals from around Michigan and beyond
- Provide expertise and guidance

Recruitment strategies for MiPEHS 2020-2021



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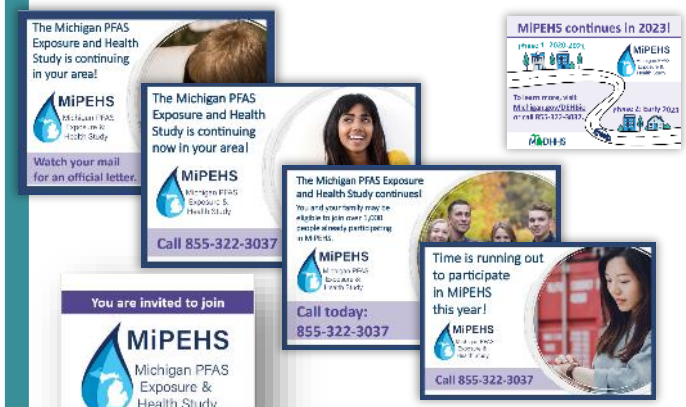
Recruitment strategies for MiPEHS 2023



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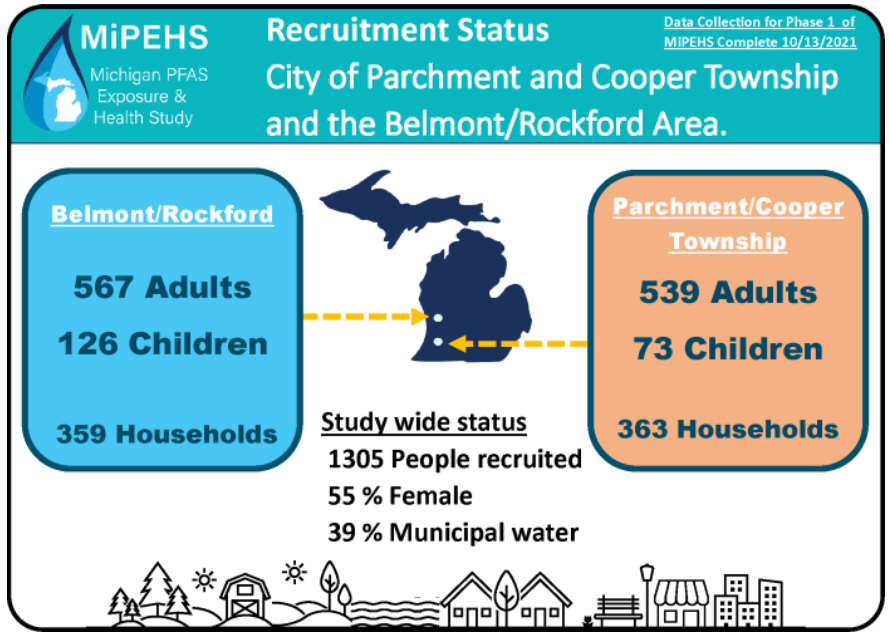
MiPEHS: Collaborations led to success



Multimedia recruitment worked.

1,305 participants were recruited from **722** households across **2** communities.

36,280+	Outbound calls made
8,000+	Flyers distributed to homes
5,969	Recruitment packets mailed
1,325	Contacts made to doctors' offices
104	Local businesses hung posters
6 Month	Social and print media campaign

MiPEHS was accessible.

2 study offices in local communities had flexible appointment times including evenings and weekends.

Free rides were arranged from participant homes to the study offices.

Spanish translations were available.

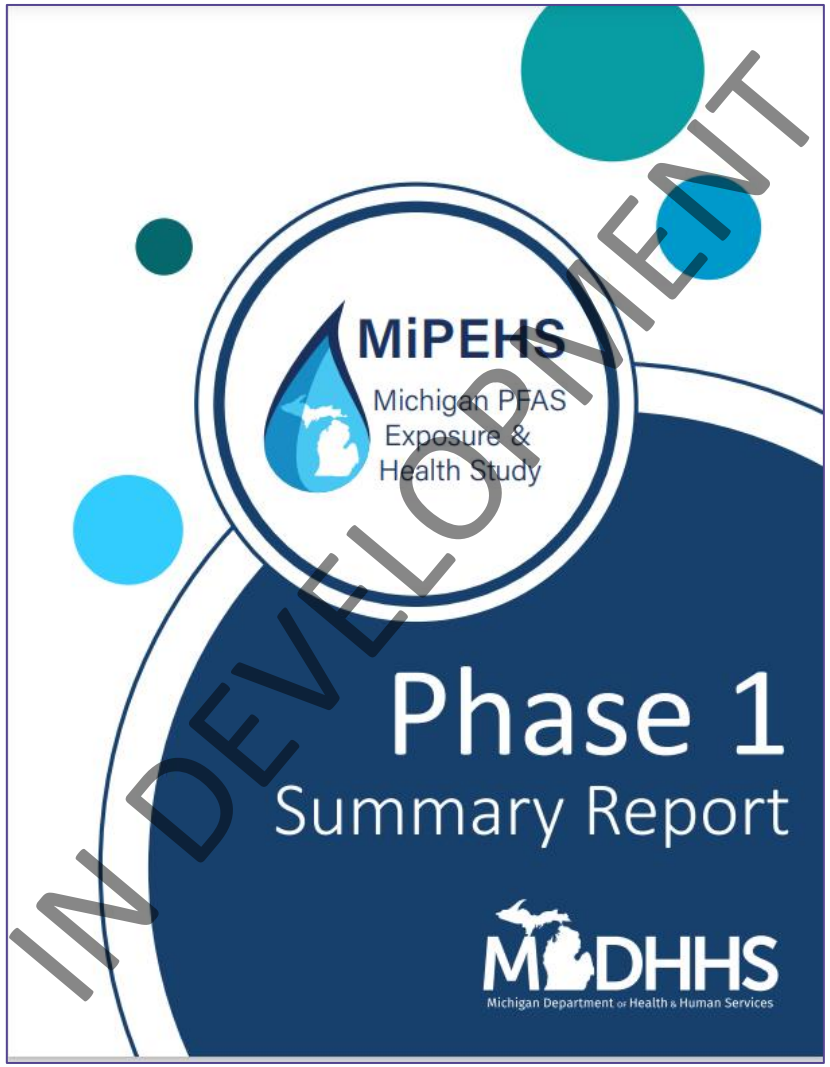
Special accommodations made it easy for each eligible person to participate.

The MiPEHS team engaged with communities.

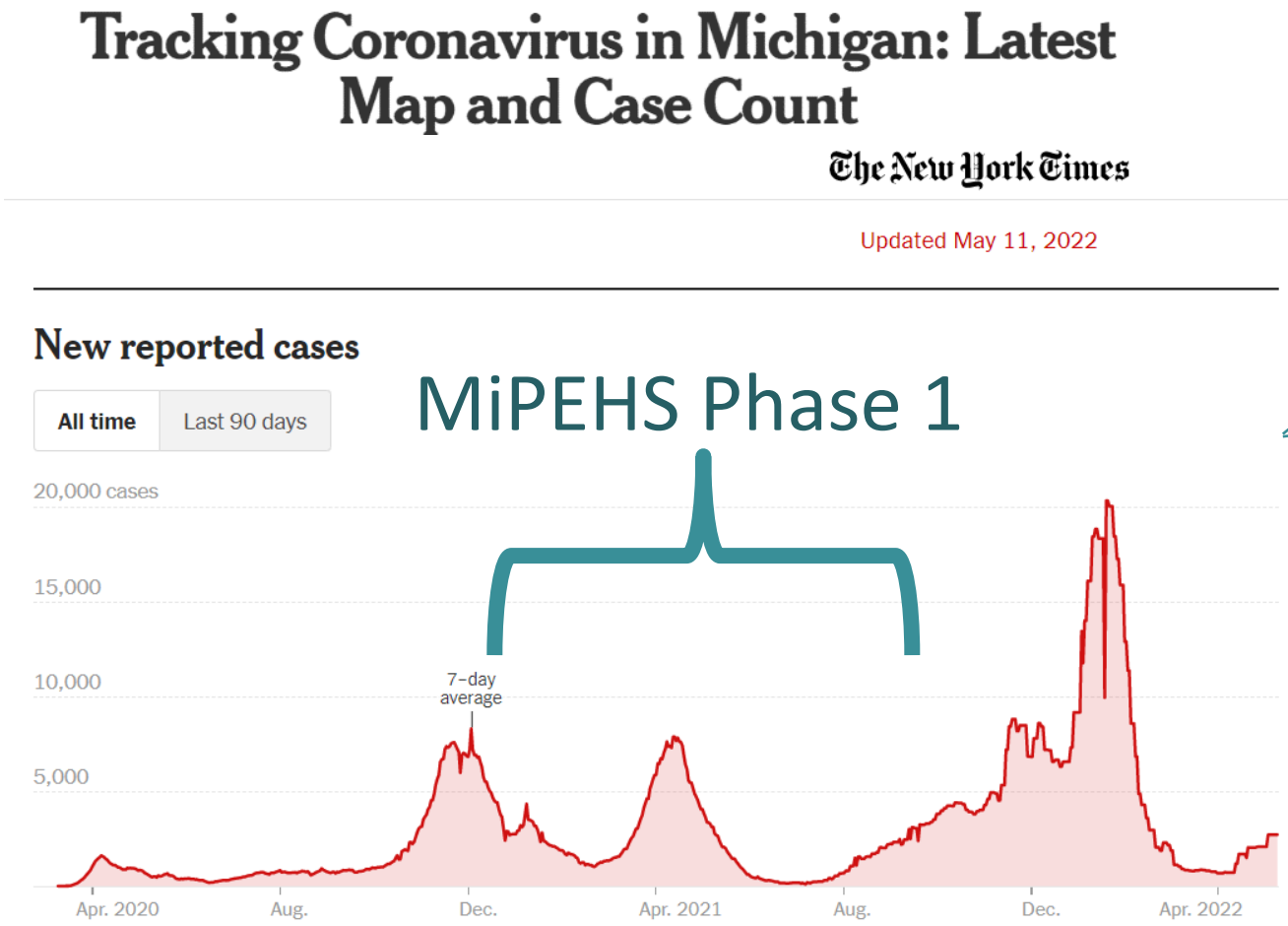
550	Newsletter recipients
120	MiPEHS website updates
50	Local stakeholder meetings held
10	Presentations and local interviews given
3	Press releases leading to 20+ articles
Daily	Monitoring of toll-free hotline, study email and web-based "Contact Us" form

100% of DHHS hotline phone calls and emails returned within 1 business day.

MiPEHS: Results



MiPEHS: Challenges and lessons learned



- Recruitment
- Study office operations
- Staffing

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Multi-site Health Study (MSS): Objective and Design

Objective

- Determine the relationship between PFAS exposure and health outcomes among different populations.
  - CO, MI, PA, MA, NY, CA, NJ

Design:

- Cross-sectional study in Michigan (City of Parchment, Cooper Township, and the Belmont/Rockford area) and 6 other states nation wide
  - High, recent exposure to PFAS via drinking water
- Blood draw (venous) to measure 9 PFAS, 38 biomarkers
- Self-administered health and exposure survey
- Urine sample
- Neurobehavioral testing for children ages 5+

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MSS: Collaborations

Federal government

- Study design and instruments
- Funding
- Data analysis for all 7 states combined
- Collaboration with other states

Research partners

- RTI International
- Frontline National
- Collaboration on research, implementation, “boots on the ground”

State government (within MDHHS)

- Community outreach
- Implementation
- Data analysis for Michigan site

Local government

- Leaders from local government, school district, police, city council
- Community perspective, local insights

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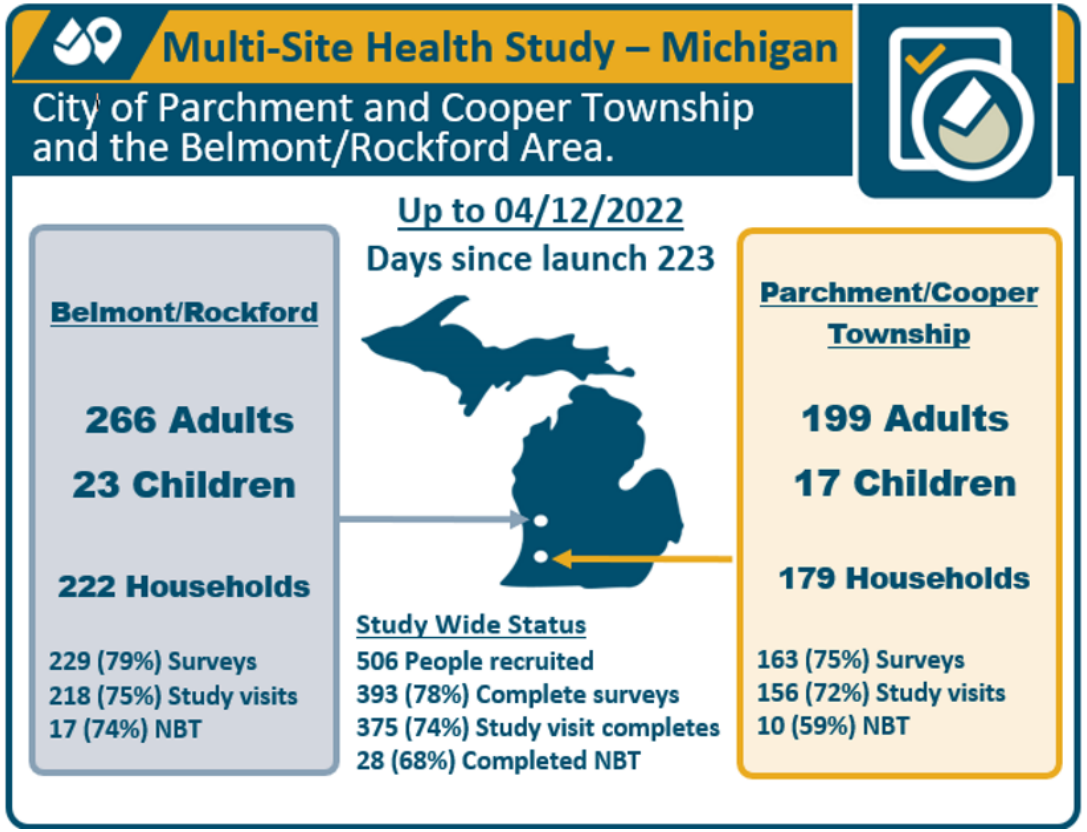
MSS: How collaborations led to success

Multi-site Health Study

Lessons learned shared between sites

- Study logistics
- Recruitment
- One central system for data collection (created and maintained by ATSDR)



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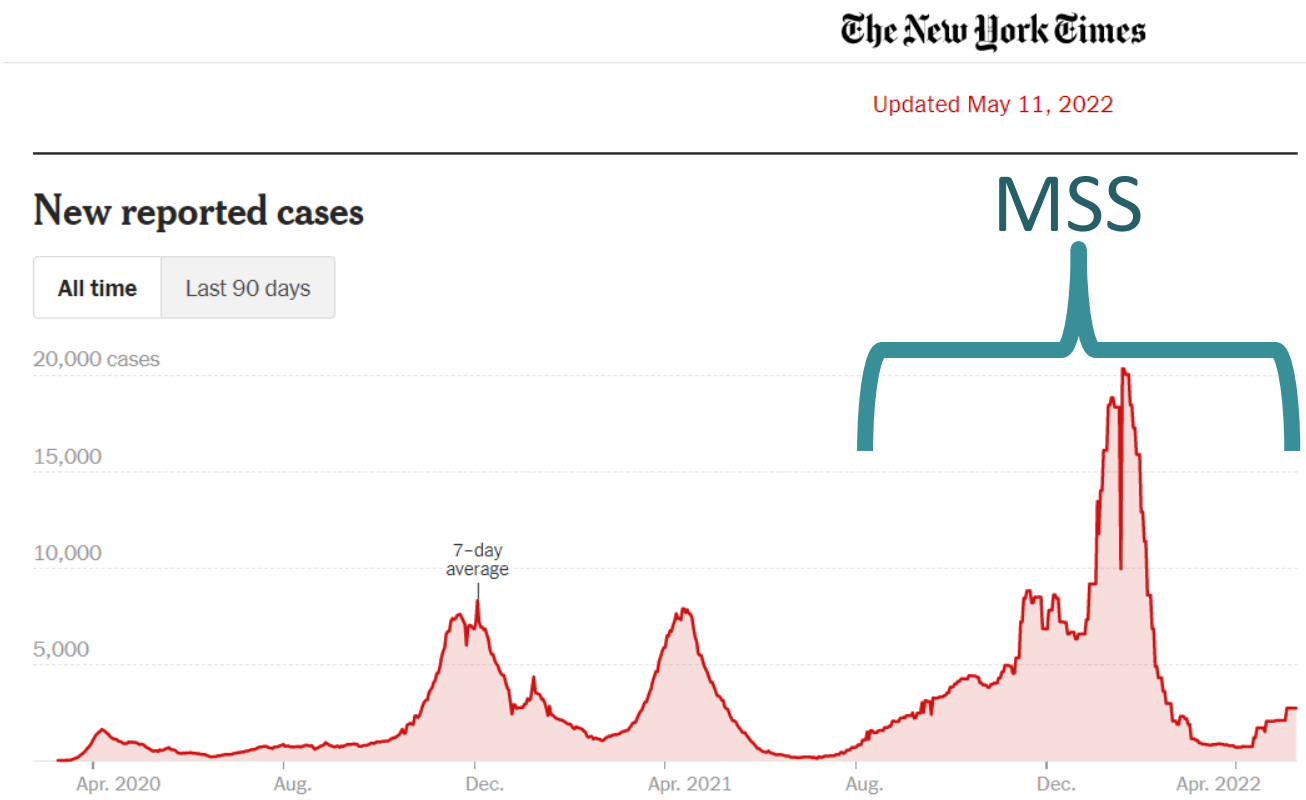
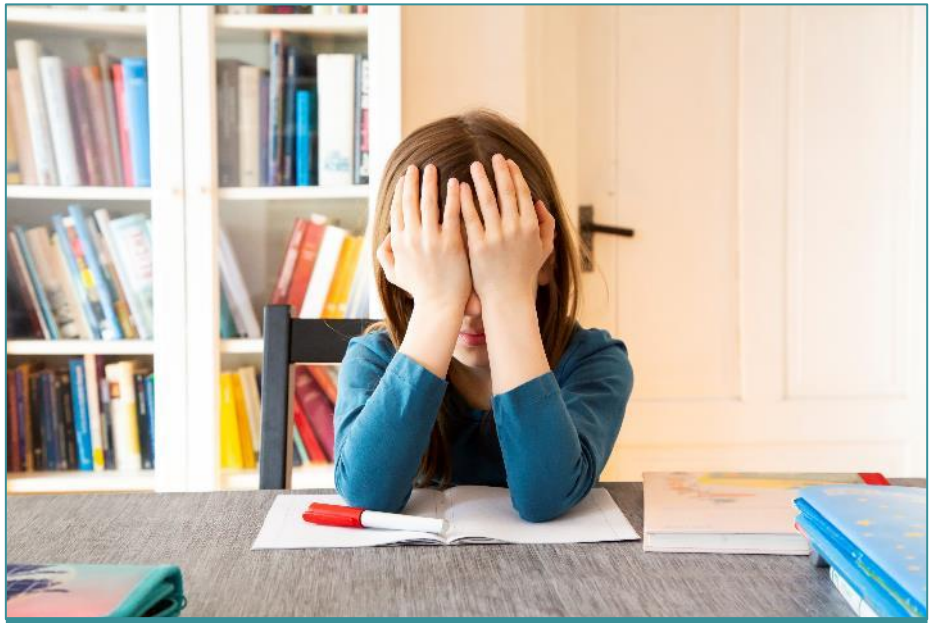
MSS: Challenges and lessons learned



MSS

- Recruitment
- Study office operations
- Staffing

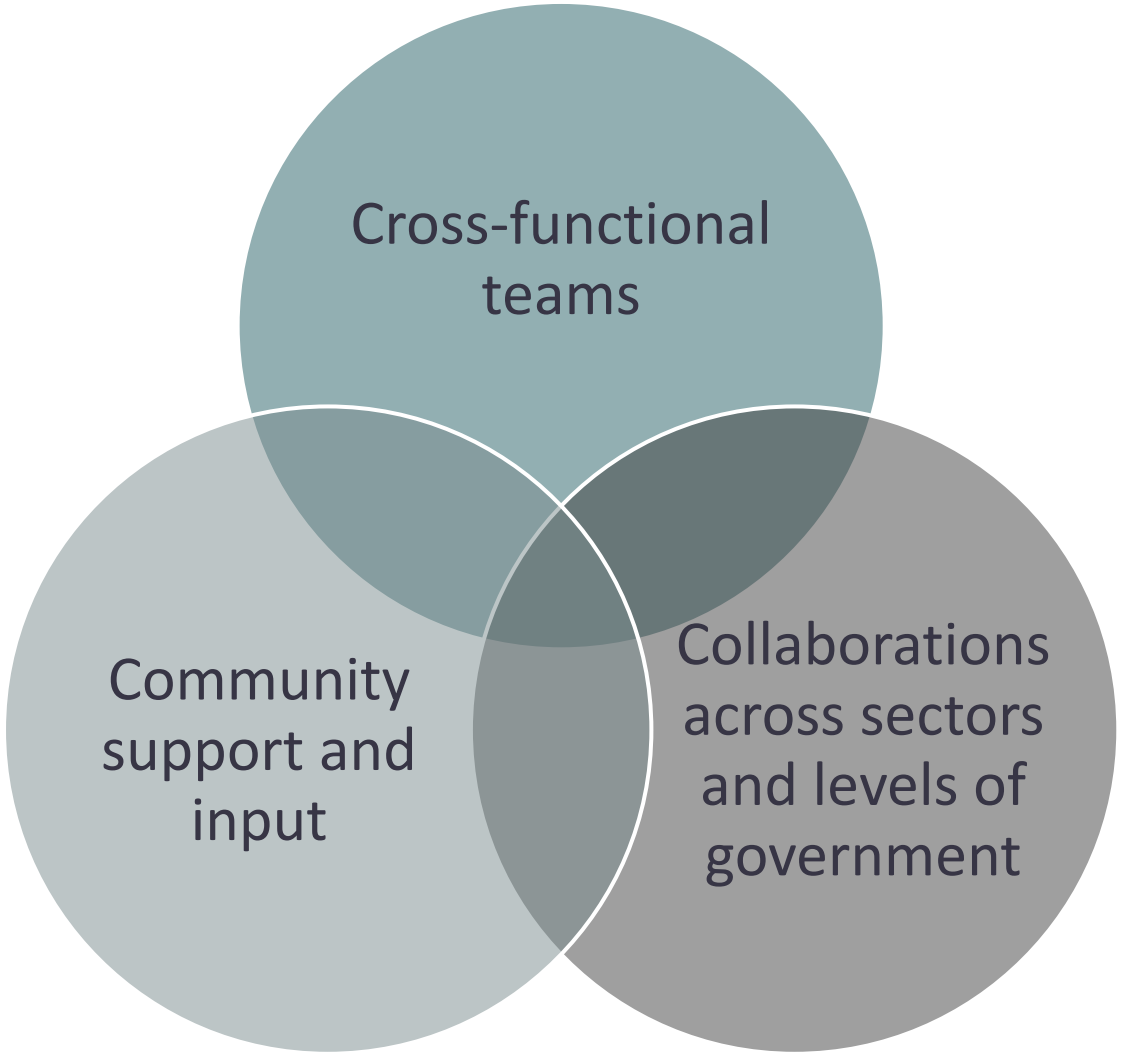
MiPEHS and MSS: Challenges and lessons learned



Study confusion

Study fatigue

Successful research requires:



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Because of these collaborations:

- Over **1,700** samples of blood have been tested for PFAS
- Over **2,200** Michiganders participated in these PFAS studies

Michigan is a leader in PFAS research and surveillance.

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More information

DEHBio - Biomonitoring and PFAS Health Studies

Michigan.gov/DEHBio

Full URL: https://www.michigan.gov/mdhhs/safety-injury-prev/environmental-health/topics/dehbio

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Acknowledgments

- All study participants
- Kent County Health Department staff and management
- Kalamazoo County Health Department staff and management
- Centers for Disease Control and Prevention (CDC) Agency for Toxic Substances and Disease Registry (ATSDR)
  - Michigan Site for ATSDR Per- and Polyfluoroalkyl Substance Contaminated Drinking Water Multi-Site Health Study - Award #1 U01TS000310-01-00
- DEH and BOL staff and management
  - Epidemiologists, toxicologists, health educators, community engagement specialists, environmental sanitarians, data specialists, lab scientists, recruitment technicians, logistics staff, contractors
- DEH Environmental Health Research and Surveillance Guidance Panel
  - Chairs: Nigel Paneth, MD, MPH; David Savitz, PhD

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Q&A

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