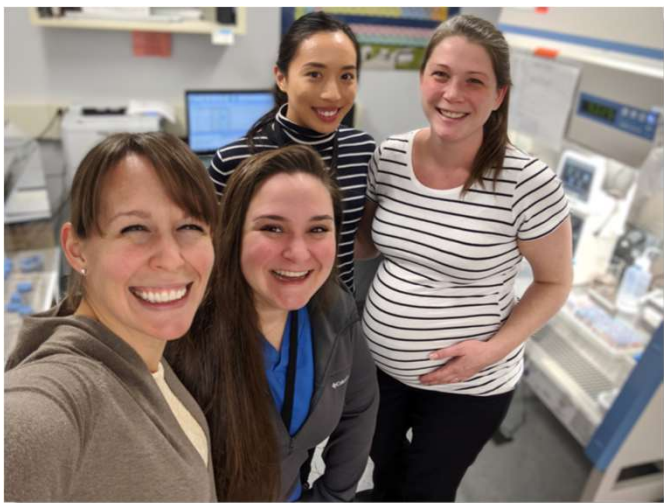


Results from the 2019 NH TrACE Study: NH's first biomonitoring surveillance study



Amanda Cosser, MPH
Nicholas Shonka, MS
September 10, 2021
HB737 Commission Meeting

Roles & Responsibilities

BiomonitoringNH

Project Design

Human Specimen
Collection &
Laboratory Testing

Communication of
Results

EPHT

Funding for
Samples, Printing,
Mailing

Combined Data
Analysis & Data
Visualization

Technical
Assistance
throughout Project

NHDES

Water Sample
Collection, Funding

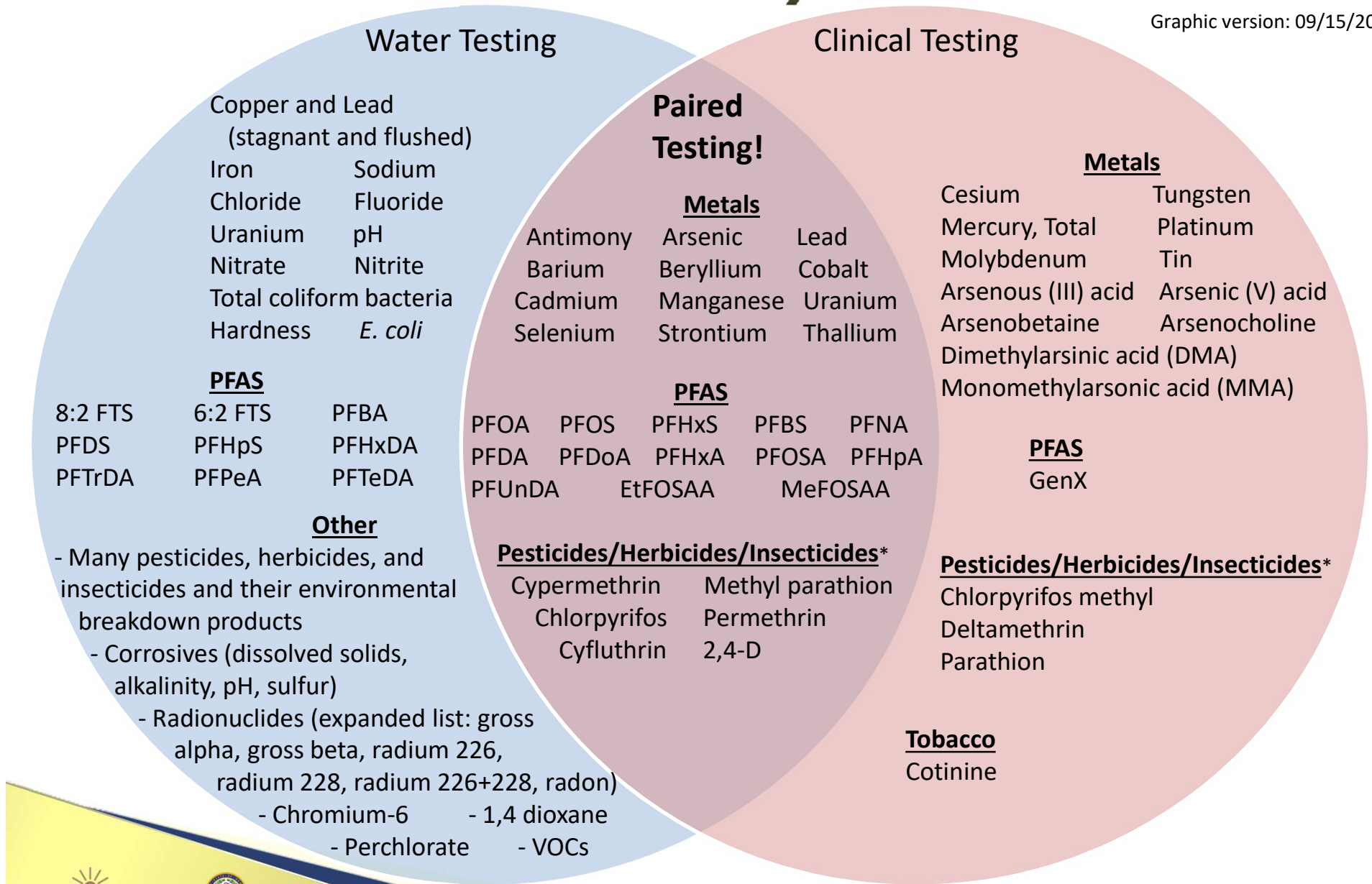
Data Sharing

Technical
Assistance
throughout Project

2019 NH TrACE Study

For more analyte lists visit:
tinyurl.com/2019TrACEStudy

Graphic version: 09/15/20



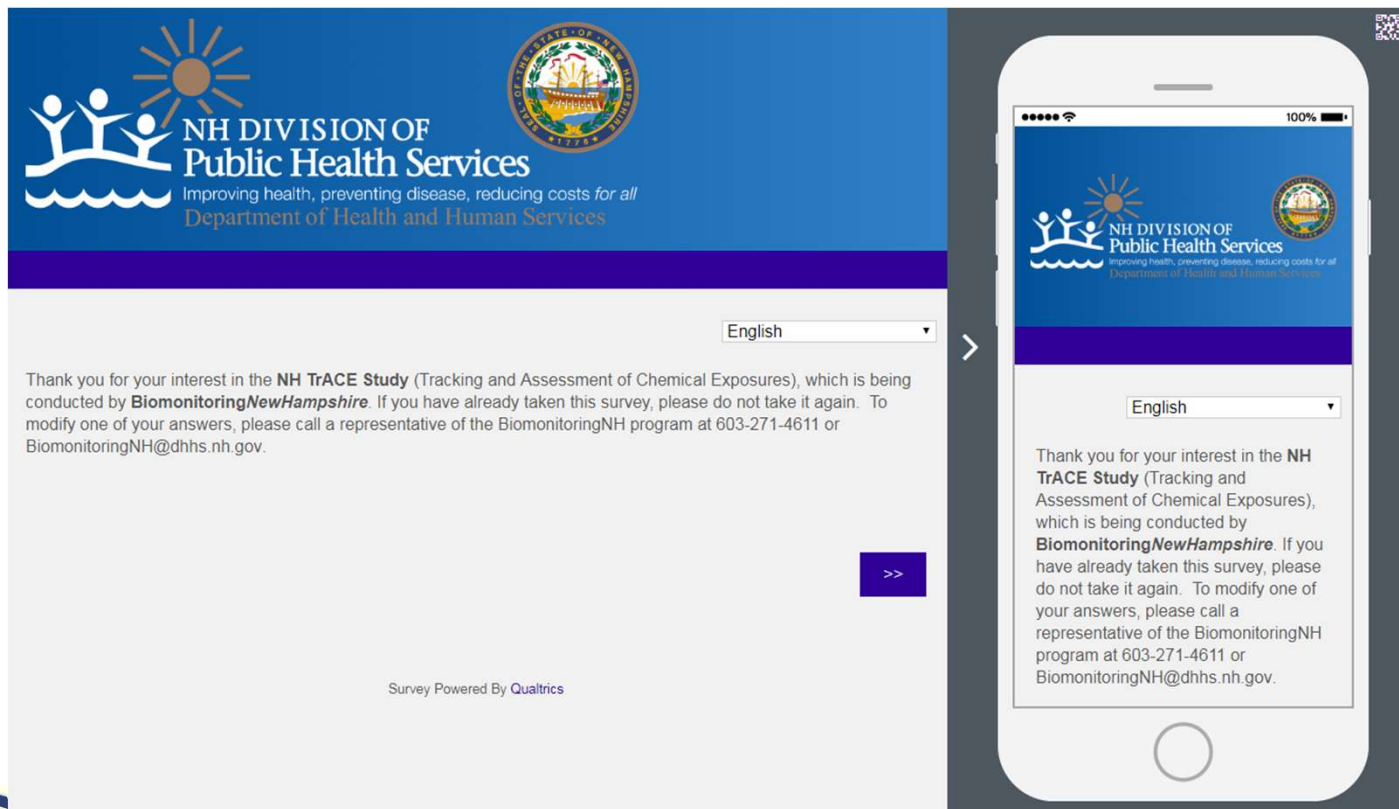
* The NH PHL tests for the metabolites of the pesticides, herbicides, and insecticides listed here.

Recruitment

For more information visit:
tinyurl.com/2019TrACEStudy

NH's first surveillance biomonitoring study

- ▶ Clinical and environmental (water) testing
- ▶ Statewide recruitment



Participants

Demographic		TrACE		Percent of NH Population ² (%)
		Participants (#)	Percent (%)	
Sex	Females	194	57.7	50.4
	Males	139	41.4	49.6
	Other	3	0.9	---
Age	Under 18	9	2.7	19.0
	18 - 64	194	57.7	62.9
	65 and older	133	39.6	18.1
Race and ethnicity	Non-Hispanic white	320	95.2	90.0
	Other	16	4.8	10.0
Water source ¹	Private well water	216	64.3	42.0
	Public drinking water	120	35.7	58.0
County	Belknap	22	6.5	4.5
	Carroll	19	5.7	3.6
	Cheshire	23	6.8	5.6
	Coos	13	3.9	2.3
	Grafton	20	6.0	6.6
	Hillsborough	91	27.1	30.6
	Merrimack	40	11.9	11.1
	Rockingham	53	15.8	22.8
	Strafford	33	9.8	9.6
	Sullivan	22	6.5	3.2
Total participants		336		

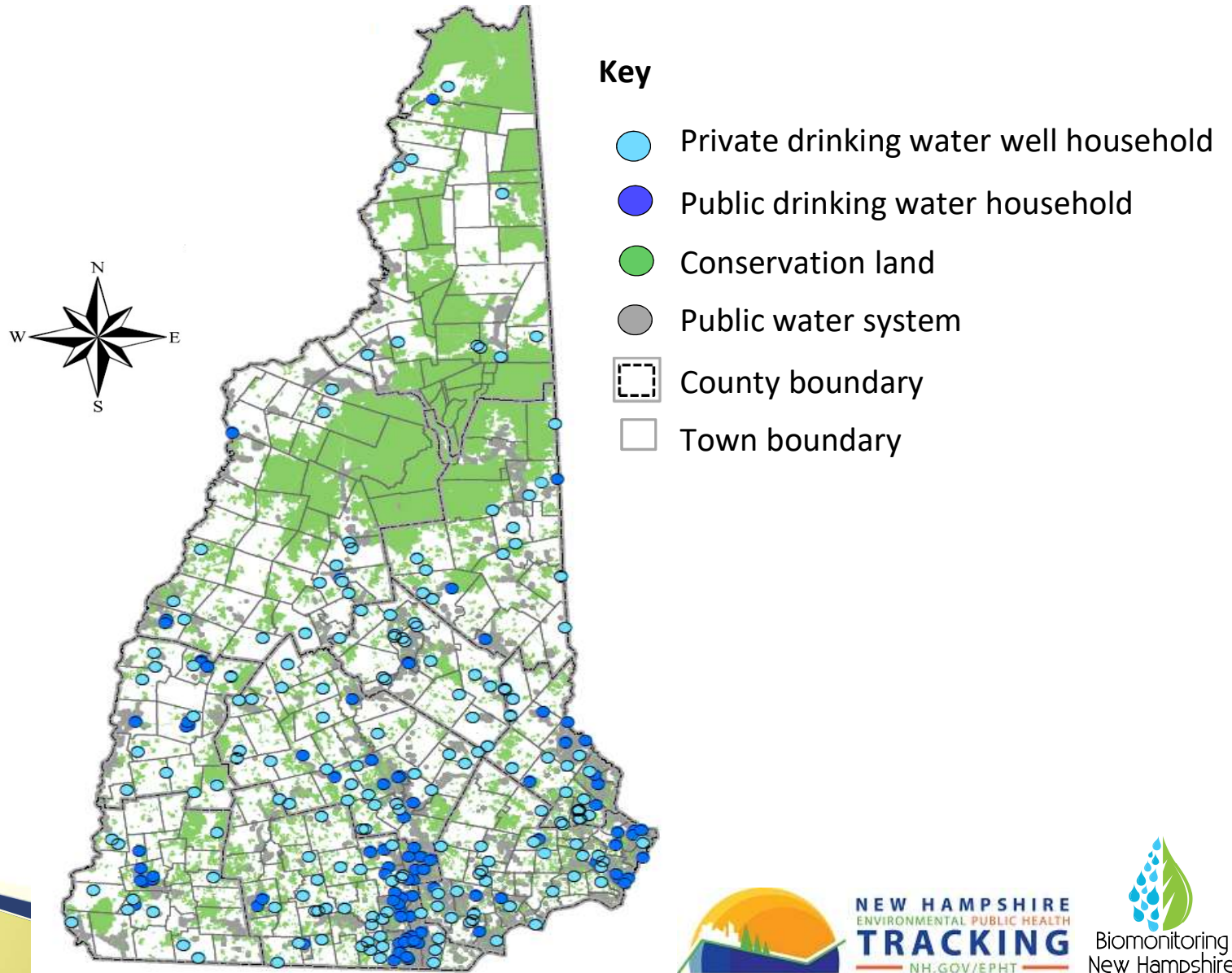
¹Two participants declined to have their water collected. Household water source estimates for NH Population using private well water as their primary source of home drinking water are from the BRFSS survey.

²Census Bureau estimates (7/1/2010) from

<https://www.census.gov/quickfacts/fact/table/NH/PST045218#PST045218> for demographics.

Note: Percentages may not equal 100% due to rounding.

TrACE Study Homes by Drinking Water Source

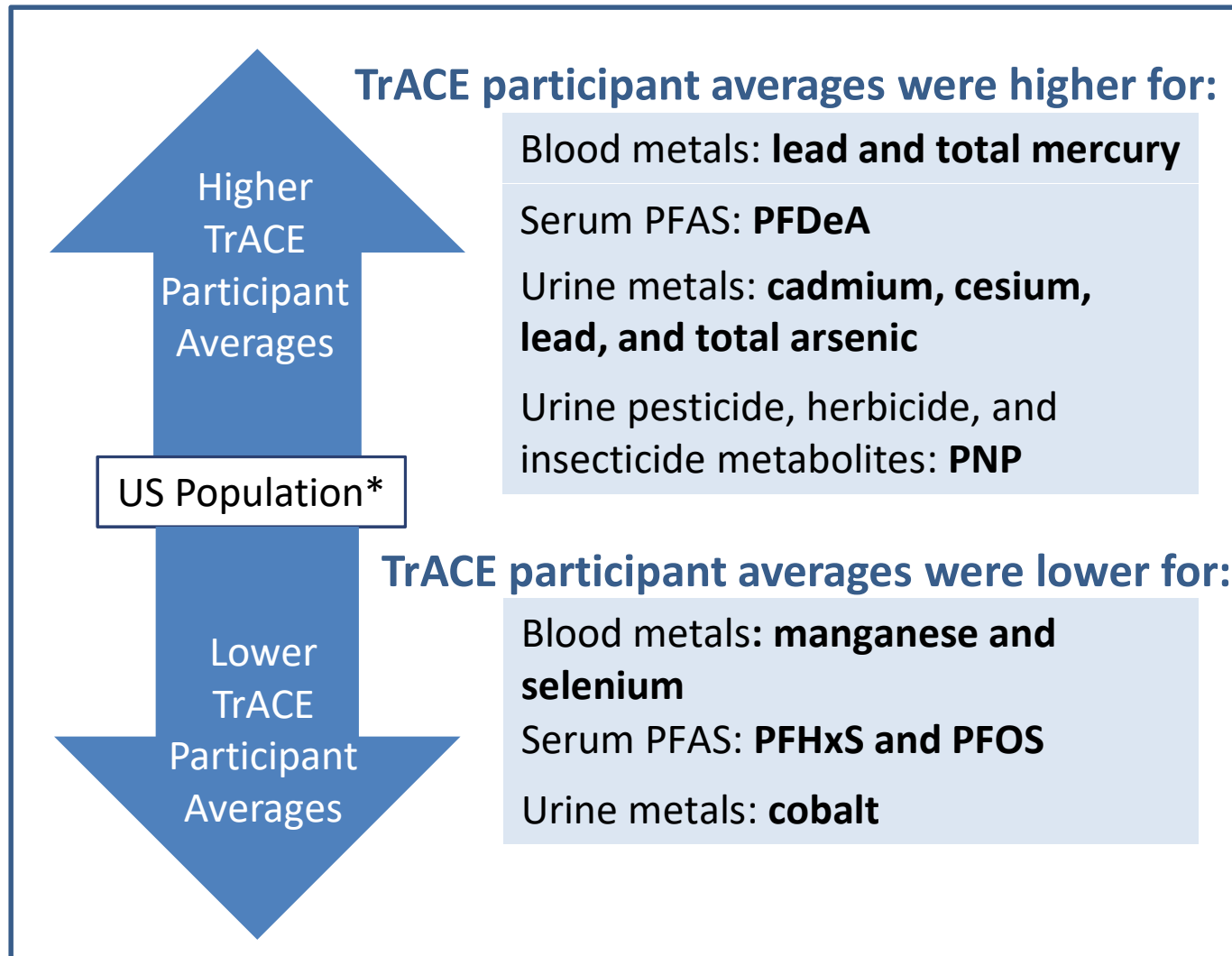


Important Notes

- ▶ Finding a measurable amount of a chemical doesn't mean an adverse health effect will occur.
- ▶ The only environmental exposure tested was water, but people are exposed to chemicals in many ways.



Important Biomonitoring Results – Comparison of TrACE and US Averages

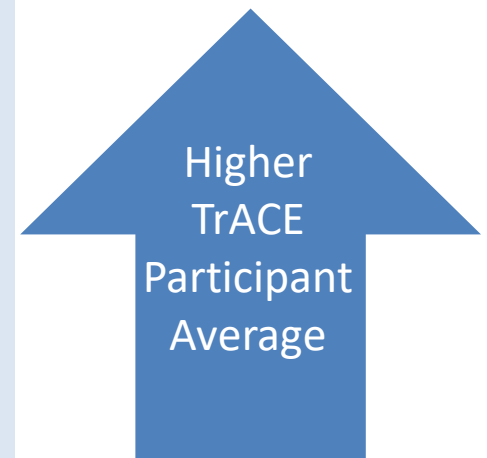


* NHANES Non-Hispanic White population

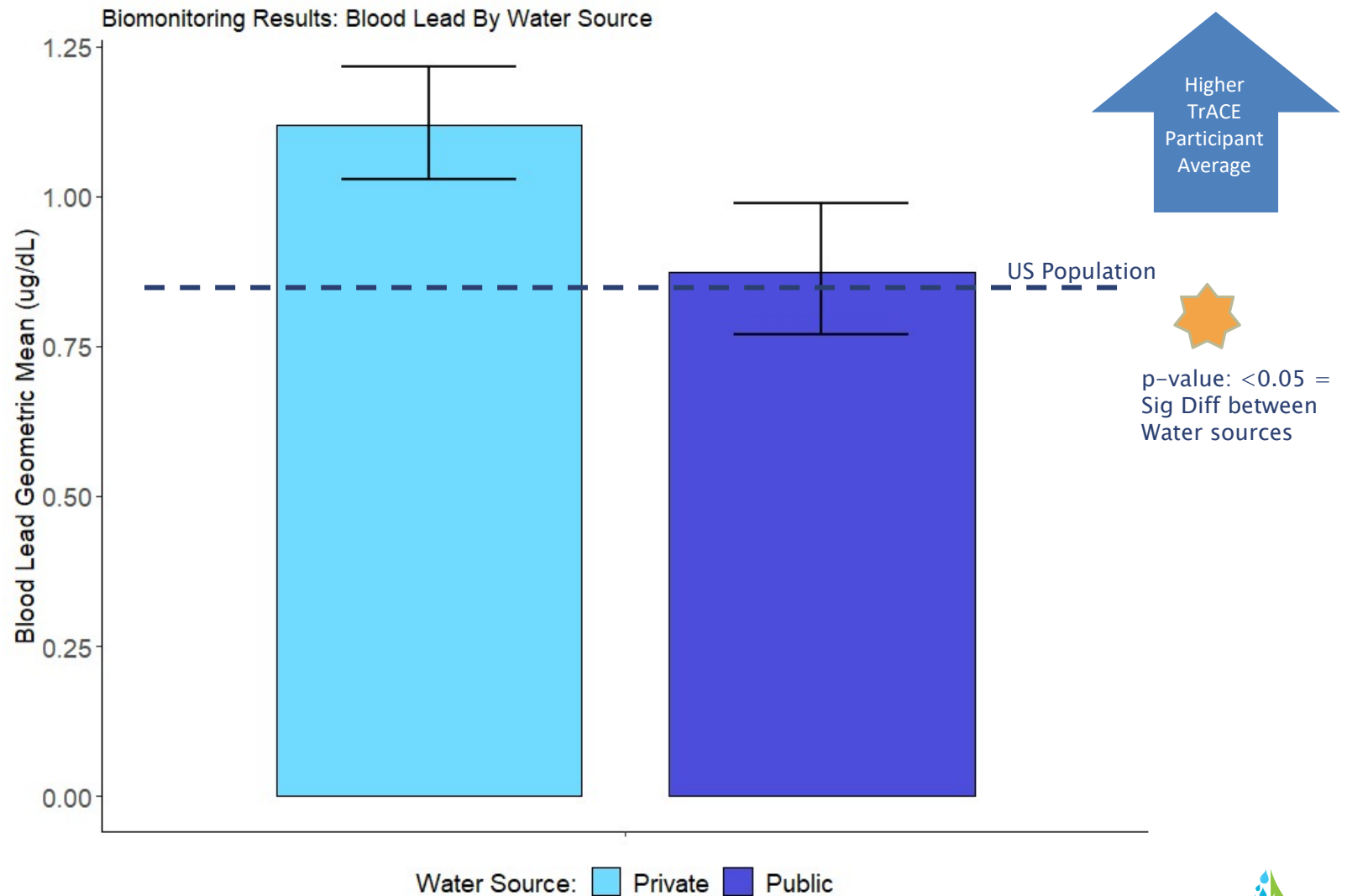
Biomonitoring Result Interpretation – Potential Exposures to Lead

Lead

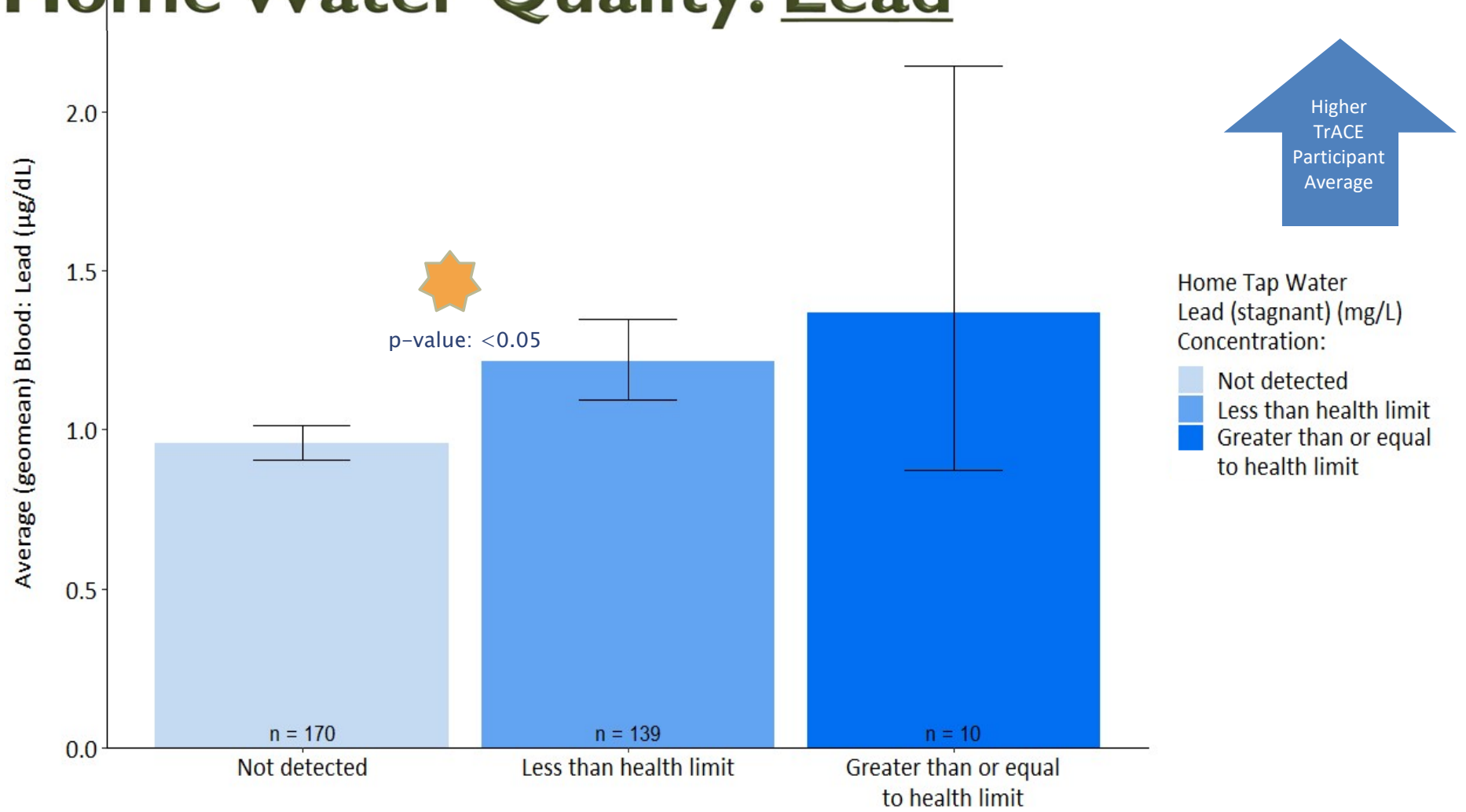
- Whole blood and urine
- Most common source in NH = lead paint (homes pre-1978)
- Another significant source = home drinking water (plumbing and fixtures)
- Previously added to gasoline, paint, plumbing, pesticides, and solder
- Other sources: occupation, imported spices, Ayurvedic medicine



Evaluation of Biomonitoring Results by Home Water Source: Blood Lead



Evaluation of Biomonitoring Results by Home Water Quality: Lead



Home Tap Water: Lead (stagnant) Concentration

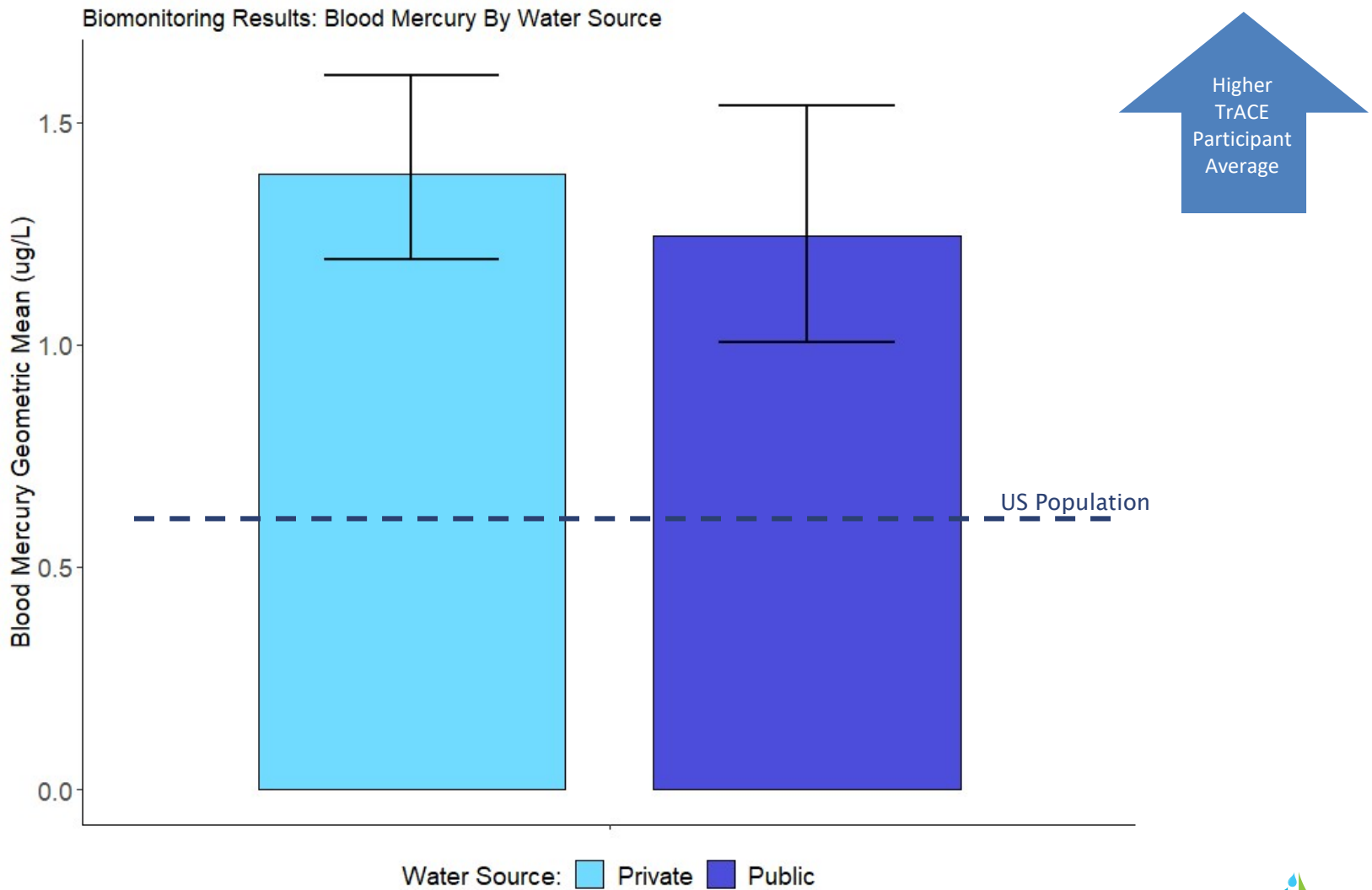
Biomonitoring Result Interpretation – Potential Exposures to Total Mercury

Total Mercury ↑

- Whole blood
- Total mercury = elemental mercury + inorganic mercury + organic mercury
- Most common source (organic methylmercury) = fish, seafood, and marine mammals.
- Limits on fish sold in stores; NH recreational fish advisories:
<https://www.wildlife.state.nh.us/fishing/consume-fresh.html>.
- Other sources = silver dental fillings, burning of municipal and medical waste, thermometers, Ayurvedic medicine, skin lightening creams

Higher
TrACE
Participant
Average

Evaluation of Biomonitoring Results by Home Water Source: Blood Total Mercury



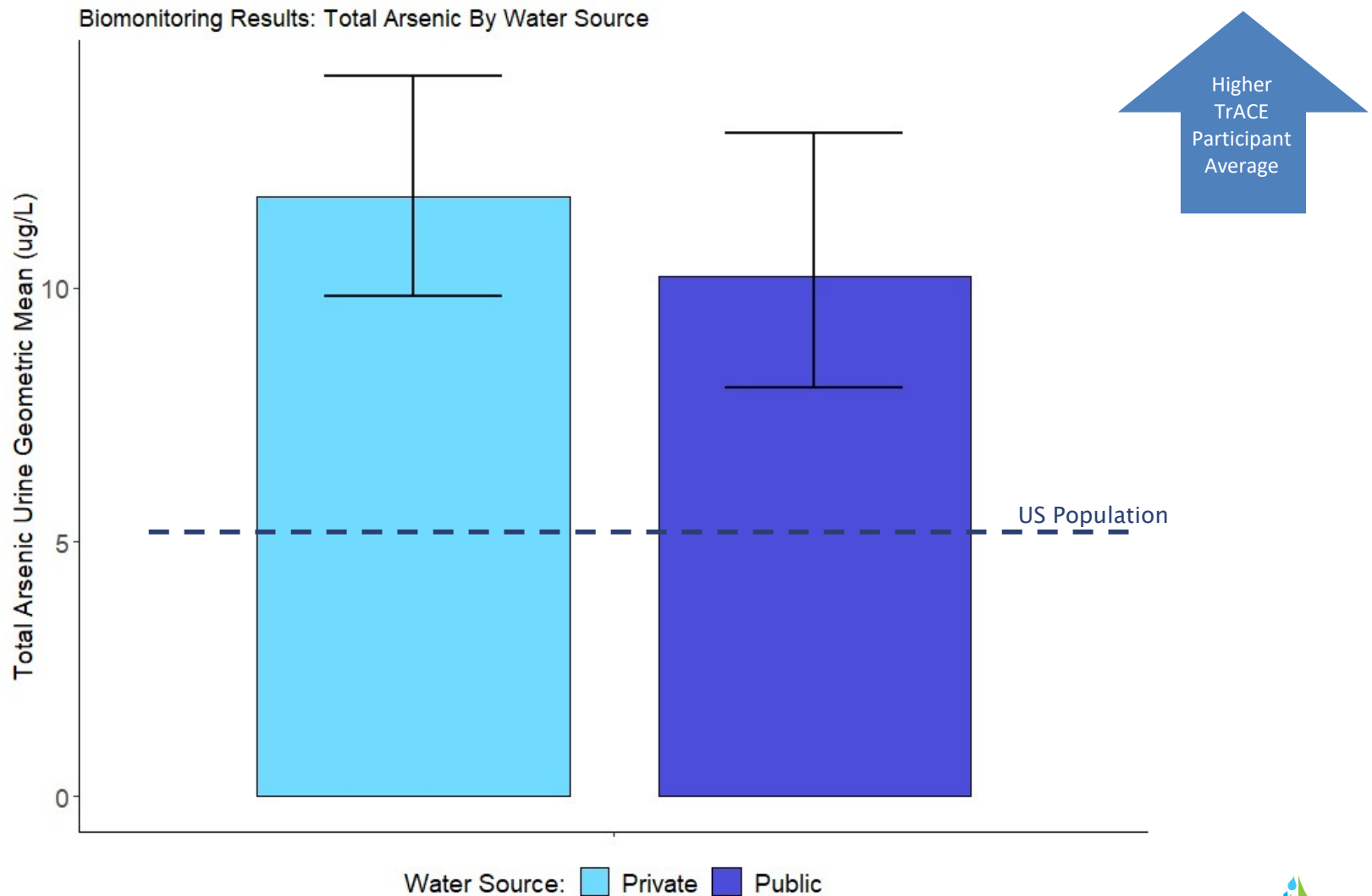
Biomonitoring Result Interpretation – Potential Exposures to Total Arsenic

Total Arsenic ↑

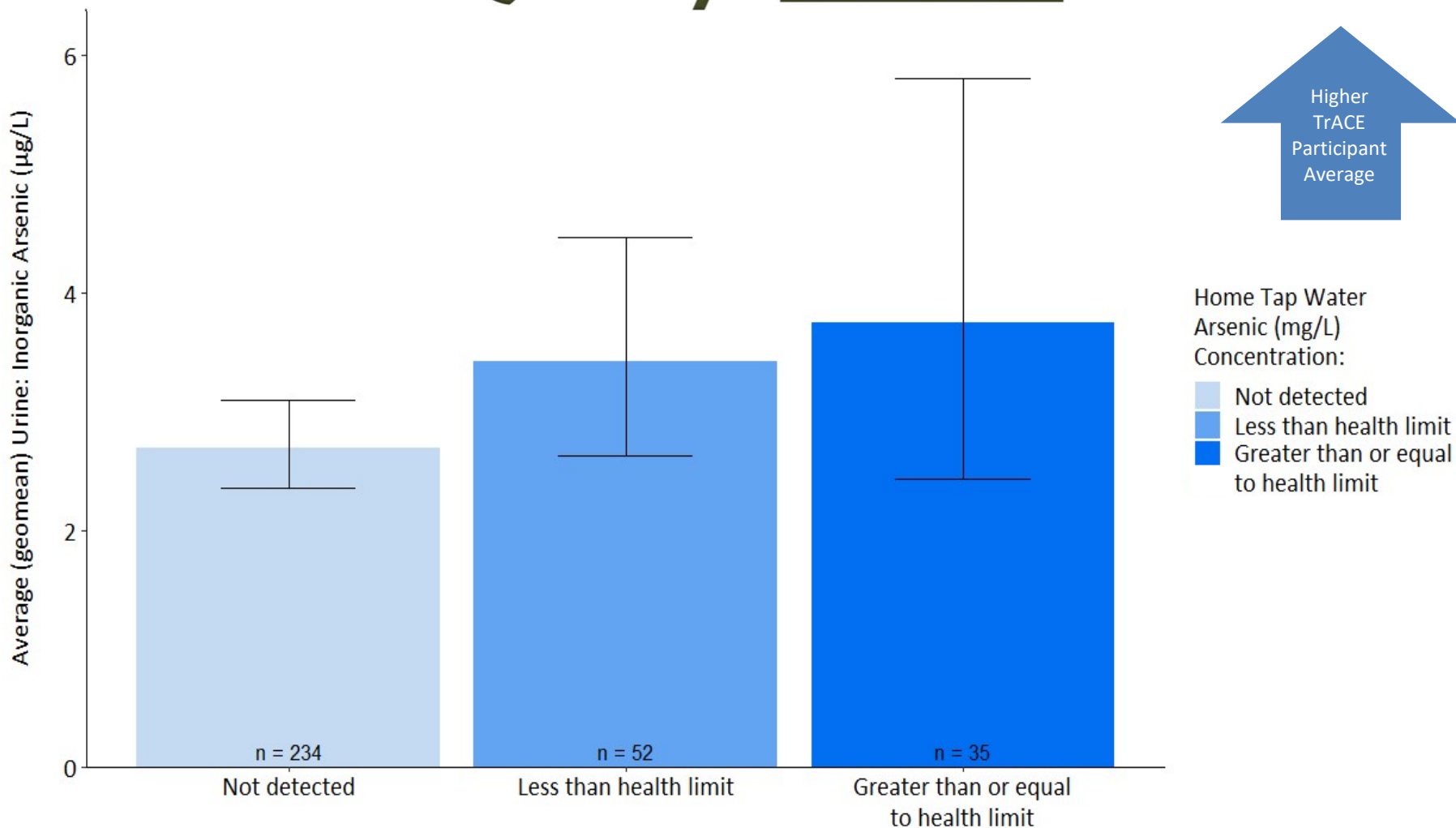
- Urine
- Total arsenic = organic arsenic + inorganic arsenic
- Most common sources: food and water
- Other sources: pesticides, treated wood, smoking tobacco, Ayurvedic medicine

Higher
TrACE
Participant
Average

Evaluation of Biomonitoring Results by Home Water Source: Urine Total Arsenic



Evaluation of Biomonitoring Results by Home Water Quality: Arsenic



Home Tap Water: Arsenic Concentration

Biomonitoring Result Interpretation – Potential Exposures to Uranium

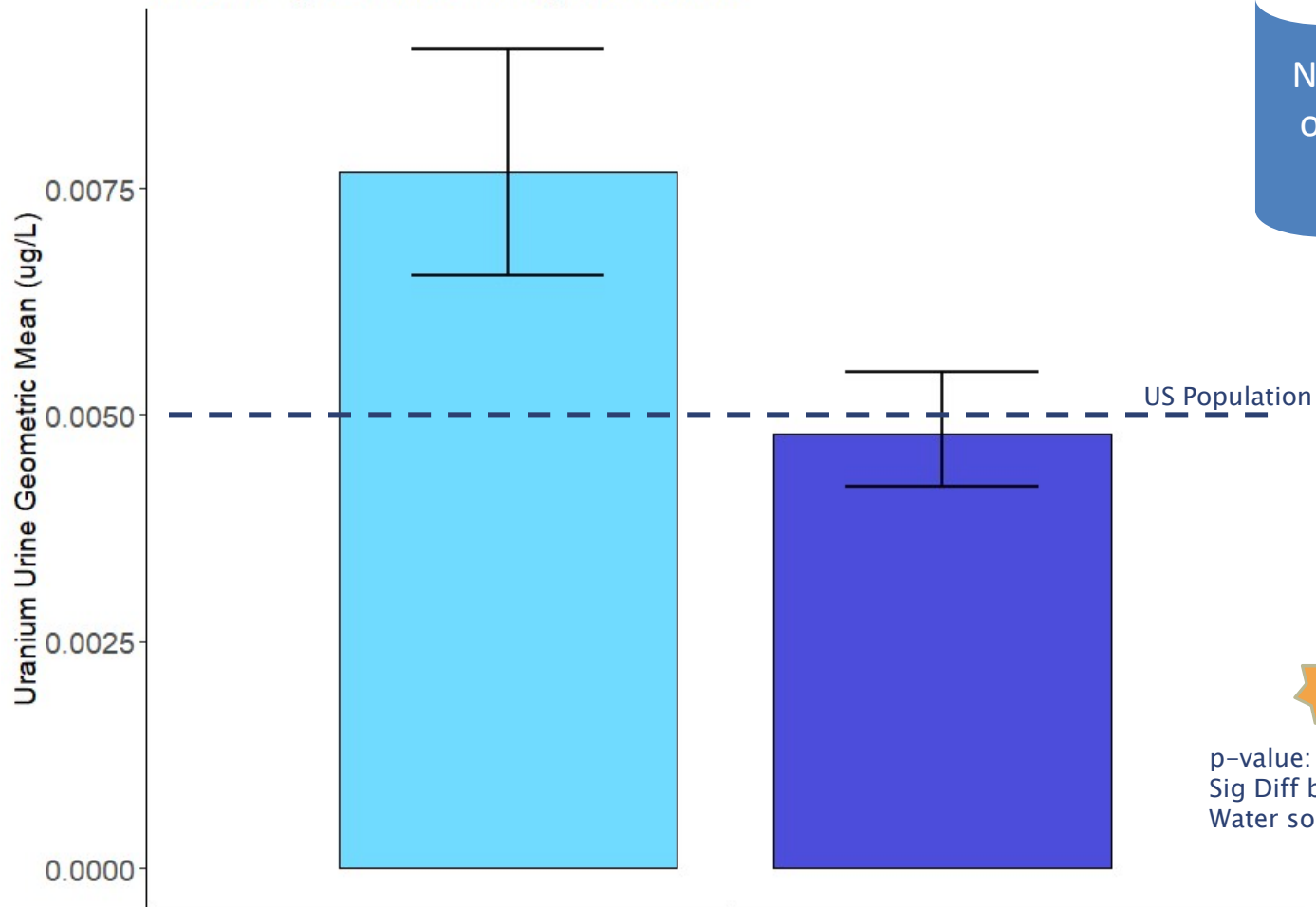
Uranium

- Urine
- Most common sources: food and water
- Other sources: phosphate fertilizers, coal-burning power plants, certain enamel and glazes for glass or pottery

NH Analyte
of Interest

Evaluation of Biomonitoring Results by Home Water Source: Urine Uranium

Biomonitoring Results: Uranium By Water Source



NH Analyte of Interest

★
p-value: <0.05 =
Sig Diff between
Water sources

Water Source: ■ Private ■ Public

Important Note

Specific areas of NH have very high levels of some PFAS in water and in people. This was seen in previous studies involving the Pease Tradeport and in southern NH (<https://wisdom.dhhs.nh.gov>).

TrACE Study data was analyzed from across the state and not specific targeted areas, so serum results may be different in people living or working in areas with higher exposure.

PFAS: per- and polyfluoroalkyl substances

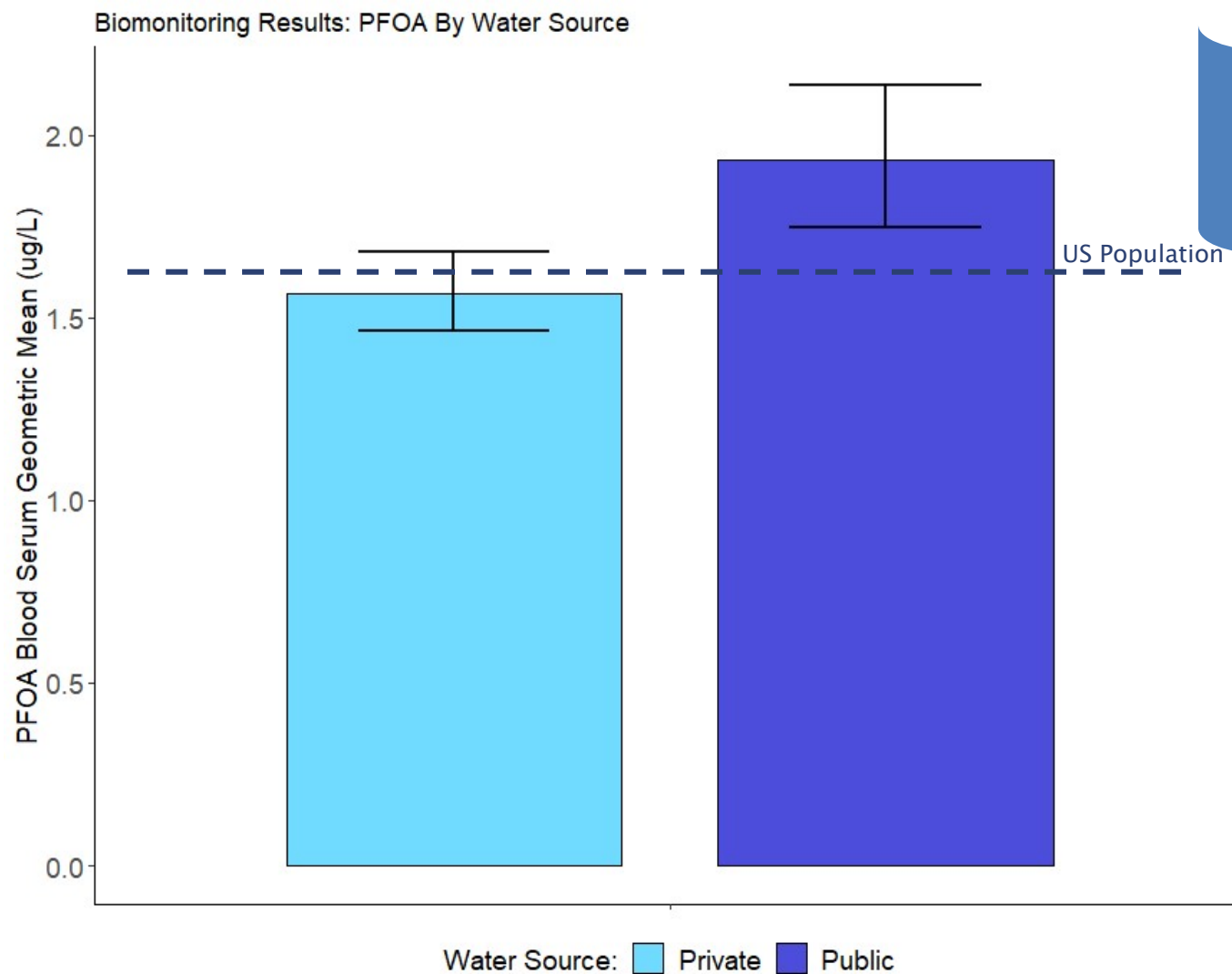
Biomonitoring Result Interpretation – Potential Exposures to PFOA & PFOS

PFOA (perfluorooctanoic acid) & PFOS (perfluorooctane sulfonic acid)

- Serum
- Most common sources: food, water, dust
- Other sources: stain-resistant carpeting or fabric, adhesives, aqueous film forming foam (AFFF), cosmetics

NH Analytes
of Interest

Evaluation of Biomonitoring Results by Home Water Source: Serum PFOA

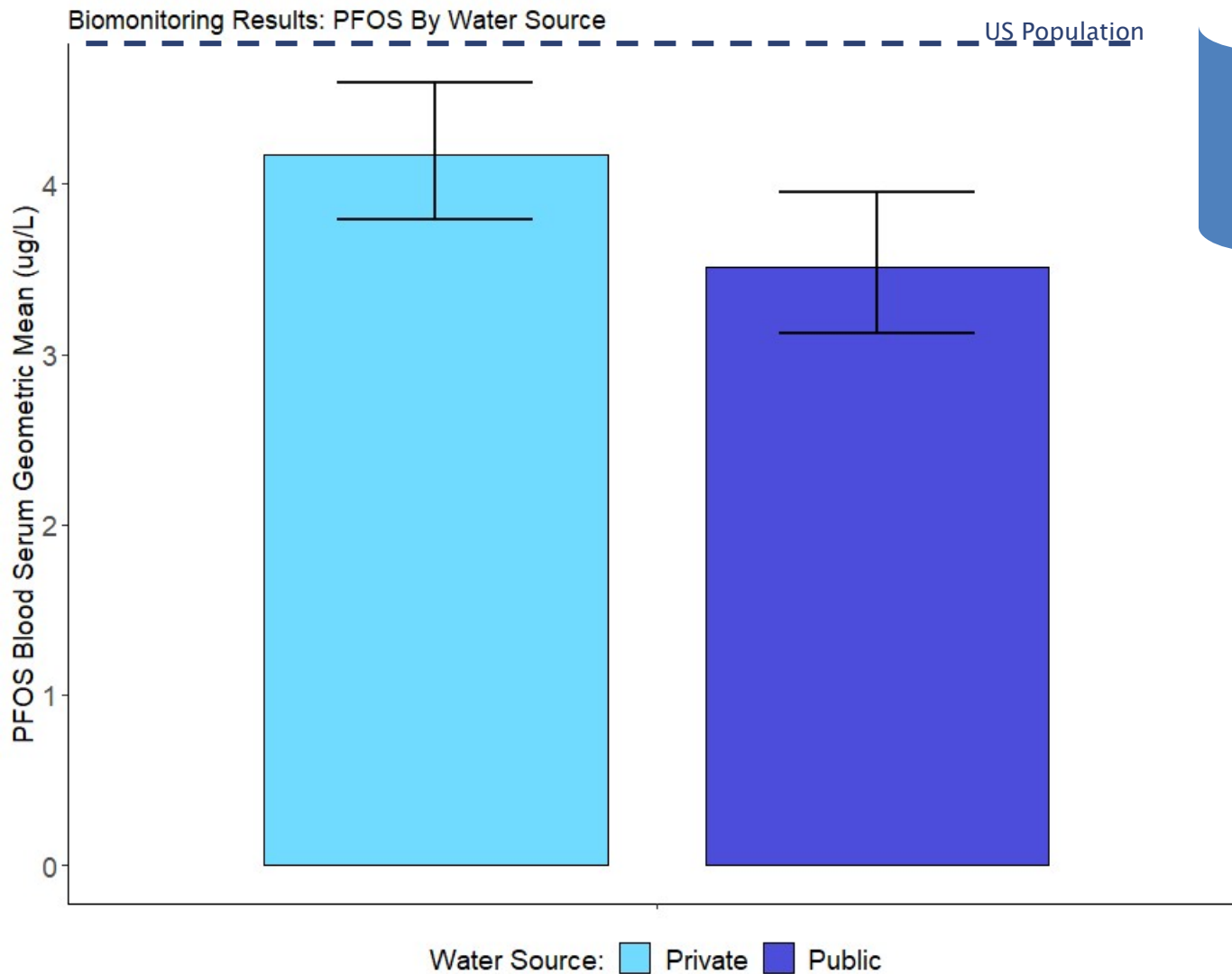


NH Analyte of Interest



p-value: <0.05 =
Sig Diff between
Water sources

Evaluation of Biomonitoring Results by Home Water Source: Serum PFOS



NH Analyte of Interest



p-value: <0.05 = Sig Diff between Water sources

PFAS Clinical Results in Elevated Areas

- ▶ TrACE participant PFAS results grouped into known areas of PFAS contamination:
 - Southern NH
 - Seacoast
- ▶ Compared the group of TrACE participants that live in known areas of PFAS contamination to TrACE participants located in other areas of New Hampshire

PFAS Clinical Results in Elevated Areas

Known Elevated PFAS Areas:

Southern NH Towns:

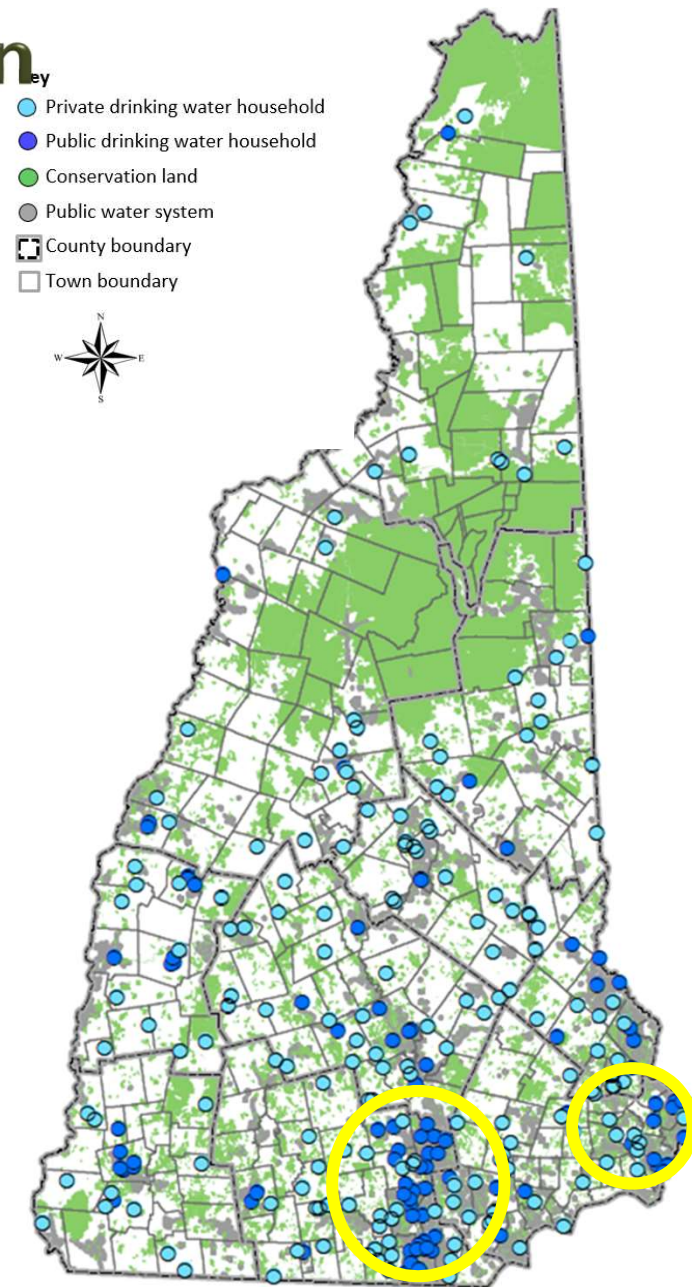
Amherst, Bedford, Hollis, Litchfield,
Londonderry, Manchester, Merrimack
-51 People in TrACE

Seacoast Towns:

Hampton, Newington, North Hampton,
Portsmouth
-11 People in TrACE

All other Areas:

272 participants in TrACE Study

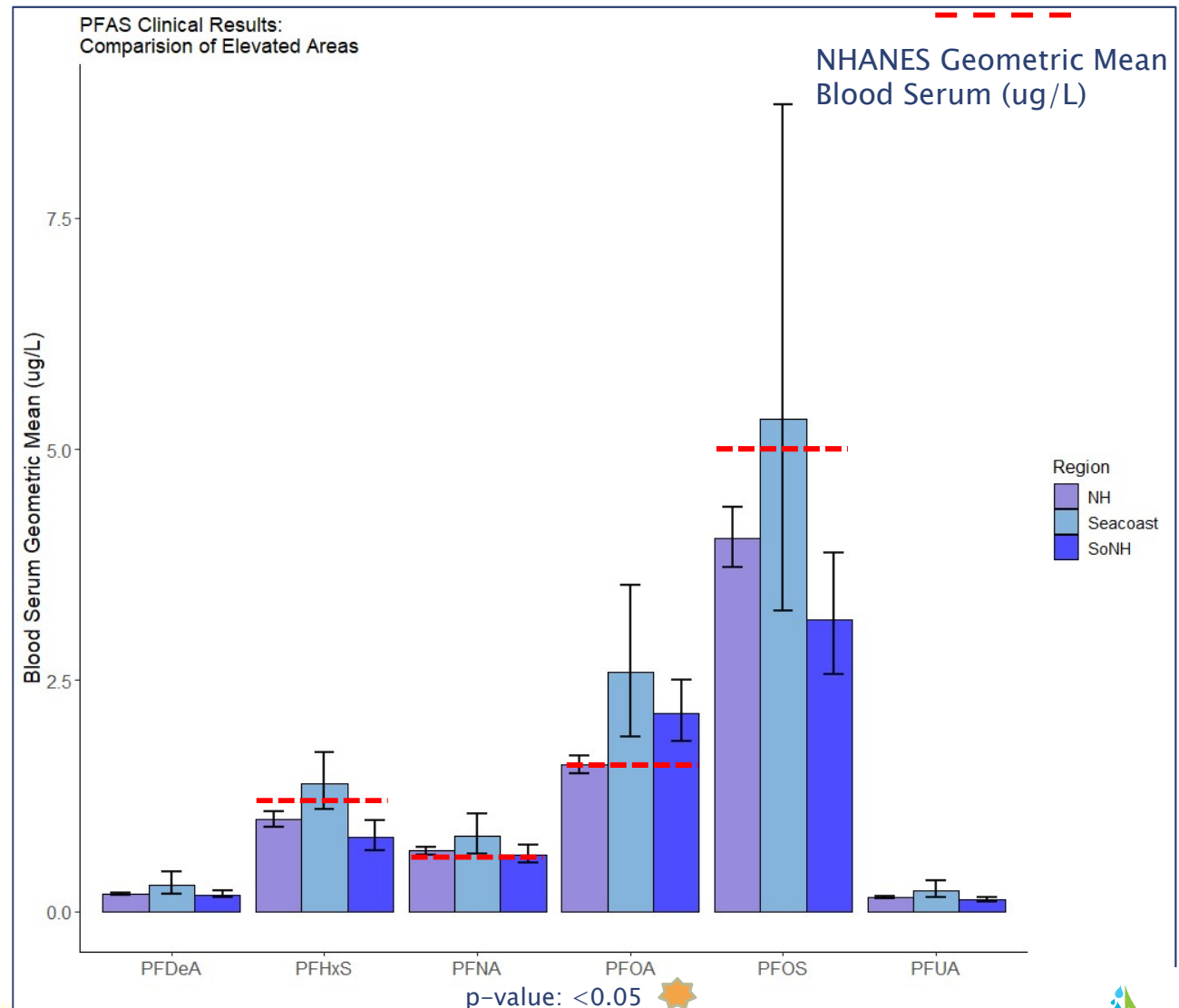


PFAS Clinical Results in Elevated Areas

Key Points:

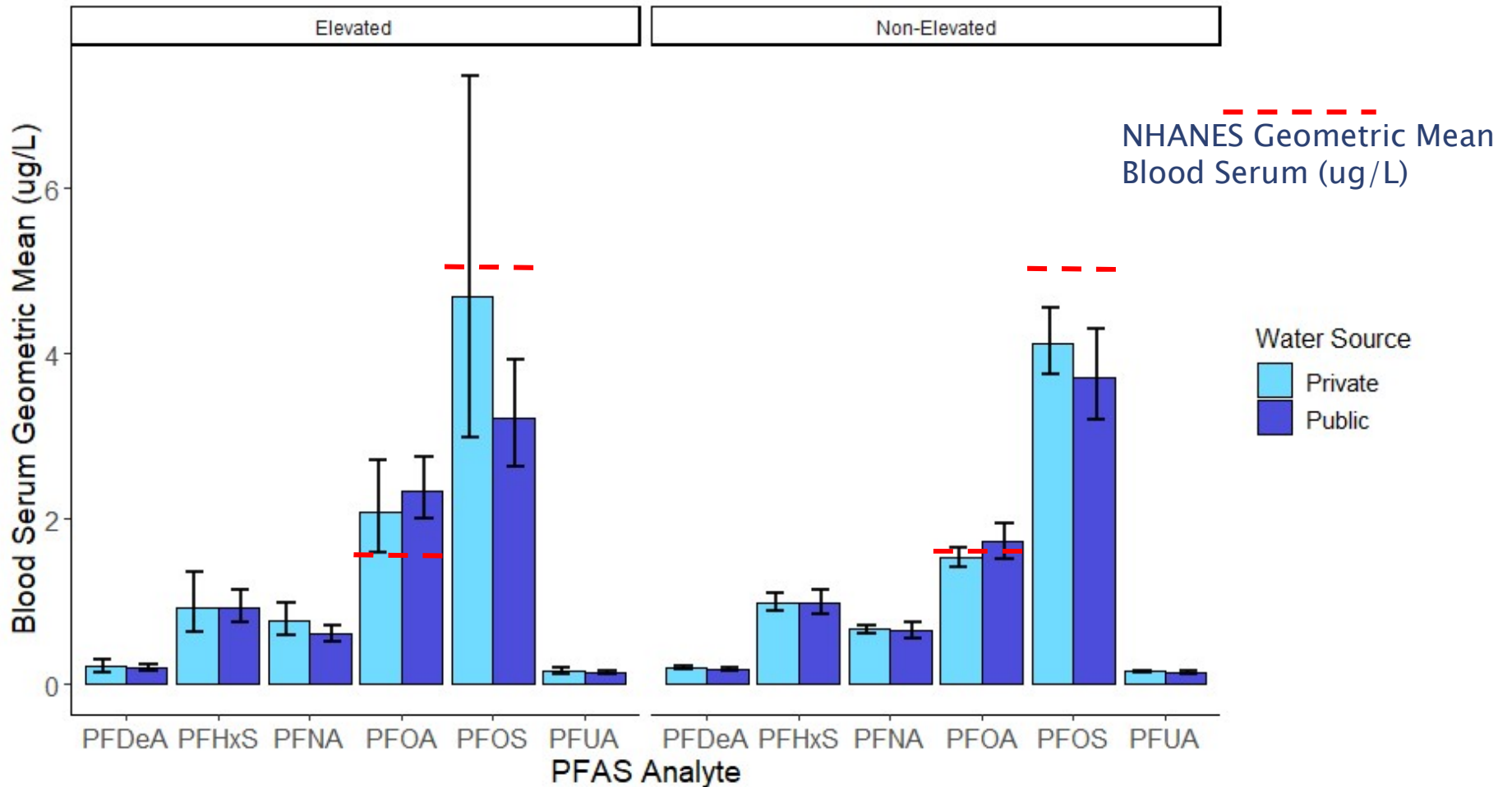
PFOA in TrACE participants is sig. diff. and higher for people in the SoNH elevated areas compared to non-elevated PFAS areas in NH.

PFOA in TrACE participants is sig. diff. and higher than NHANES if they live in towns with known PFAS contamination



Clinical PFAS by Water Source & Elevated Areas

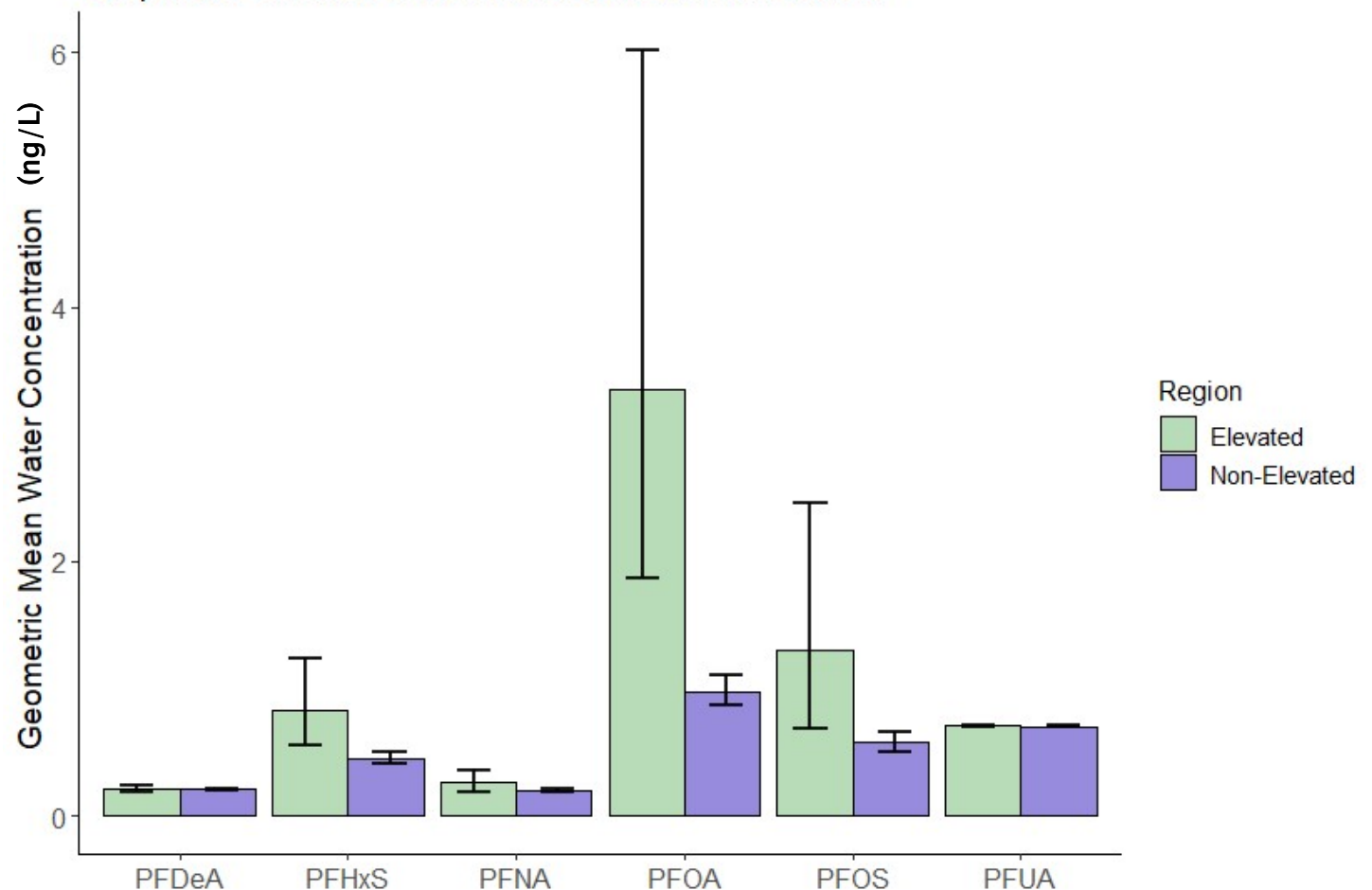
PFAS Clinical Results:
Private Well Water vs Public Water
in Known PFAS Elevated Areas vs Non-Elevated Areas



→ PFOA in TRACE participants on either Private Well Water or Public Water is higher than NHANES in known elevated PFAS areas (Southern NH and Seacoast)

PFAS Private Well Water Results in Elevated Areas vs Non Elevated Area

PFAS Private Well Water:
Comparison of PFAS Elevated Areas vs Non-Elevated Areas



Key Points:
PFOA and PFOS are sig. different and higher in private wells in known elevated PFAS areas compared to private wells in non-elevated areas of NH.

p-value: <math><0.05</math>

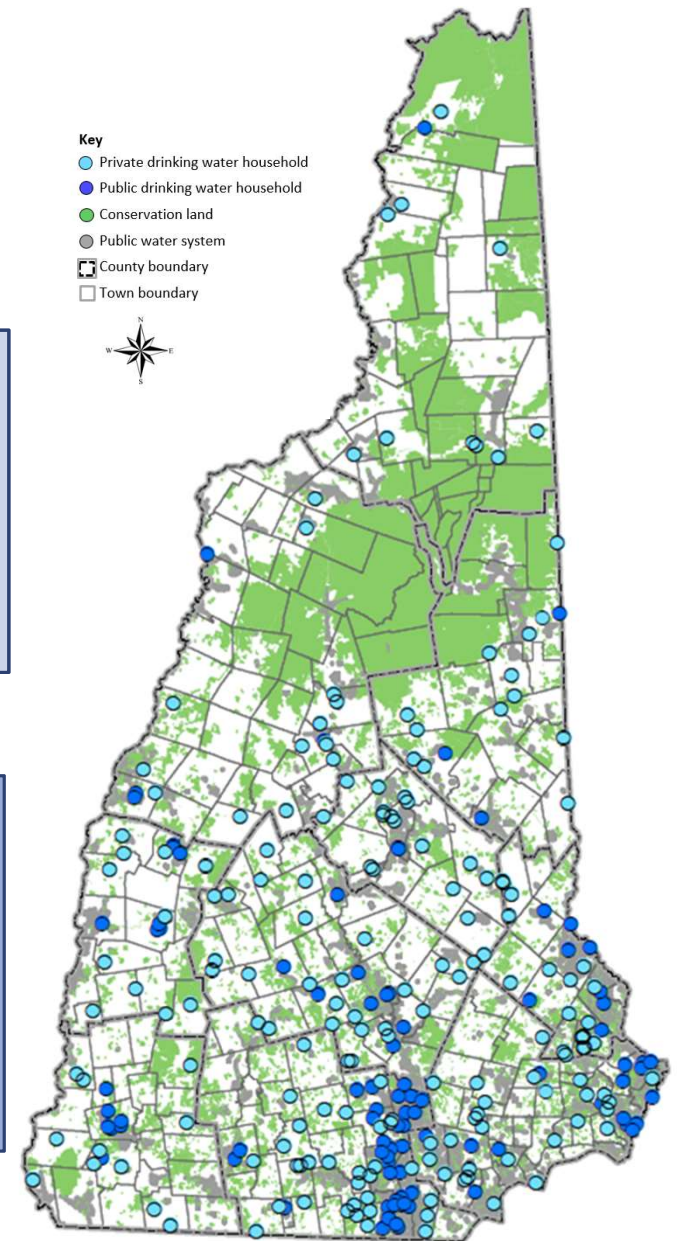
2019 NH TrACE: PFAS in People and Water

Key Finding 1

NH TrACE Study participants living in known areas of elevated PFAS contamination have higher amounts of PFOA in their *body* when compared to other parts of NH and to NHANES.

Key Finding 2

Private Well users in known elevated PFAS areas have significantly different and higher concentrations of PFOA and PFOS in their *water* compared to private wells in non-elevated areas.



Home Water Quality: Private Well Raw & Finished Water

			Private Wells Raw Water	Private Wells Finished Water
Chemical Class	Chemical	Health Limit or Screening Level	Samples with Elevated Results (%)	Samples with Elevated Results (%)
Metals	Arsenic (mg/L)	0.005	21.7	15.9
	Copper (stagnant) (mg/L)	1.3	Not Tested	8.0
	Lead (flushed) (mg/L)	0.015	No Exceedances	0.6
	Lead (stagnant) (mg/L)	0.015	Not Tested	4.0
	Manganese (mg/L)	0.3	7.2	0.6
	Strontium (mg/L)	1.5	Not Tested	1.2
PFAS	PFOA (ng/L)	12	2.8	Not Tested
	PFOS (ng/L)	15	1.1	Not Tested
Radiologicals	Radium 226 (pCi/L)	5	1.7	Not Tested
	Radon (pCi/L)	2000	49.7	37.5
	Uranium (µg/L)	30	3.9	2.8
VOCs	1,4-Dioxane (µg/L)	0.32	1.1	Not Tested

Home Water Quality: Private Well Raw & Finished Water

			Private Wells Raw Water	Private Wells Finished Water
Chemical Class	Chemical	Health Limit or Screening Level	Samples with Elevated Results (%)	Samples with Elevated Results (%)
Metals	Arsenic (mg/L)	0.005	21.7	15.9
	Copper (stagnant) (mg/L)	1.3	Not Tested	8.0
	Lead (flushed) (mg/L)	0.015	No Exceedances	0.6
	Lead (stagnant) (mg/L)	0.015	Not Tested	4.0
	Manganese (mg/L)	0.3	7.2	0.6
	Strontium (mg/L)	1.5	Not Tested	1.2
PFAS	PFOA (ng/L)	12	2.8	Not Tested
	PFOS (ng/L)	15	1.1	Not Tested
Radiologicals	Radium 226 (pCi/L)	5	1.7	Not Tested
	Radon (pCi/L)	2000	49.7	37.5
	Uranium (µg/L)	30	3.9	2.8
VOCs	1,4-Dioxane (µg/L)	0.32	1.1	Not Tested

Home Water Quality: Public & Private Finished Water

			Public Water System Finished Water	Private Wells Finished Water
Chemical Class	Chemical	Health Limit or Screening Level	Samples with Elevated Results (%)	Samples with Elevated Results (%)
Metals	Arsenic (mg/L)	0.005	4.3	15.9
	Copper (stagnant) (mg/L)	1.3	1.1	8.0
	Lead (flushed) (mg/L)	0.015	No Exceedances	0.6
	Lead (stagnant) (mg/L)	0.015	2.1	4.0
	Manganese (mg/L)	0.3	1.1	0.6
	Strontium (mg/L)	1.5	No Exceedances	1.2
PFAS	PFOA (ng/L)	12	Not Tested	Not Tested
	PFOS (ng/L)	15	Not Tested	Not Tested
Radiologicals	Radium 226 (pCi/L)	5	Not Tested	Not Tested
	Radon (pCi/L)	2000	4.3	37.5
	Uranium (µg/L)	30	No Exceedances	2.8
VOCs	1,4-Dioxane (µg/L)	0.32	Not Tested	Not Tested

Summary of Key Findings

1. More research is needed.
2. Water treatment systems work. Health limits improve water quality.
3. Evidence of increased lead and inorganic arsenic body burden as water concentration increased.
4. Lead-contaminated stagnant water may be contributing to body burden.

Recommendations

1. Test your water. Install a treatment system (if indicated) and maintain it. Continue testing your water. Use *Be Well Informed* <https://www4.des.state.nh.us/DWITool/Welcome.aspx> for result interpretation.
2. Test your home air for radon and install a mitigation system (if indicated).
3. Talk with your healthcare provider.
4. Explore your potential for health effects from chemicals.

Next Steps

- ▶ Summary Report



2019 NH Tracking and Assessment of Chemical Exposures (TrACE) Study




Summary Report

New Hampshire Department of Health and Human Services | Division of Public Health Services
Bureau of Public Health Laboratories | 29 Hazen Drive, Concord, NH 03301 | 603-271-4611
BiomonitoringNH@dhhs.nh.gov

Next Steps

- ▶ Result return
- ▶ Exposure questionnaire analysis
- ▶ Future TrACE studies


PARTICIPANT LABORATORY REPORT



**NH DIVISION OF
Public Health Services**
Improving health, preventing disease, reducing costs for all

New Hampshire Public Health Laboratories
Department of Health and Human Services
29 Hazen Dr., Concord, NH 03301
Phone (603) 271-4661
Fax (603) 271-2138


Participant Name: Test Sample
Workorder Number: 86041
Project: 2019 NH TrACE Study



Chemical Measured: Antimony

Your level by Urine Multi-Element Analysis:

	Specimen type	Your Result	Test Report Date	US Population, ages 20+ years	
				50th Percentile	95th Percentile
Antimony (ug/L)	Urine	1.20	02/13/2020	0.044	0.191




The graph shows a horizontal axis representing Antimony concentration in ug/L. Three vertical tick marks are labeled: '50th: 0.044 ug/L', '95th: 0.191 ug/L', and 'Your Result: 1.20 ug/L'. The 'Your Result' is significantly higher than both population percentiles.

Important Information about Antimony

Antimony (Sb) is a naturally occurring element. Most people come into contact with antimony through their food or water where it is normally present in very small amounts. Some people come into contact with it through their job(s), especially those who work with incinerators, smelters, or in coal-burning power plants and mines. Antimony is used to create storage batteries, solder, sheet and pipe metal, bearings, ammunition, and pewter. It is also used in rubber, adhesives, pigments/paints, fireworks, and ceramics/glass. People may come into contact with antimony when using these products. In rare circumstances, it has been used in a medicine to treat leishmaniasis, a disease caused by sand flies. The EPA has set the maximum contaminant level of antimony in public water systems at 0.006 mg/L (milligrams per liter). Some possible sources of antimony in drinking water include discharge from petroleum refineries, fire retardants, ceramics, electronics, and solder.

It is unknown whether small amounts of antimony over time will cause health effects. Many factors go into whether a person will develop a health effect from coming into contact with a chemical. Some of these include their genetics, overall health, how much and for how long they have been in contact with that chemical, and if they are exposed to other chemicals at the same time. Swallowing a large amount of antimony can cause stomach irritation, vomiting, diarrhea, and irregular heart rhythms. Inhaling antimony in the workplace can irritate the eyes, nose, throat, lungs, and stomach. This can lead to problems breathing. Skin exposure can cause a rash. When large amounts of antimony are injected to treat parasitic infections, it can cause headache, fatigue, and muscle and joint pain and it can also affect the pancreas, liver, and stomach. Antimony can also decrease blood cell counts. Some cardiovascular effects such as increased cholesterol or decreased blood sugar may also occur. It is estimated that it takes several days for half of the antimony in the body to be eliminated once a person is no longer in contact with it. For more information, visit <https://tinyurl.com/CDCAntimony>.



NH DIVISION OF
Public Health Services
Department of Health and Human Services

Acknowledgements

- ▶ NH Public Health Laboratories
- ▶ NH Environmental Public Health Tracking Program
- ▶ NH Department of Environmental Services
- ▶ NH Drinking Water and Groundwater Trust Fund
- ▶ Northern New England Poison Center
- ▶ CDC National Center for Environmental Health

Financial and technical assistance was provided through cooperative agreement with the Centers for Disease Control and Prevention (CDC) Division of Laboratory Sciences at the National Center for Environmental Health *RFA EEH14140202*. The contents of these pages do not necessarily represent the official views of the CDC.



Study findings are online:
tinyurl.com/2019TrACereport

Contact Information

Amanda Cosser, MPH
Biomonitoring Program
NH DHHS DPHS
(603) 271-4611
Amanda.Cosser@dhhs.nh.gov

Nicholas Shonka, MS
EPHT Program
NH DHHS DPHS
(603) 271-4304
Nicholas.Shonka@dhhs.nh.gov



NEW HAMPSHIRE
ENVIRONMENTAL PUBLIC HEALTH
TRACKING
NH.GOV/EPHT

