Perfluorochemical (PFC) Testing Program: Summary of test results for children <12 y.o.

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New Hampshire Department of Health & Human Services

Purpose of Tonight's Meeting

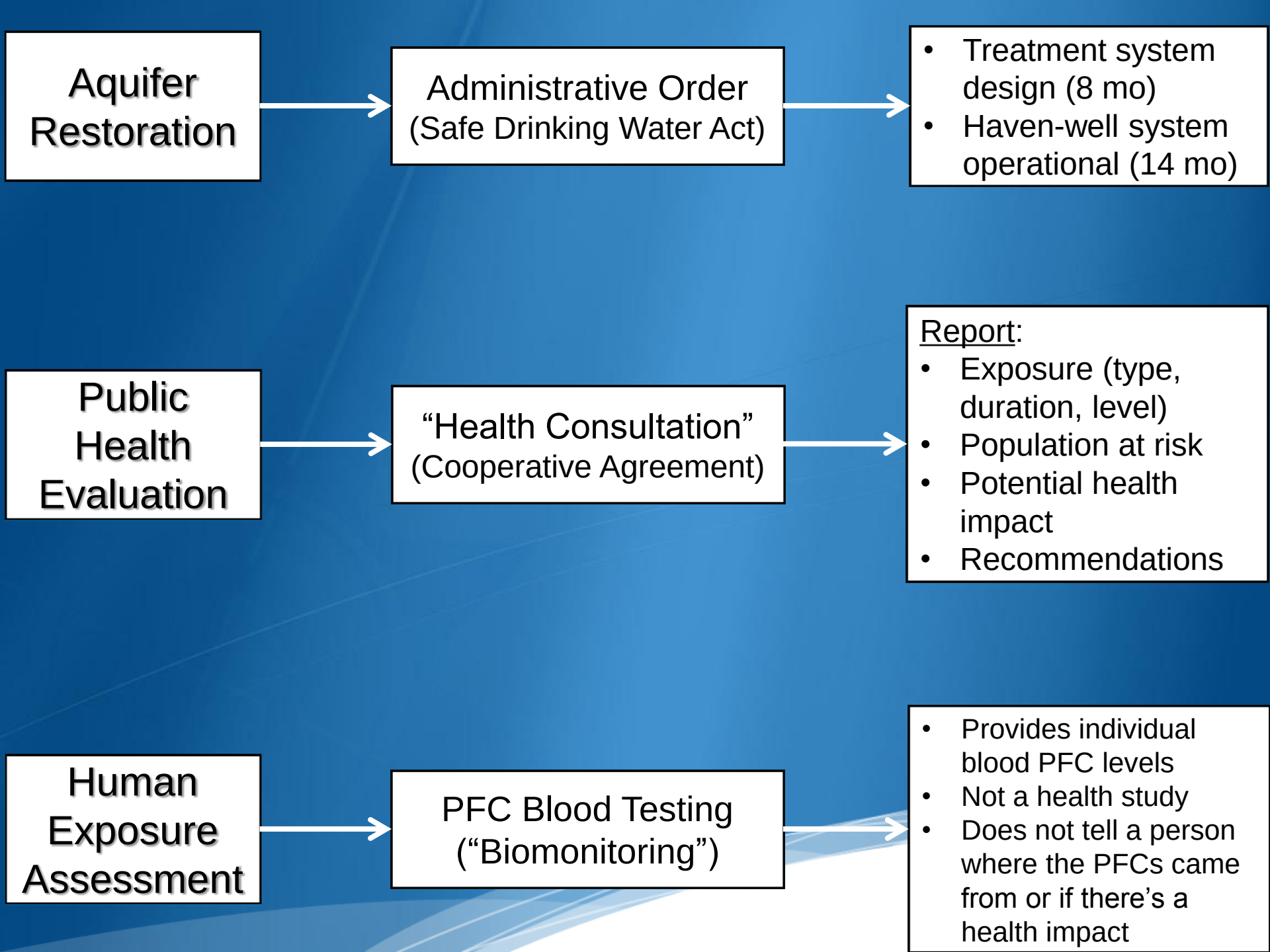
- Briefly review the work being performed to address the Pease Tradeport well contamination and how the DHHS blood testing program relates
- Review preliminary results from the first 108 child participants
- Provide information to aide interpretation of individual test results
- Offer a chance for questions and feedback

Multiagency Collaborative Response

- U.S. Air Force
- Environmental Protection Agency (EPA)
- NH Dept. of Environmental Services (DES)
- NH Department of Health & Human Services (DHHS)
- Northern New England Poison Center (NNEPC)
- Centers for Disease Control and Prevention (CDC)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- Environmental Medical Group at Boston Children's Hospital
- Portsmouth Regional Hospital
- Community Advisory Board (CAB) & community members
- Senator Shaheen & staff
- Senator Ayotte & staff

Current Paths of Work

Aquifer Restoration	Lead: **Air Force** **EPA** (Administrative Order) **DES** (Waste Management Division)
Public Health Evaluation	Lead: **DES** (Environmental Health Program) **ATSDR** (Cooperative Agreement)
Human Exposure Assessment	Lead: **DHHS** **ATSDR** (Technical Assistance)


Aquifer Restoration
Administrative Order (Safe Drinking Water Act)
• Treatment system design (8 mo)
• Haven-well system operational (14 mo)
Public Health Evaluation
“Health Consultation” (Cooperative Agreement)
Report:
• Exposure (type, duration, level)
• Population at risk
• Potential health impact
• Recommendations
Human Exposure Assessment
PFC Blood Testing (“Biomonitoring”)
• Provides individual blood PFC levels
• Not a health study
• Does not tell a person where the PFCs came from or if there’s a health impact

Why is DHHS Performing PFC Blood Testing Outside the Typical Path?

- Assess individual exposure to PFCs at the community's request… delay was unacceptable
- Limitation: Blood test does not tell a person where the PFCs came from or if there's a health impact
- We hear the concern and anxiety around the uncertainty about what the PFC levels mean for a person's health
- We hear the requests for future study and re-testing

How Will the Individual PFC Blood Levels be Used?

- We are still in the middle of testing
- At the end of all testing, there will be a more complete analysis and review of the blood test results with our partners
- How the levels will be used in any future work, and “next steps” will be determined through the ATSDR/DES science based process

What We Will Do

- We are committed to maintaining communication with the community and the Community Advisory Board (CAB)
- We will continue to provide updates and keep the community informed about any new developments
- We will work with our partners to try and develop a timeframe to provide answers to your questions

Current Status of the Testing Program

- 471 people tested (363 adolescents & adults, 108 children 11 years and younger)
- All results have been mailed
- Testing is re-opened until October 16, 2015 for those who missed the April-May testing
- More than 600 people have so far signed up for this second round of testing (includes ~175 more children)
- When all results are back and analyzed, we will provide a complete report at another community meeting

PFCs Tested in Blood

PFC Name	Abbreviation
perfluorooctane sulfonic acid	PFOS
perfluorooctanoic acid	PFOA
perfluorohexane sulfonic acid	PFHxS
perfluorononanoic acid	PFNA
perfluorodecanoic acid	PFDeA
perfluoroundecanoic acid	PFUA
Perfluorooctane sulfonamide*	PFOSA
2-(N-ethyl-perfluorooctane sulfonamido) acetic acid*	ET-PFOSA-ACOH
2-(N-methyl-perfluorooctane sulfonamido) acetic acid*	ME-PFOSA-ACOH

PFCs Tested in Water

PFC Name	Abbreviation
perfluorooctane sulfonic acid	PFOS
perfluorooctanoic acid	PFOA
perfluorohexane sulfonic acid	PFHxS
perfluorononanoic acid	PFNA
perfluorodecanoic acid	PFDeA
perfluoroundecanoic acid	PFUA
Perfluorododecanoic acid**	PFDoA
Perfluoropentanoic acid**	?
Perfluorobutane sulfonate**	PFBuS
Perfluorohexanoic acid**	PFHxA
Perfluoroheptanoic acid**	PFHpA

* PFCs tested in blood by CDC lab, but not tested in water

** PFCs not tested in blood by CDC lab, but tested in water

PFC levels in Water

- PFOS PHA: 0.2 µg/L
- PFOA PHA: 0.4 µg/L

PFC Name	Abbreviation	PFC Levels in µg/L		
		Haven Well	Harrison Well	Smith Well
perfluorooctane sulfonic acid	PFOS	2.50	0.05	0.02
perfluorooctanoic acid	PFOA	0.35	0.009	0.004
perfluorohexane sulfonic acid	PFHxS	0.83	0.04	0.01
perfluorononanoic acid	PFNA	0.02	ND	ND
perfluorodecanoic acid	PFDeA	0.005	ND	0.004
perfluoroundecanoic acid	PFUA	ND	ND	0.02
Perfluorooctane sulfonamide*	PFOSA	--	--	--
2-(N-ethyl-perfluorooctane sulfonamido) acetic acid*	ET-PFOSA-ACOH	--	--	--
2-(N-methyl-perfluorooctane sulfonamido) acetic acid*	ME-PFOSA-ACOH	--	--	--
Perfluorododecanoic acid**	PFDoA	ND	ND	0.01
Perfluoropentanoic acid**	?	0.27	0.008	0.004
Perfluorobutane sulfonate**	PFBuS	0.05	0.002	0.0009
Perfluorohexanoic acid**	PFHxA	0.33	0.009	0.004
Perfluoroheptanoic acid**	PFHpA	0.12	0.005	0.003

* PFCs tested in blood by CDC lab, but not tested in water

** PFCs not tested in blood by CDC lab, but tested in water

ND = Not Detected

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Reporting and Interpreting Results

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CHILD LABORATORY REPORT (< 12 years old)

Example Report

Participant Name: Benjamin Chan
Participant Identification Number: PT9999

Your Child's PFC Blood Test Results Compared with Children in the Schecter Study

Texas Study

PFC Tested	Your Child's Result (µg/L)	Median	Range
PFOA perfluorooctanoic acid	4.97	2.85	<0.1 - 13.50
PFOS perfluorooctane sulfonic acid	7.29	4.10	<0.2 - 93.30
PFHxS perfluorohexyl sulfonate	2.15	1.2	<0.1 - 31.20
PFUA perfluoroundecanoic acid	0.732	*Not reported in Schecter study*	*Not reported in Schecter study*
PFOSA perfluorooctane sulfonamide	0.6	<0.1	<0.1 - 0.60
PFNA perfluorononanoic acid	1.74	1.2	<0.1 - 55.80
PFDeA perfluorodecanoic acid	0.759	<0.2	<0.2 - 2.10
Me-PFOSA-AcOH$_2$ 2-(N-methyl-perfluorooctane sulfonamido) acetic acid	0.372	<0.2	<0.2 - 28.90
Et-PFOSA-AcOH 2-(N-ethyl-perfluorooctane sulfonamido) acetic acid	<0.1	<0.2	<0.2 - 0.70

(µg/L) = micrograms per liter

Median = middle PFC value of all 300 children tested

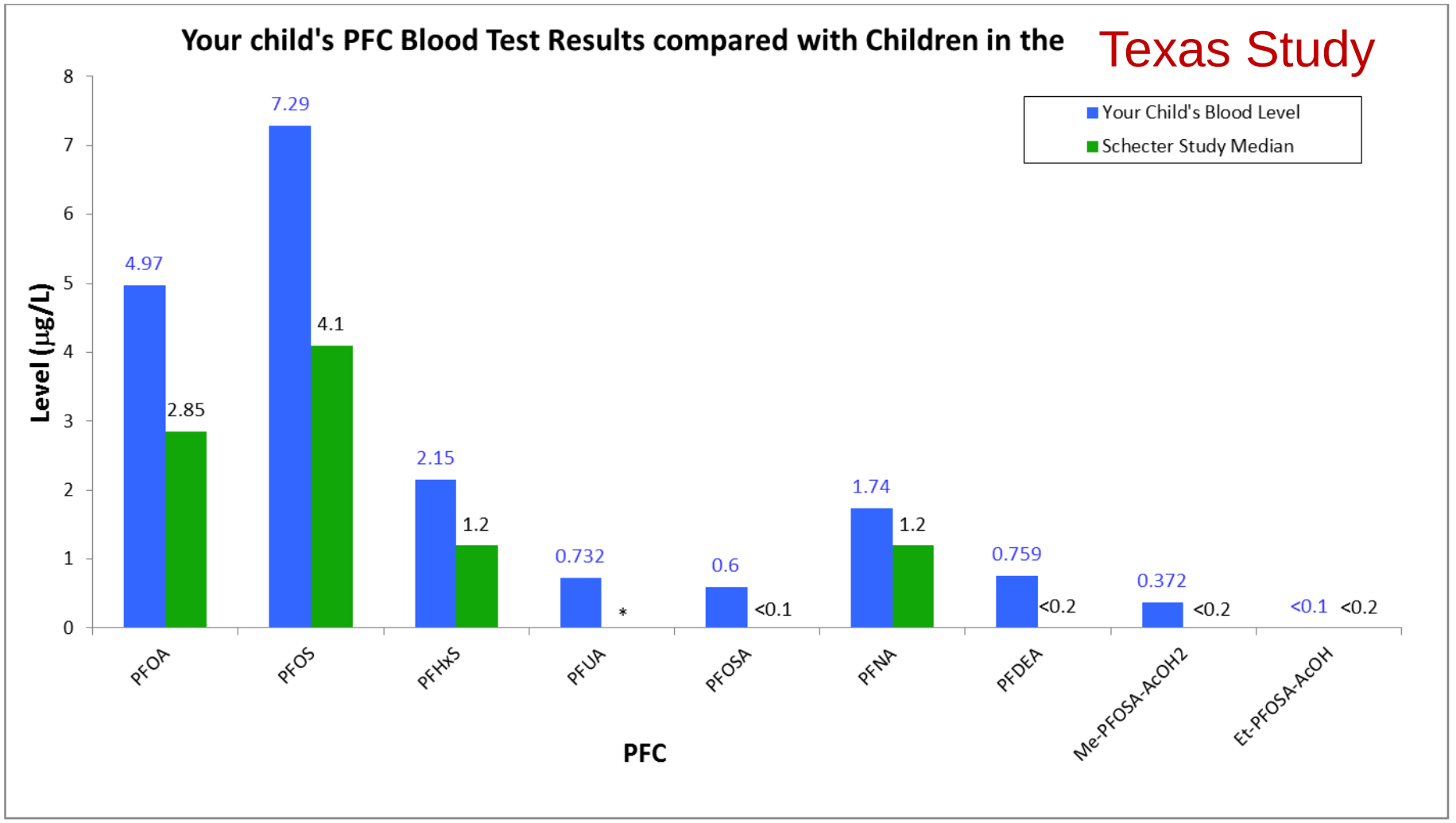
Note: A value reported as <0.1 or < 0.2 indicates the result was less than the Limit of Detection (LOD) for that PFC by that testing method.
Samples were analyzed at the National Center for Environmental Health, US Centers for Disease Control and Prevention, Chamblee, GA.

A health level concern has not been established for perfluorochemicals in blood.

CHILD LABORATORY REPORT (< 12 years old)

Example Report

Participant Name: Benjamin Chan
Participant Identification Number: PT9999



*The Schecter Study did not report PFUA (perfluoroundecanoic acid) results.
Note: A value reported as <0.1 or < 0.2 indicates the result was less than the Limit of Detection (LOD) for that PFC by that testing method.
Samples were analyzed at the National Center for Environmental Health, US Centers for Disease Control and Prevention, Chamblee, GA.

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Defining the Comparison Numbers

- **Range**: The lowest (min) and highest (max) levels found in the study or testing program
- **Median**: Middle value (half are above this level, half are below this level)
- **Geometric Mean**: A type of average, usually similar to the median (most people will not have a blood level of a PFC that exactly matches the average number; it will be above or below)

Understanding the Comparisons

- These comparison numbers are a way for you to compare your results with others
- The comparison numbers do not tell us what a level of concern is or anything about possible health impacts
- Health effects cannot currently be linked to PFC blood levels

Interpreting the Results

- People are going to interpret results differently
- In the absence of any hard science showing health effects at specific levels, interpretation comes down to perspective
- Levels that are “high” or “low” are relative to other study comparisons
- Goal: provide additional information and context to give you an idea about how levels compare to other studies

Comparisons for each PFC

- Summary table of measures:
  - Adolescents & Adults
  - Children
- Distribution of children's results (# of children at each PFC level)
- Compare children's level to other adult populations (for PFOS, PFOA, PFHxS, PFNA)
- Compare children's level to other pediatric populations (for PFOS, PFOA, PFHxS, PFNA)

Adult Comparison Studies

Study Population	Years Blood Tested	# Participants	Reference
3M workers(PFOS and PFOA)	2000	263	Olsen GW, et al. Epidemiologic assessment of worker serum perfluorooctanesulfonate (PFOS) and perfluorooctanoate (PFOA) concentrations and medical surveillance examinations. J Occup Environ Med. 2003;45(3):260-270.
3M workers (PFHxS)*	2004	26	Olsen GW, et al. Half-life of serum elimination of perfluorooctanesulfonate,perfluorohexanesulfonate, and perfluorooctanoate in retired fluorochemical production workers. Environ Health Perspect. 2007;115(9):1298-1305.
Dupont workers*	2004	1025	Sakr CJ, et al. Cross-sectional study of lipids and liver enzymes related to a serum biomarker of exposure (ammonium perfluorooctanoate or APFO) as part of a general health survey in a cohort of occupationally exposed workers. J Occup Environ Med. Oct 2007;49(10):1086-1096.
Ohio River Valley	2005-2006	69,030	Frisbee et al. The C8 Health Project: Design, methods, and participants. Env Health Persp 2009;117(12):1873-82.
Decatur, Alabama	2009	153	ATSDR. Exposure Investigation Report: PFC serum sampling in the vicinity of Decatur, AL Morgan, Lawrence, and Limestone Counties. Apr 2013. Accessed at: http://www.atsdr.cdc.gov/HAC/pha/Decatur/Perfluorochemical_Serum%20Sa
East Metro Minnesota pilot	2008-2009	196	Minnesota Dept of Health. East Metro PFC biomonitoring pilot project. Jul 2009. Accessed at: http://www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/pfcfinalrpt2009.pdf
Red Cross donors	2006	600	Olsen GW, et al. Decline in PFOS and other PFCs in American Red Cross adult blood donors, 2000-2006. Enciron Sci Technol. 2008;42:4989-4995.
NHANES	2005-2006 2011-2012	2120 1904	CDC. Fourth National report on human exposure to environmental chemicals. Feb 2015. Accessed at: http://www.cdc.gov/exposurereport/

* Reports on arithmetic mean serum concentration (instead of geometric mean). Arithmetic mean is usually higher than the geometric mean. All other studies report geometric mean serum concentration.

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Decatur, Alabama	2009	153	ATSDR. Exposure Decatur, AL Mor at: http://www.atsc
East Metro Minnesota pilot	2008-2009	196	Minnesota Dept 2009. Accessed a http://www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/pfcfinalrpt2009.pdf
Red Cross donors	2006	600	
NHANES	2005-2006 2011-2012	2120 1904	

Occupationally Exposed

Environmentally Exposed

General Population

* Reports on arithmetic mean serum concentration (instead of geometric mean). Arithmetic mean is usually higher than the geometric mean. All other studies report geometric mean serum concentration.

Pediatric Comparison Studies

Location	Years Blood Tested	# Participants	Age Range (years)	Reference
Ohio River Valley (PFOA water contamination)	2005-2006	?	<12	Frisbee et al. The C8 Health Project: Design, methods, and participants. Env Health Persp 2009;117(12):1873-82.
23 States + D.C.	1994-1995	598	2-12	Olsen et al. Quantitative Evaluation of Perfluorooctanesulfonate (PFOS) and Other Fluorochemicals in the Serum of Children. J Child Health 2004;2(1):53-76.
Greater Cincinati	2005-2007	353	6-8	Pinney SM, et al. Serum Biomarkers of Polyfluoroalkyl Compound Exposure in Young Girls in Greater Cincinnati and the San Francisco Bay Area, USA. Environ Pollut 2014;184:327-34.
San Francisco Bay	2005-2009	351	6-8	Pinney SM, et al. Serum Biomarkers of Polyfluoroalkyl Compound Exposure in Young Girls in Greater Cincinnati and the San Francisco Bay Area, USA. Environ Pollut 2014;184:327-34.
Northern California	208-2009	68	2-8	Wu et al. Serum concentrations of perfluorinated compounds (PFC) among selected populations of children and Adults in California. Environ Res 2015; 136:264-73.
Texas*	2009	300	0-12	Schecter et al. Polyfluoroalkyl Compounds in Texas Children from Birth through 12 Years of Age. Environ Health Perspect 2012;120:590-594.

* Reports on median serum concentration. All other studies report geometric mean serum concentration

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PFOA Exposed

General Population

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Summary of "Adult" Results (n=363)

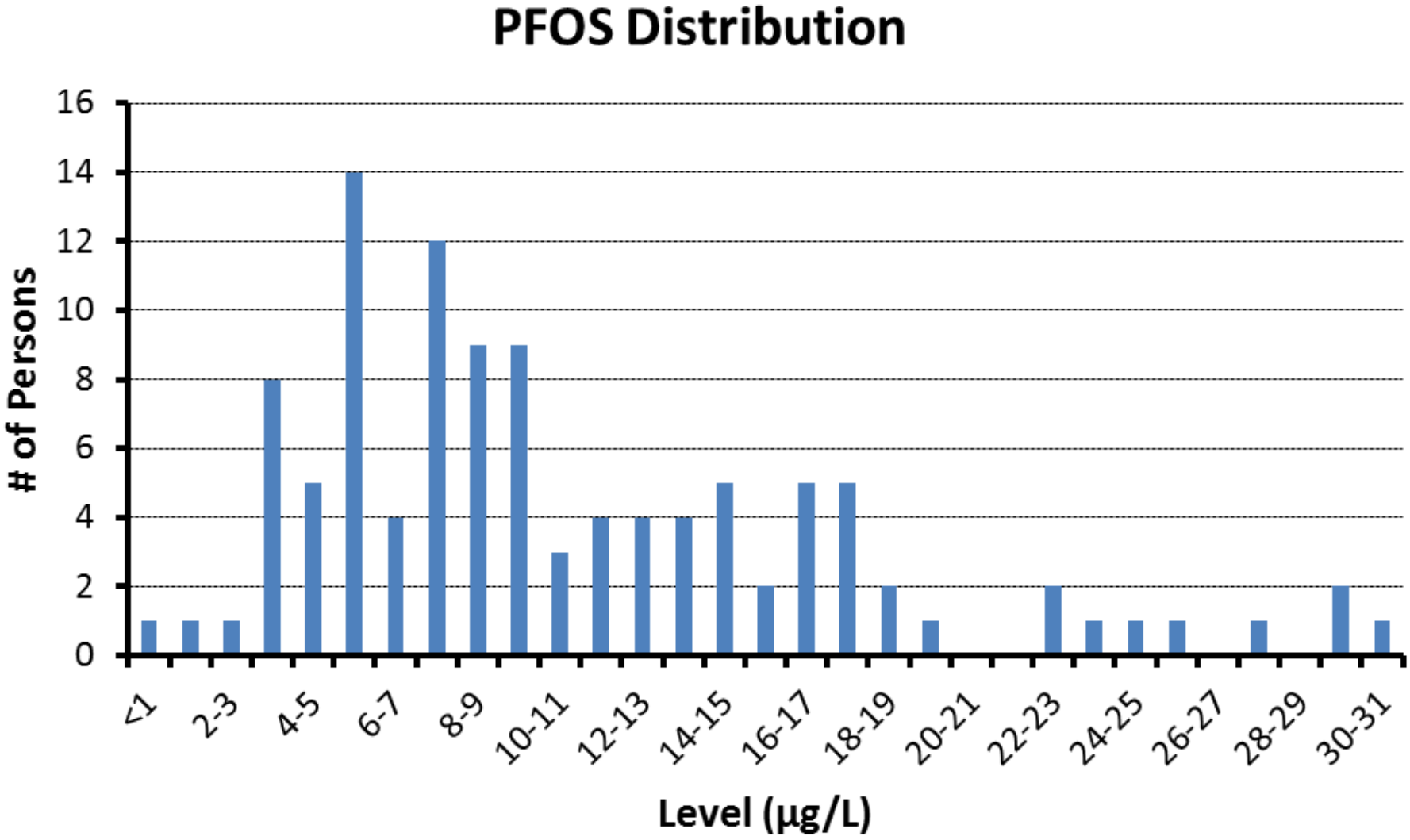
	PEASE TRADEPORT (Level in µg/L)			NHANES, 2011-2012 (Level in µg/L)		
PFC Tested	Geometric Mean	Min	Max	Geometric Mean	Min	Max
PFOA	3.0	0.2	15.9	2.1	<0.1	43.0
PFOS	7.5	<0.1	75.2	6.3	0.1	235.0
PFHxS	4.6	0.2	68.7	1.3	<0.1	47.8
PFUA	0.1	<0.1	0.9	NC	<0.1	7.0
PFOSA	<0.1	<0.1	0.1	NC	<0.1	0.6
PFNA	0.7	<0.1	4.9	0.9	<0.1	80.8
PFDeA	0.2	<0.1	5.6	0.2	<0.1	17.8
Me-PFOSA-AcOH	0.1	<0.1	1.1	NC	<0.1	4.3
Et-PFOSA-AcOH	<0.1	<0.1	0.4	NC	<0.1	0.7

NC=Not Calculated. The national average was not calculated for this PFC because the proportion of results below limit of detection was too great to provide a valid result.

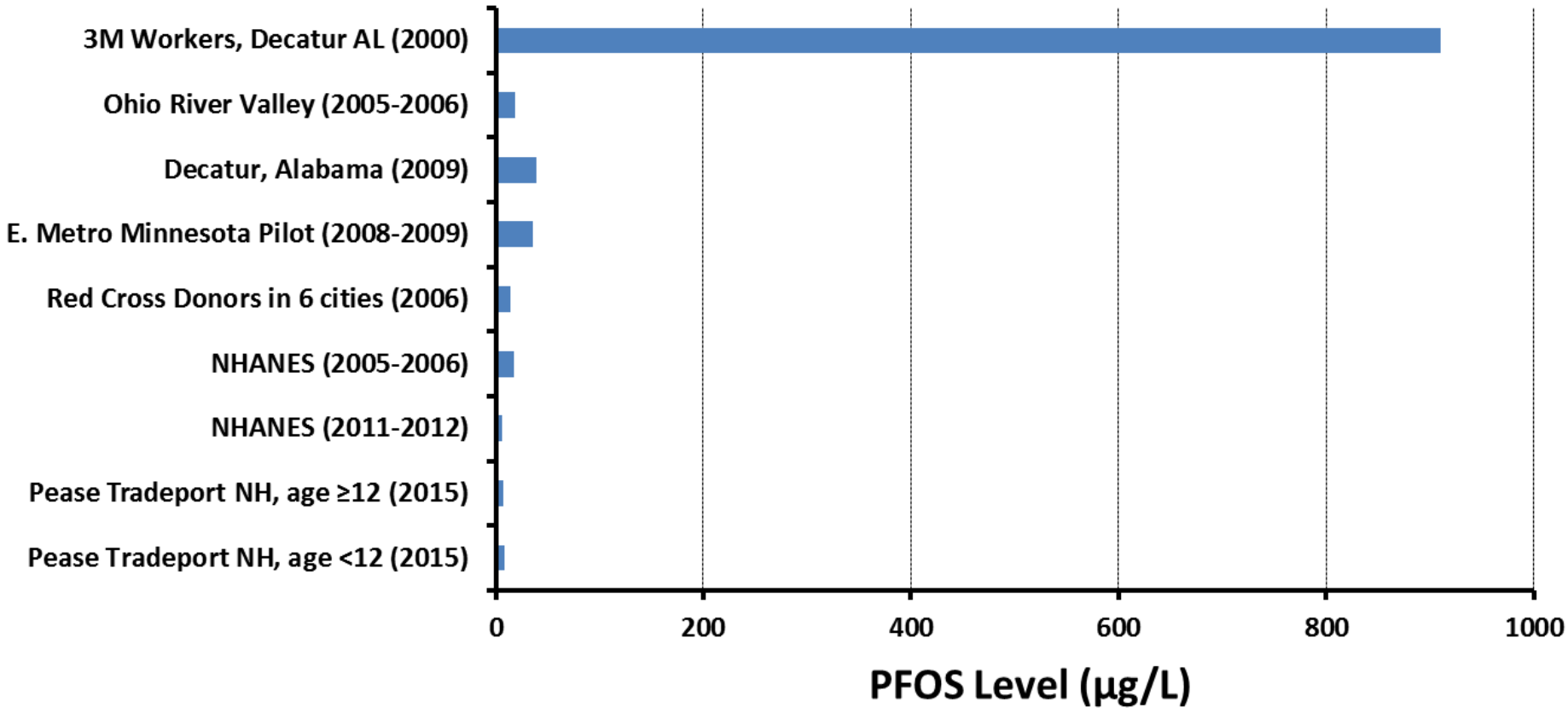
Summary of "Child" Results (n=108)

	PEASE TRADEPORT (Level in µg/L)				TEXAS STUDY (Level in µg/L)		
PFC Tested	Geometric Mean	Median	Min	Max	Median	Min	Max
PFOA	4.0	4.5	<0.1	12.0	2.9	<0.1	13.5
PFOS	8.9	8.9	0.5	30.8	4.1	<0.2	93.3
PFHxS	6.1	7.4	0.2	26.2	1.2	<0.1	31.2
PFUA	<0.1	<0.1	<0.1	0.5	N/A	N/A	N/A
PFOSA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.6
PFNA	1.1	1.0	<0.1	5.2	1.2	<0.1	55.8
PFDeA	0.2	0.2	<0.1	0.7	<0.2	<0.2	2.1
Me-PFOSA-AcOH	0.1	<0.1	<0.1	1.3	<0.2	<0.2	28.9
Et-PFOSA-AcOH	<0.1	<0.1	<0.1	0.2	<0.2	<0.2	0.7

PFOS Distribution of Results
(Children 11 years and younger)



PFOS Adult Population Comparison
(Includes Occupationally Exposed)



Note: Compares Geometric Mean, unless otherwise noted

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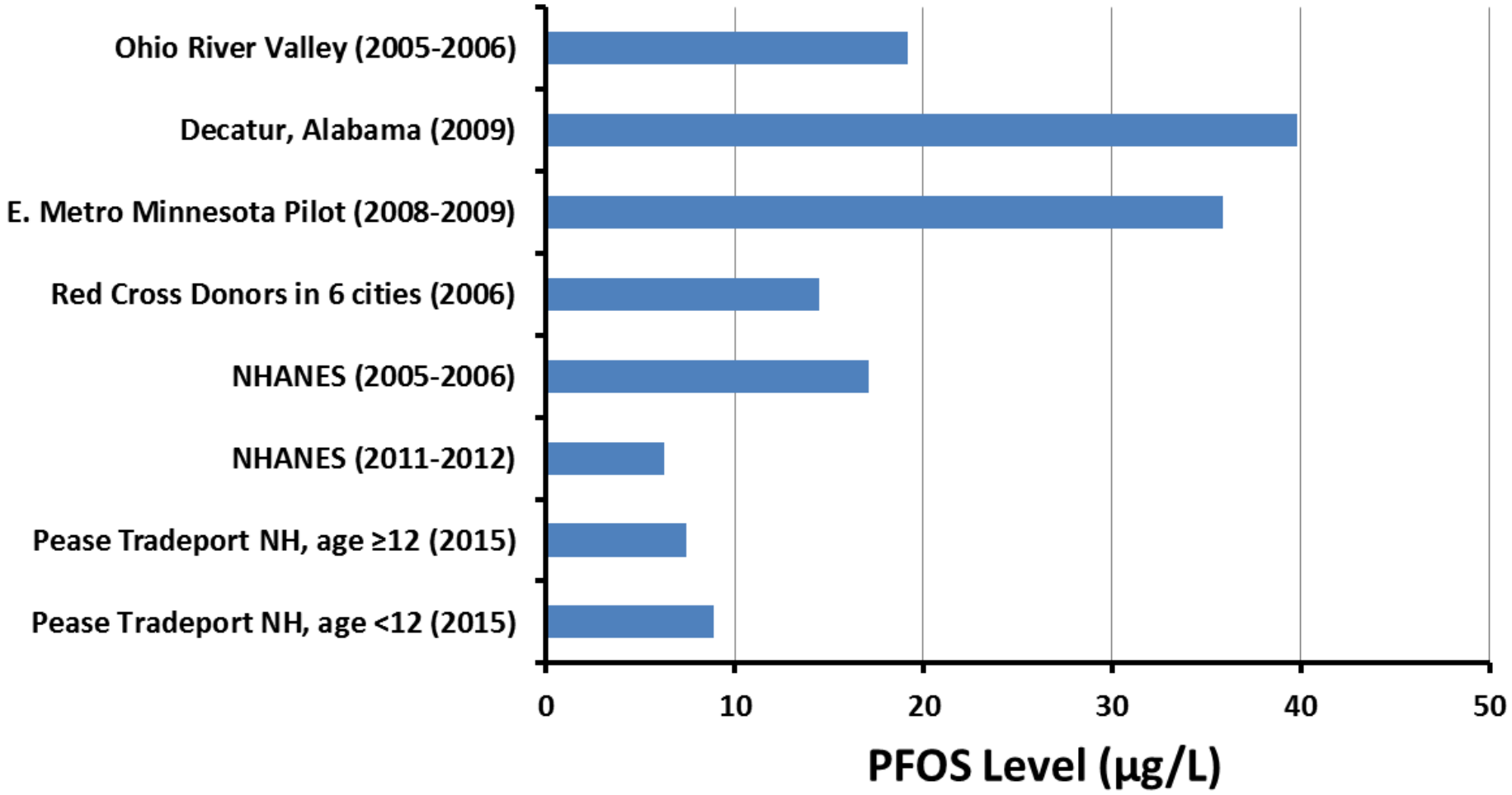

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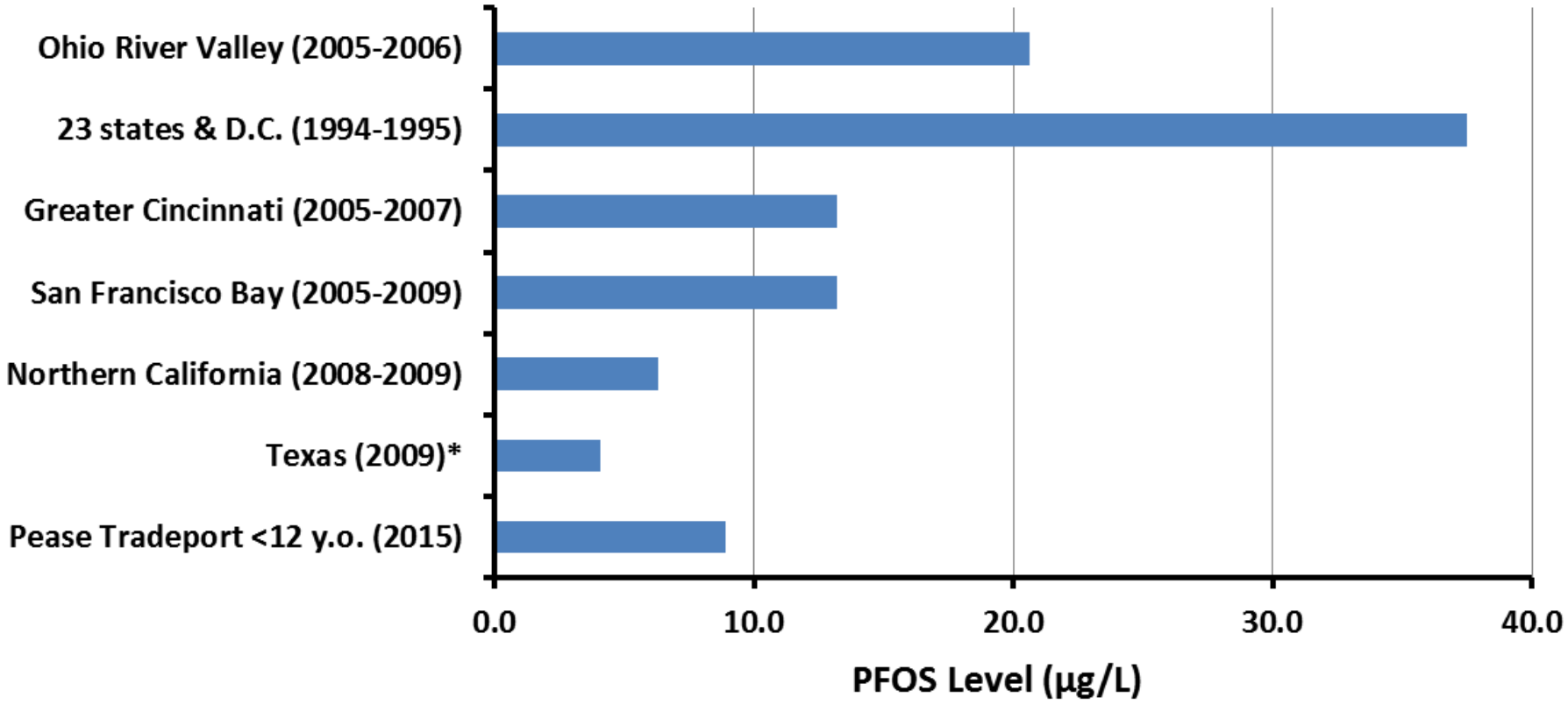
PFOS Pediatric Population Comparison



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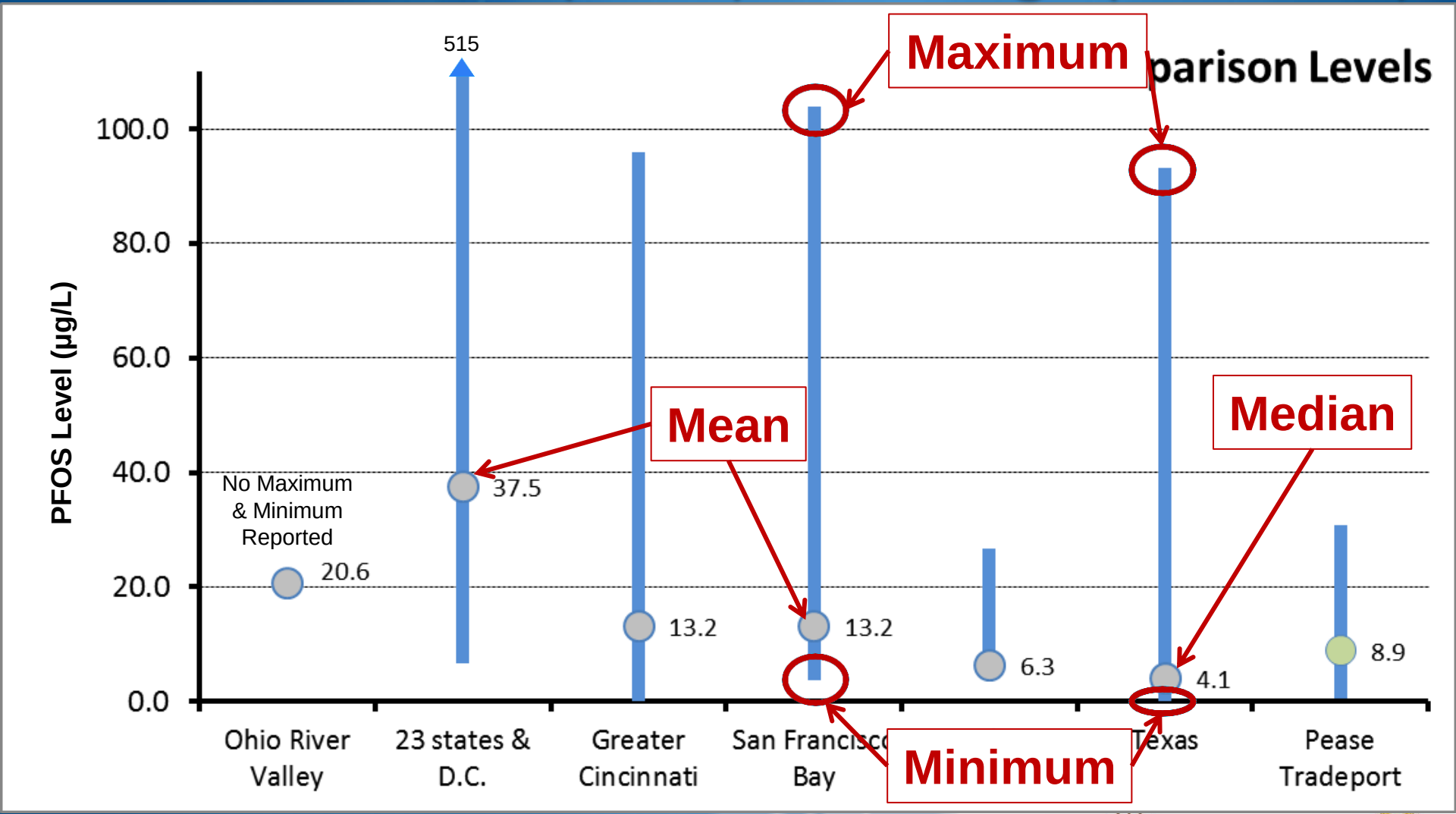
PFOS Pediatric Population Comparison of Central Measure (circle) and Range (blue bars)



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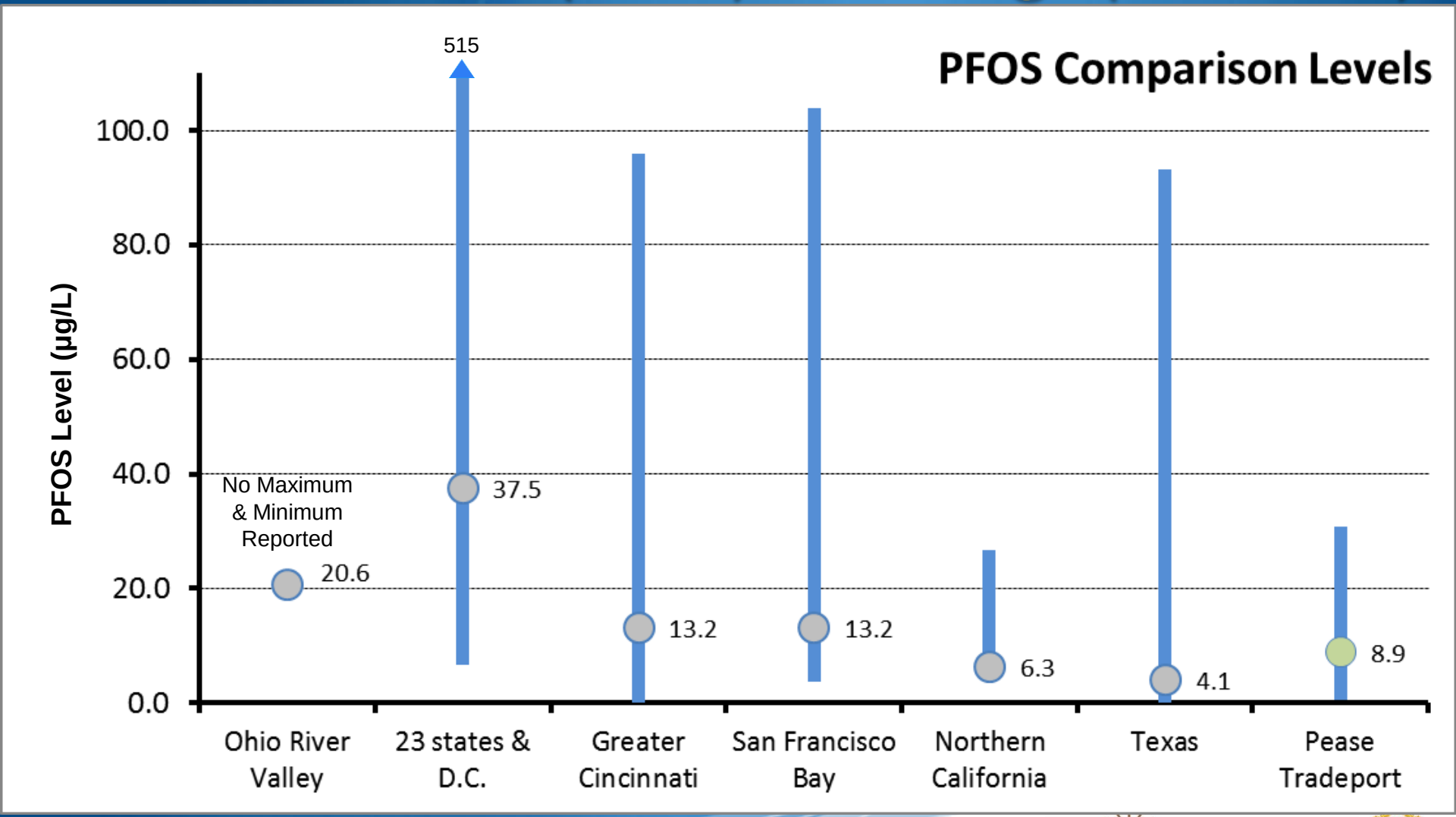
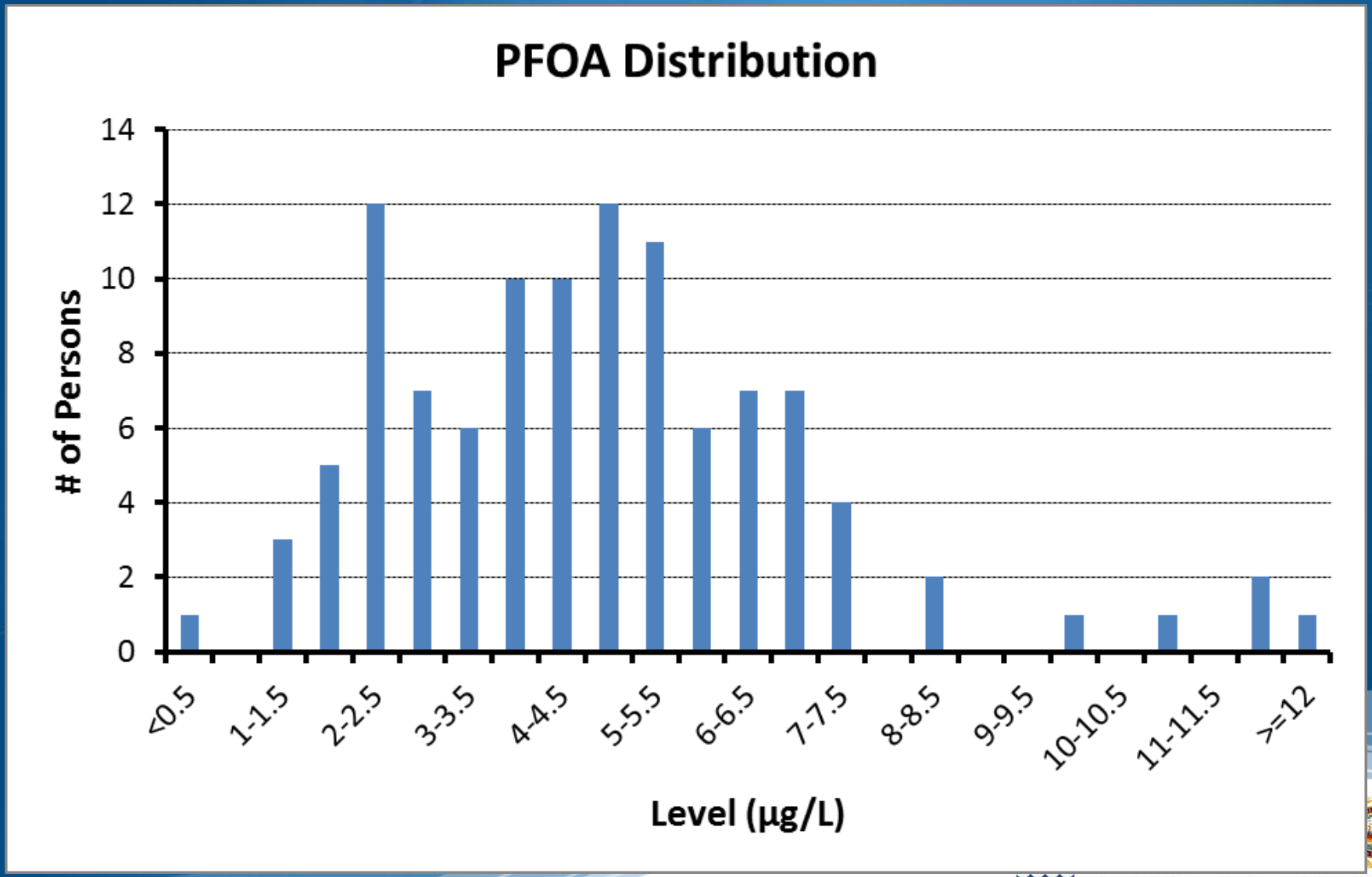


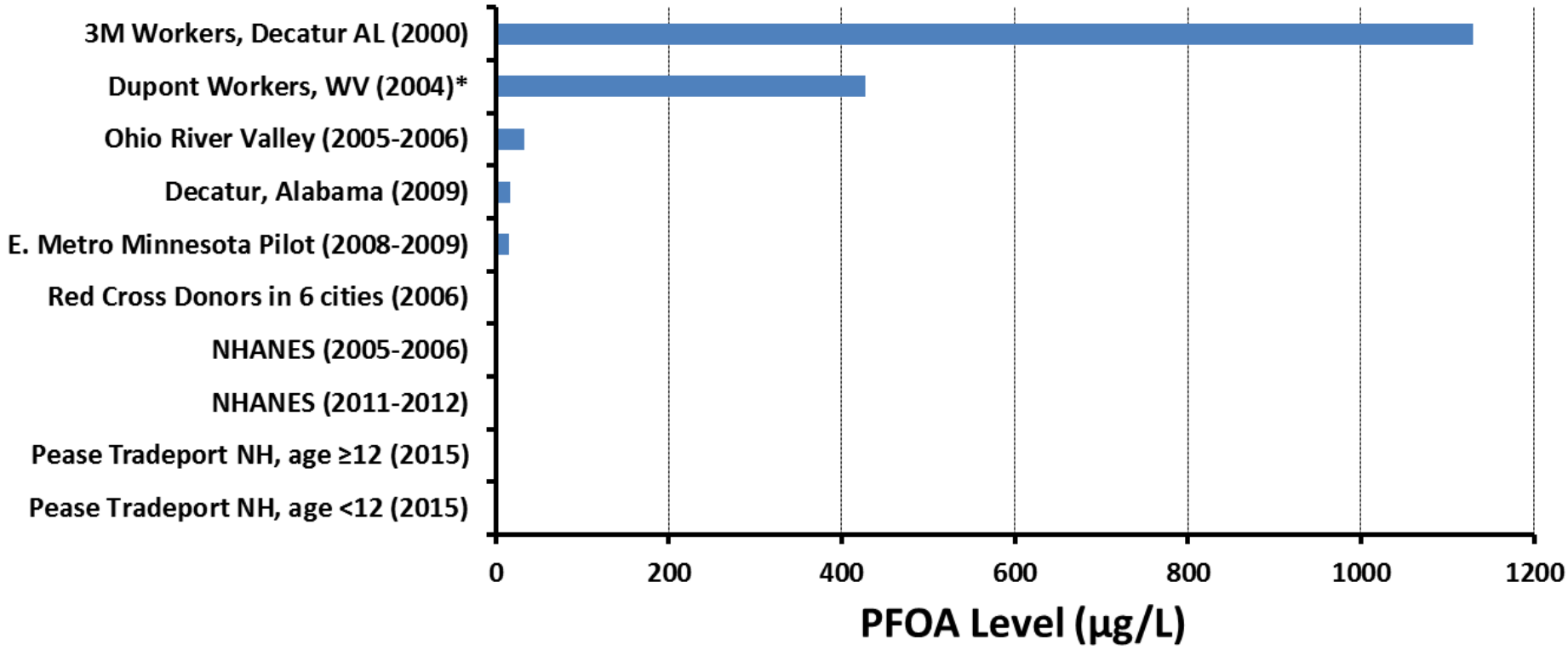
PFOS Summary

- Average Pease pediatric levels are slightly higher compared to the most recent NHANES data representing the general adult U.S. population, but levels are lower than the general adult population within the last 10 years
- Average Pease pediatric levels are similar to other general pediatric populations but with a much smaller range (lower maximum levels)
- Pease pediatric levels are much lower than levels seen in other environmentally exposed communities

PFOA Distribution of Results (Children 11 years and younger)



PFOA Adult Population Comparison
(Includes Occupationally Exposed)



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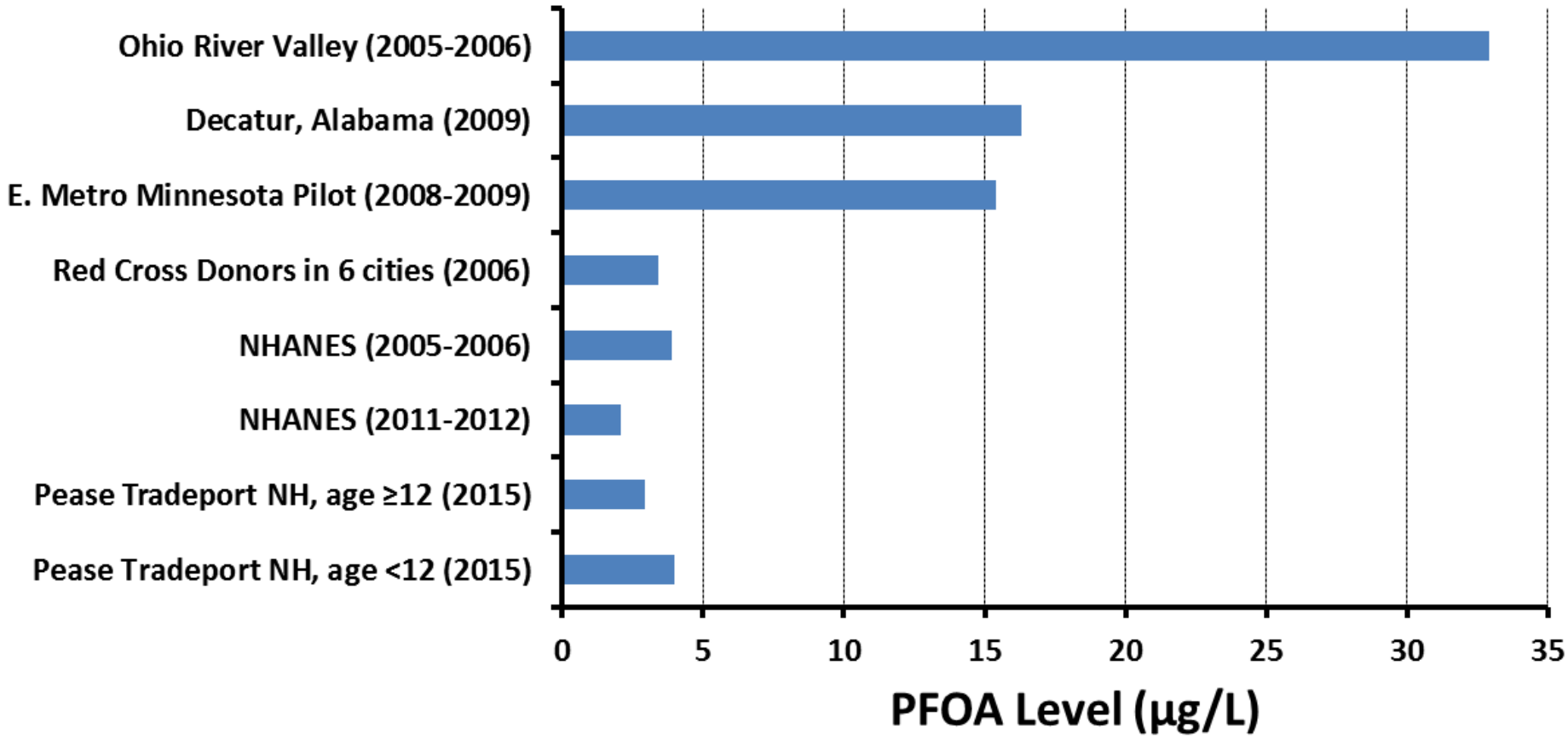

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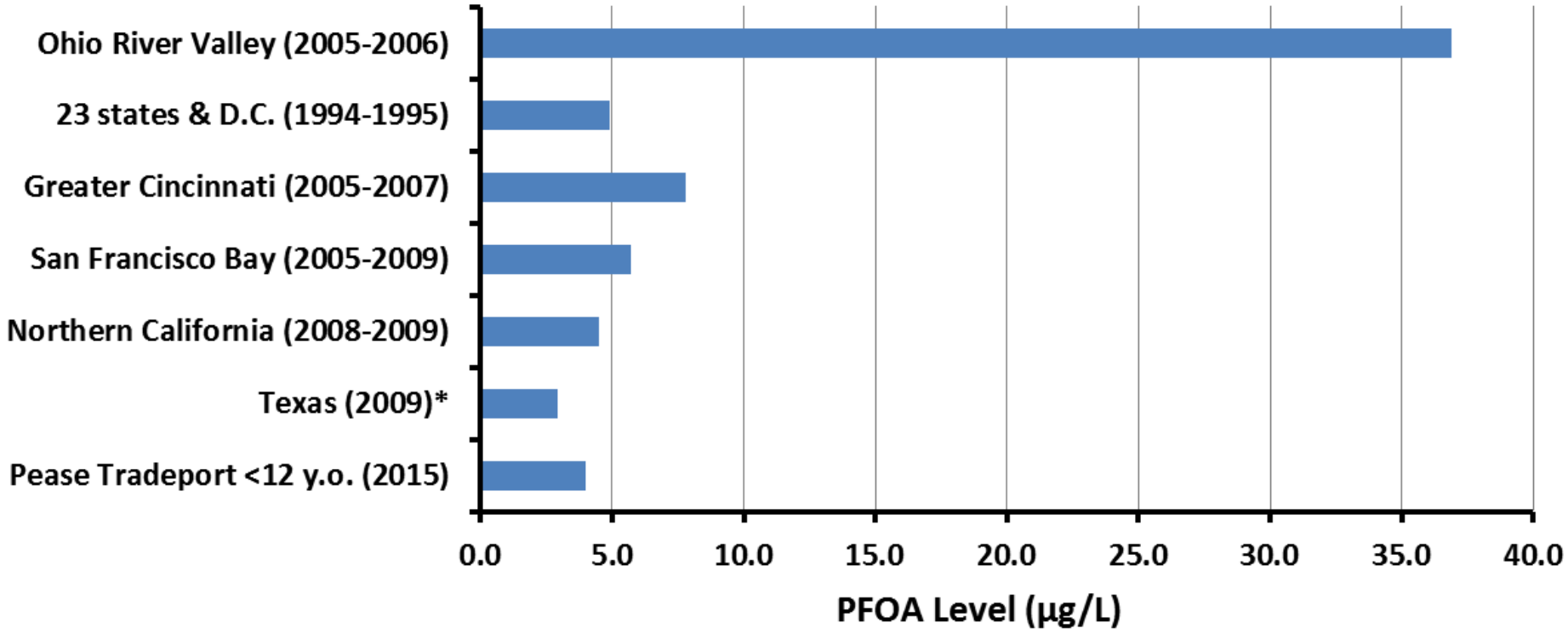

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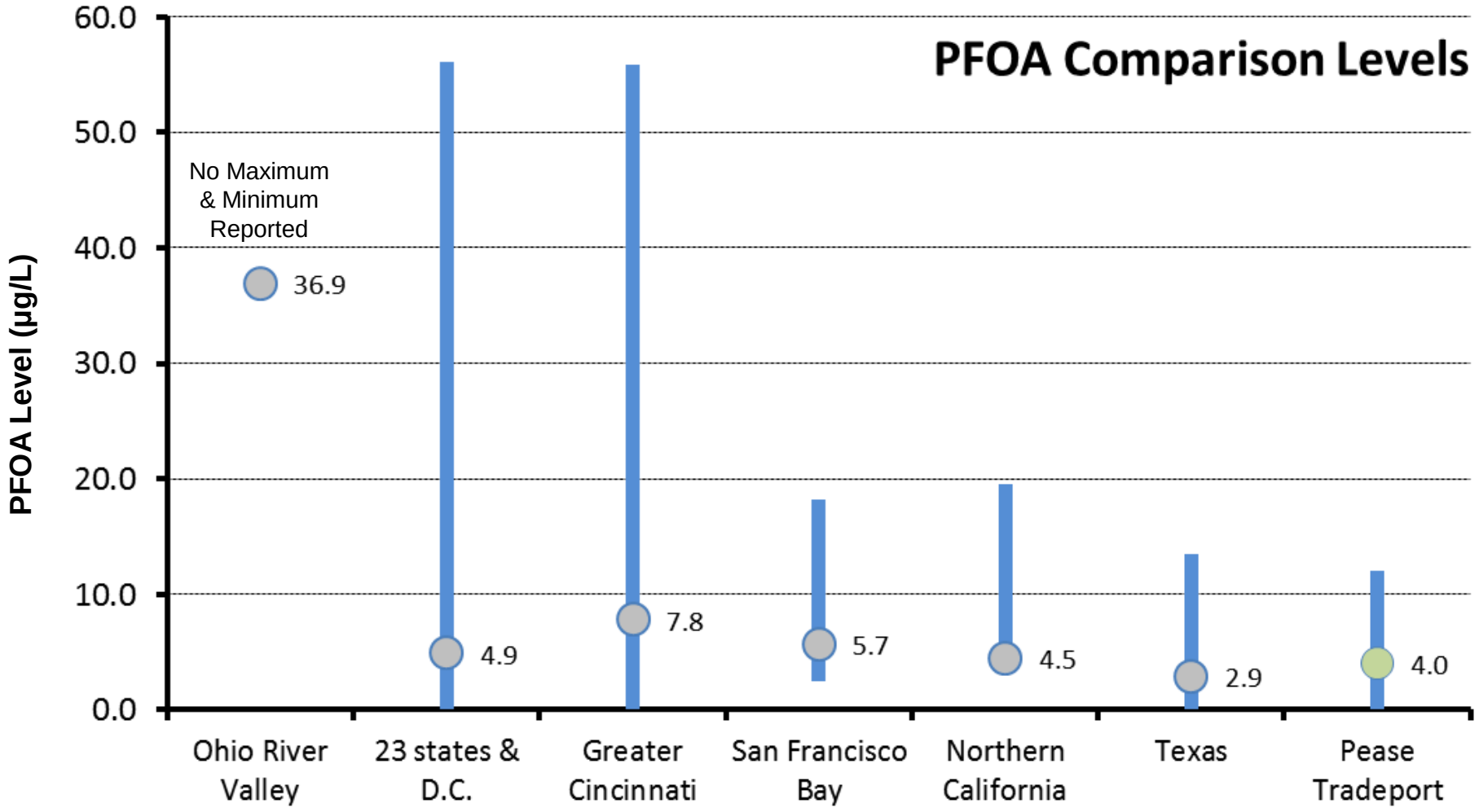

PFOA Summary

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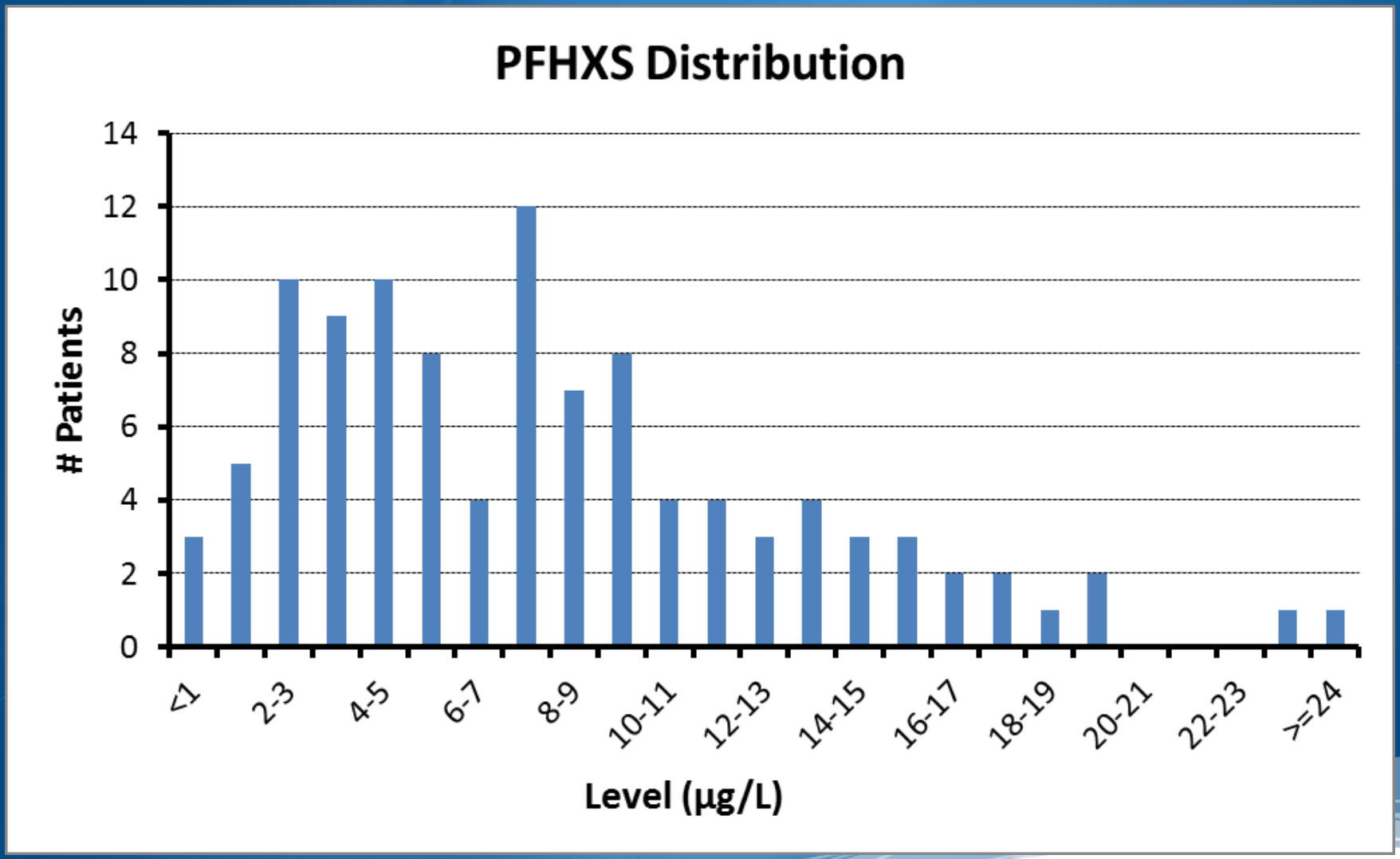
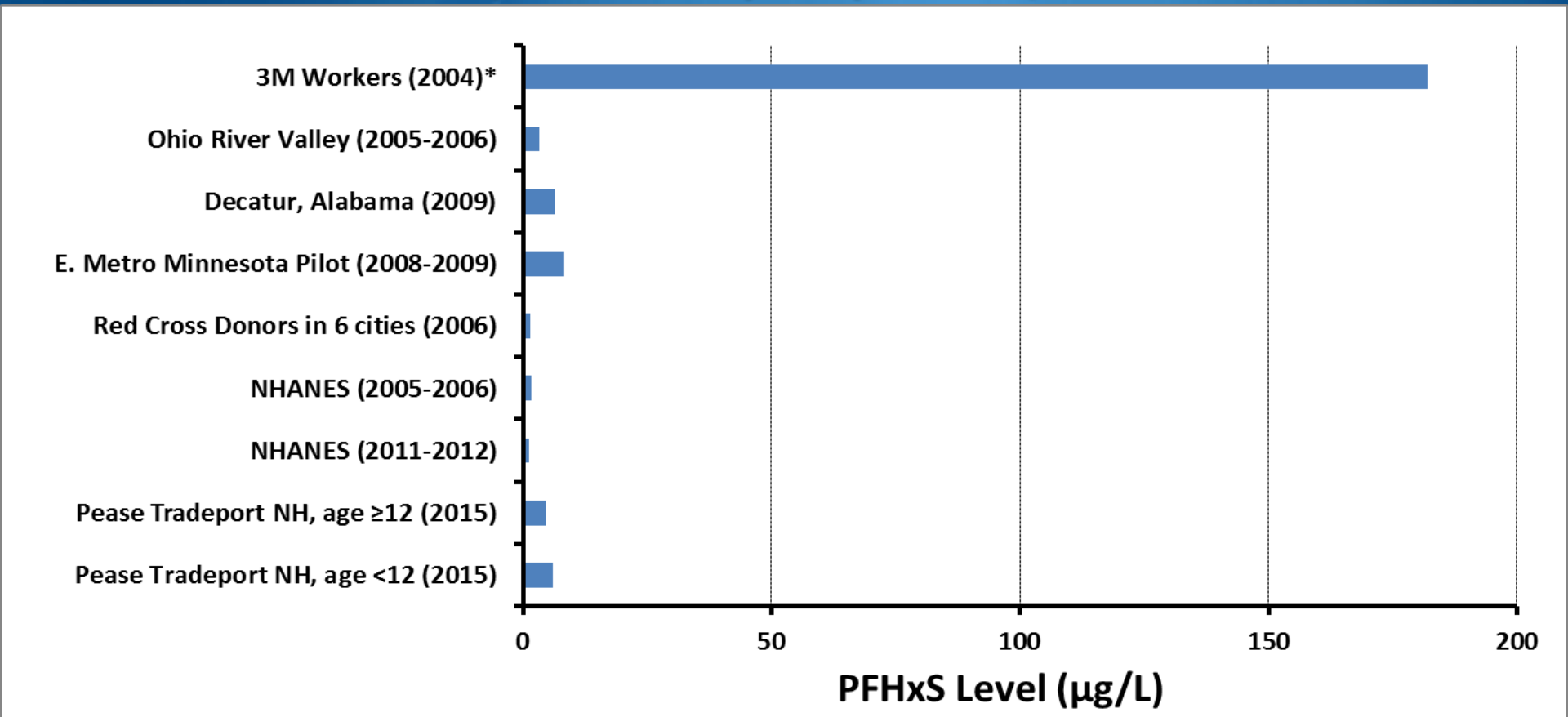
- Pease pediatric levels are much lower than levels seen in other environmentally exposed populations

PFHxS Distribution of Results



PFHxS Adult Population Comparison (Includes Occupationally Exposed)



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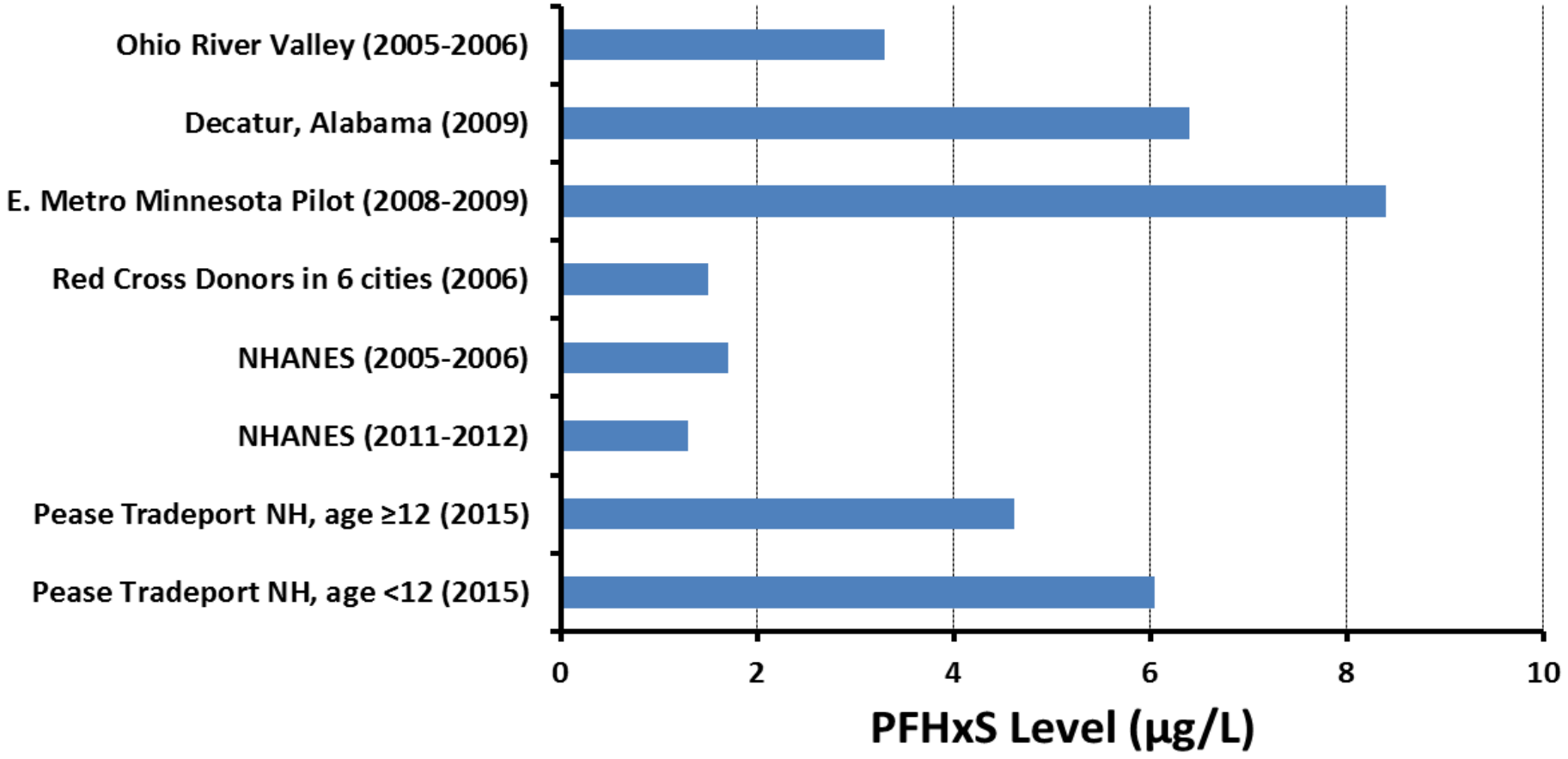

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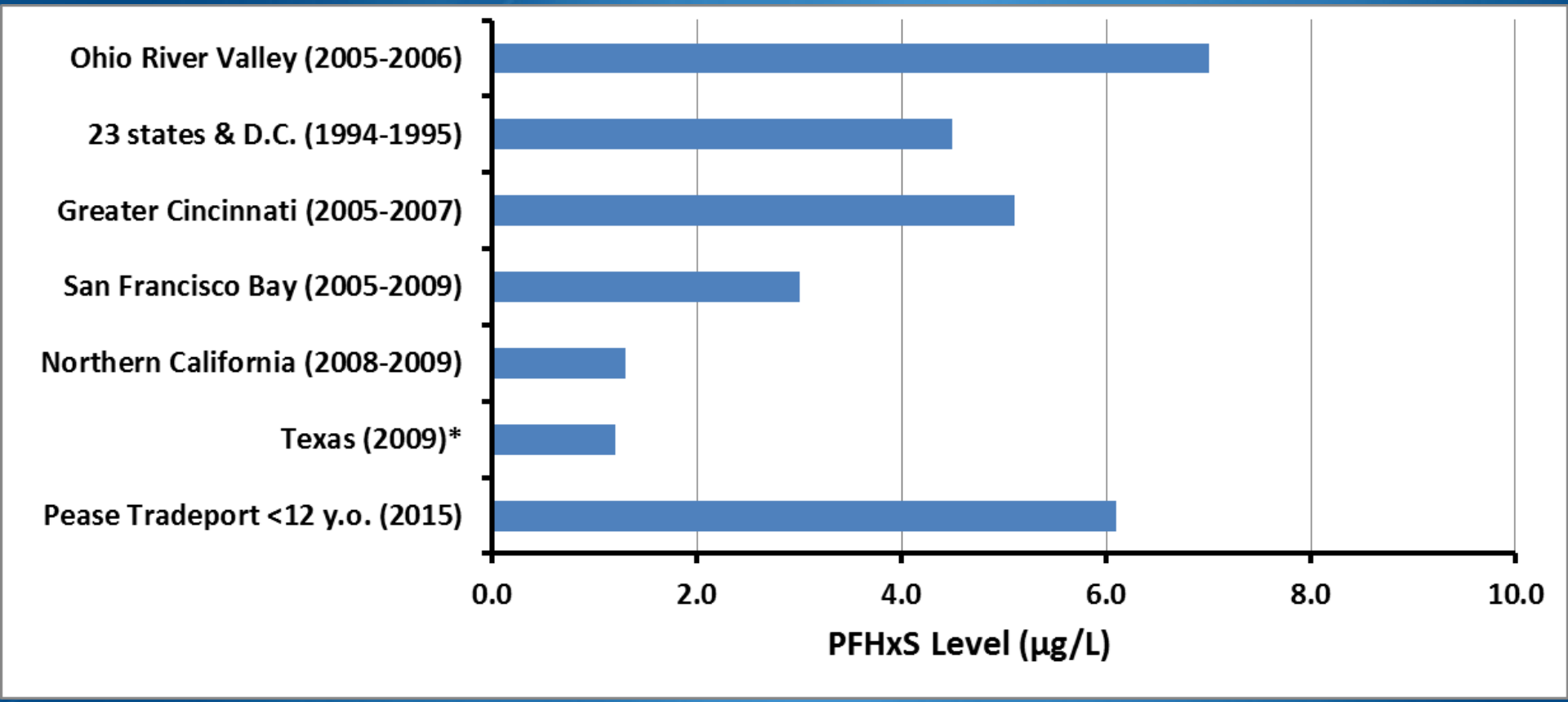

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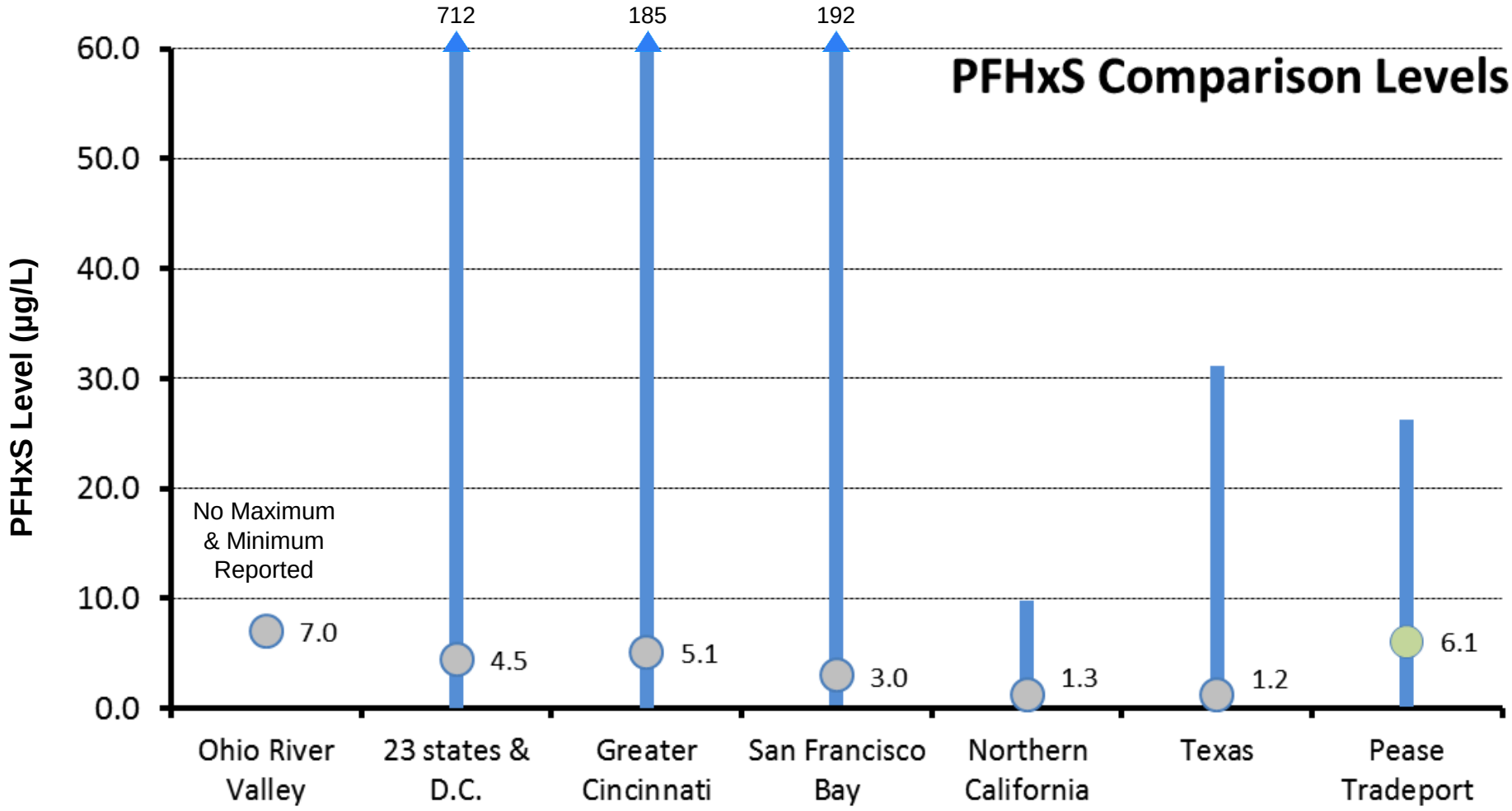
Note: Compares Geometric Mean, unless otherwise noted

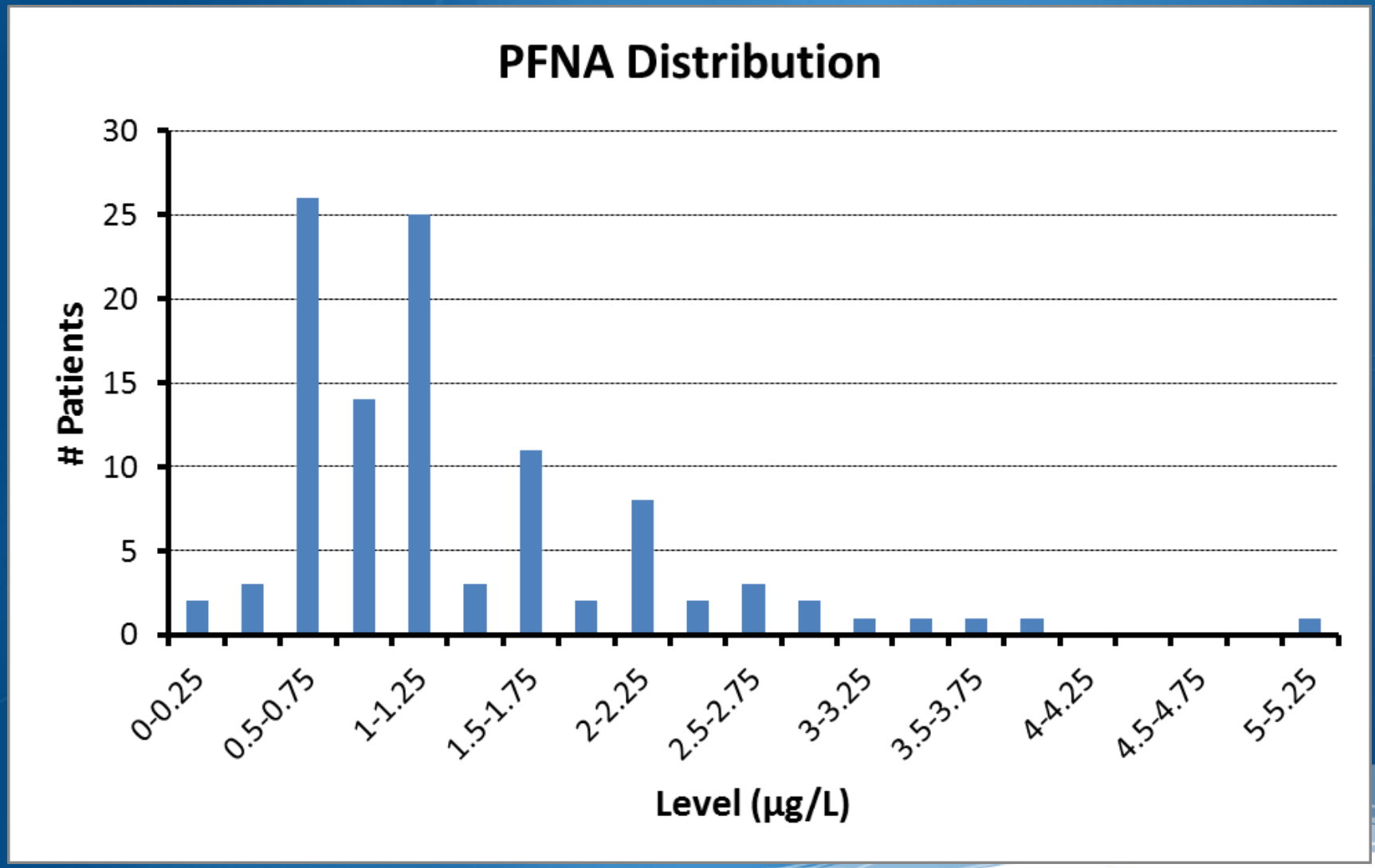
PFHxS Pediatric Population Comparison of Central Measure (circle) and Range (blue bars)



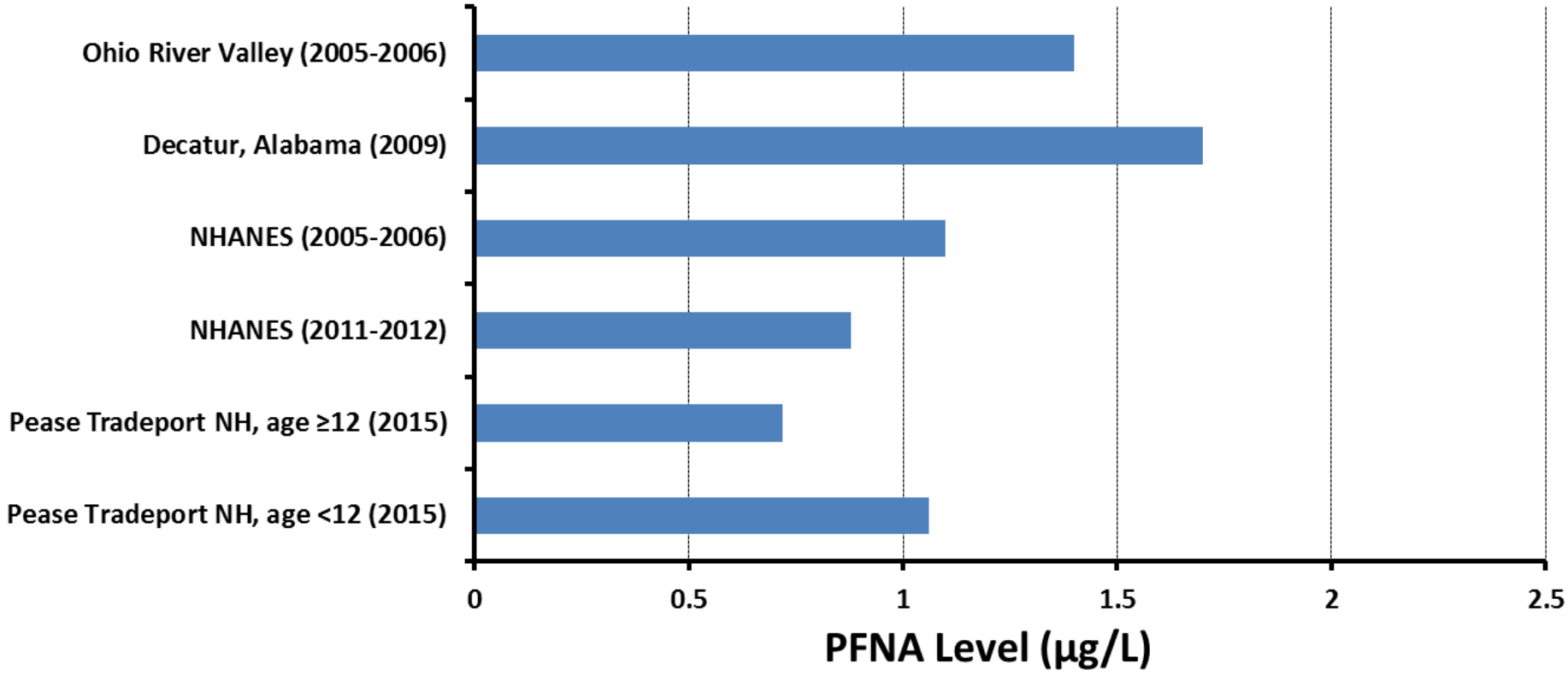
PFHxS Summary

- Average Pease pediatric levels are higher compared to the most recent NHANES data representing the general adult U.S. population, and levels are higher than the general adult population within the last 10 years
- Average Pease pediatric levels are close to levels seen in some environmentally exposed adult populations
- Average Pease pediatric levels are slightly higher than other general pediatric populations
- Range of Pease pediatric levels are similar to or much lower than other pediatric populations

PFNA Distribution of Results

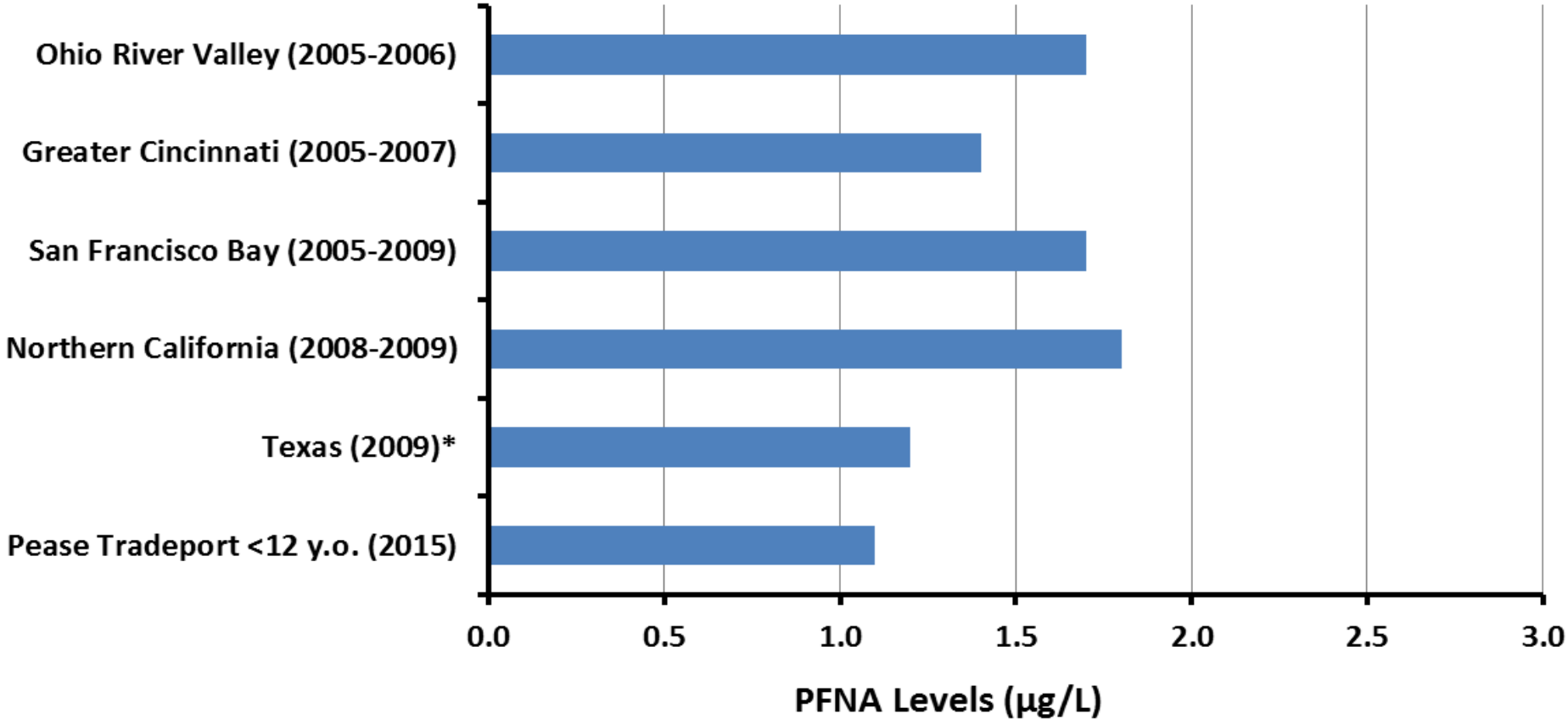


PFNA Adult Population Comparison



Note: Compares Geometric Mean, unless otherwise noted

PFNA Pediatric Population Comparison



***** Indicates Median reported (instead of geometric mean). Median is usually similar to the geometric mean.

Note: Compares Geometric Mean, unless otherwise noted

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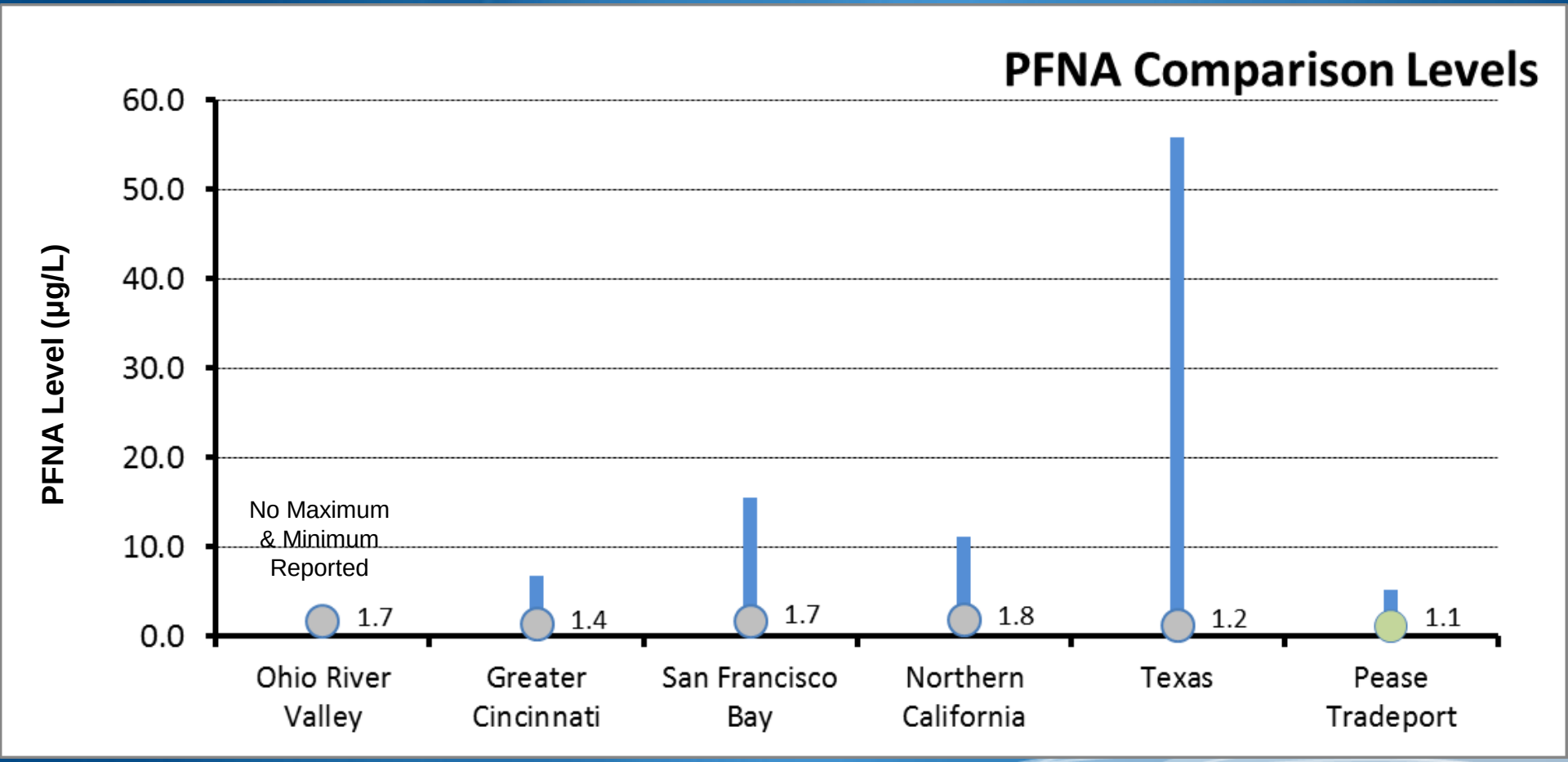
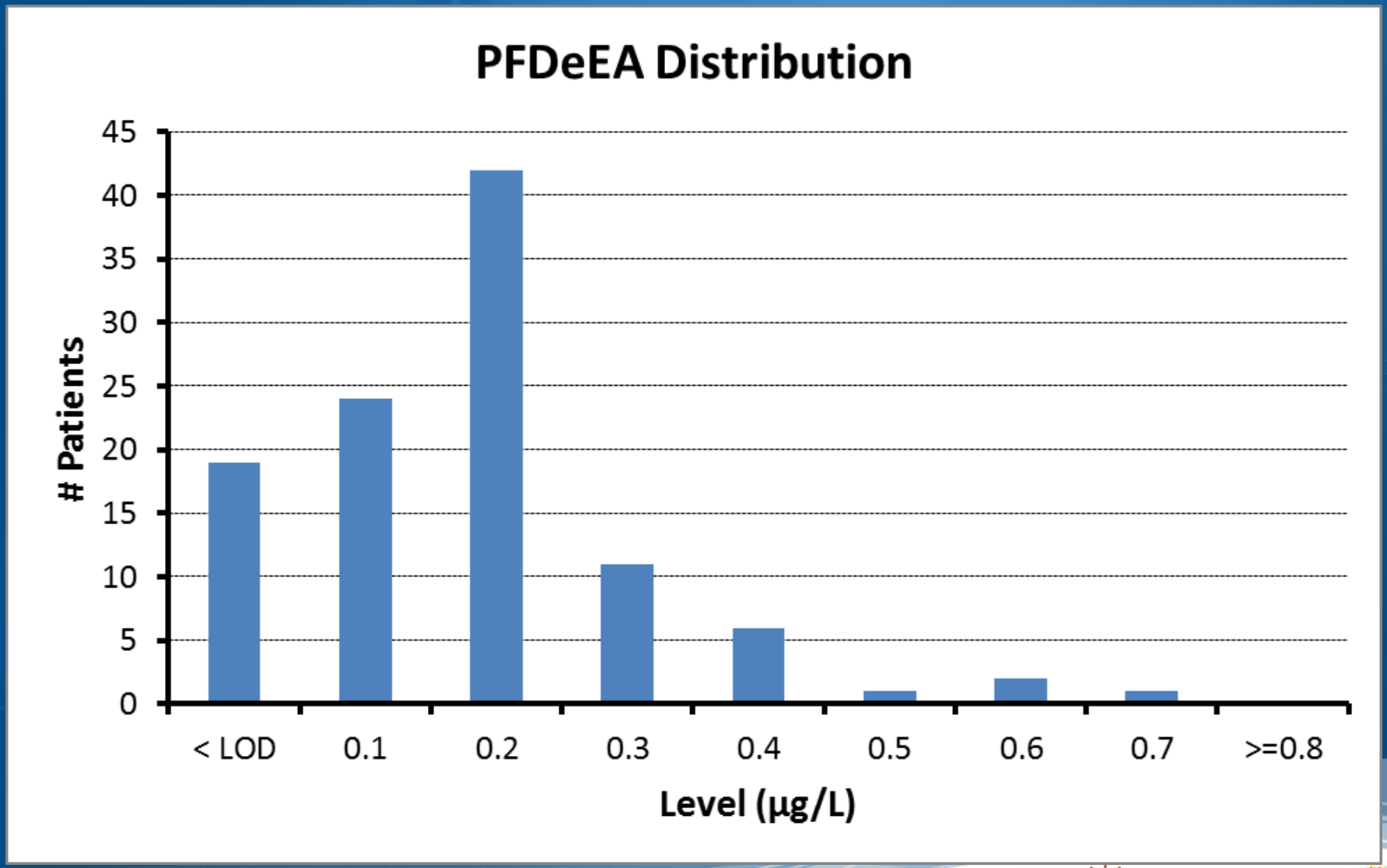
PFNA Pediatric Population Comparison of Central Measure (circle) and Range (blue bars)



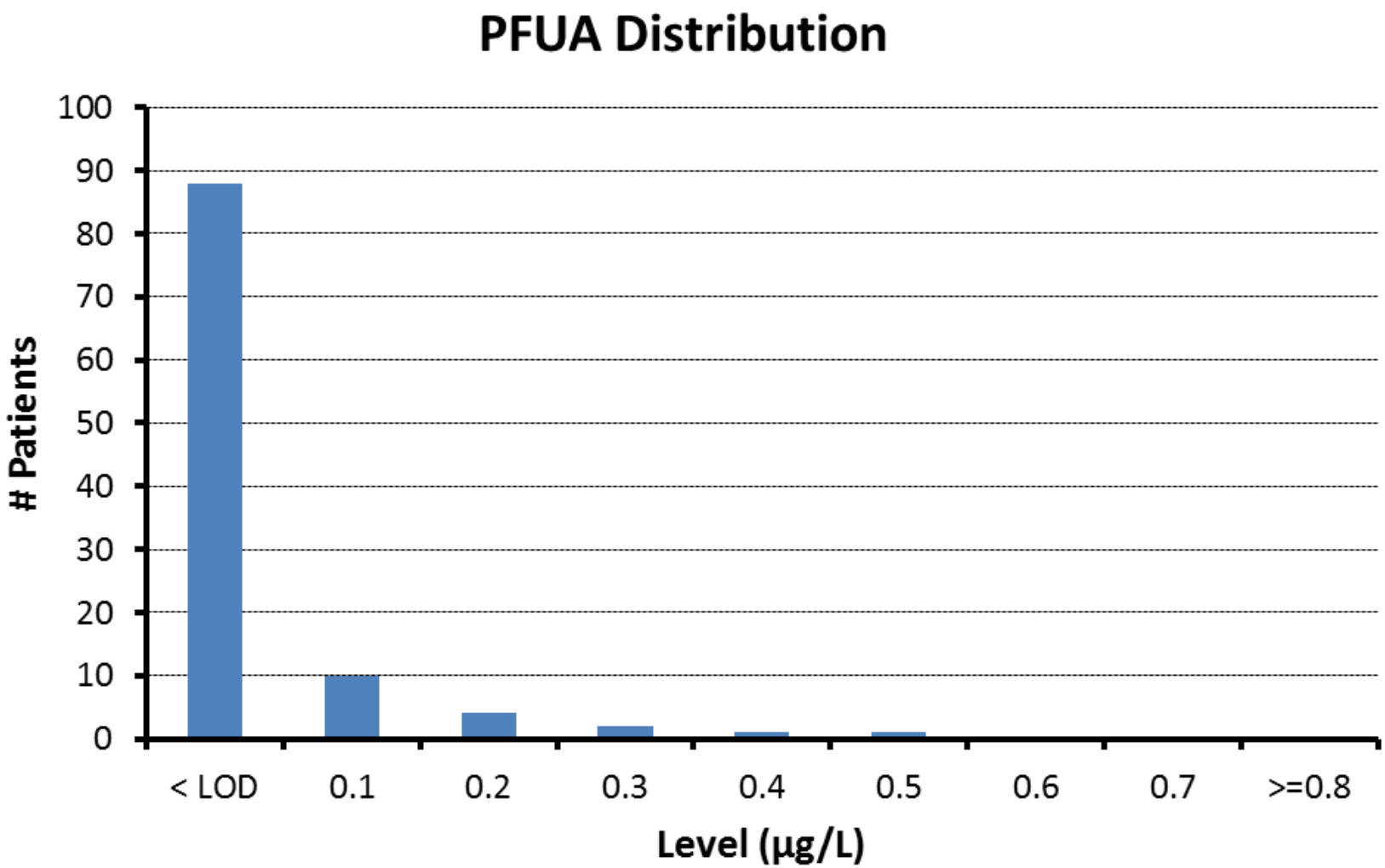
PFNA Summary

- Average Pease pediatric levels are similar compared to the most recent NHANES data representing the general adult U.S. population,
- Average Pease pediatric levels are similar or lower than other general pediatric populations with a smaller range (lower maximum levels)

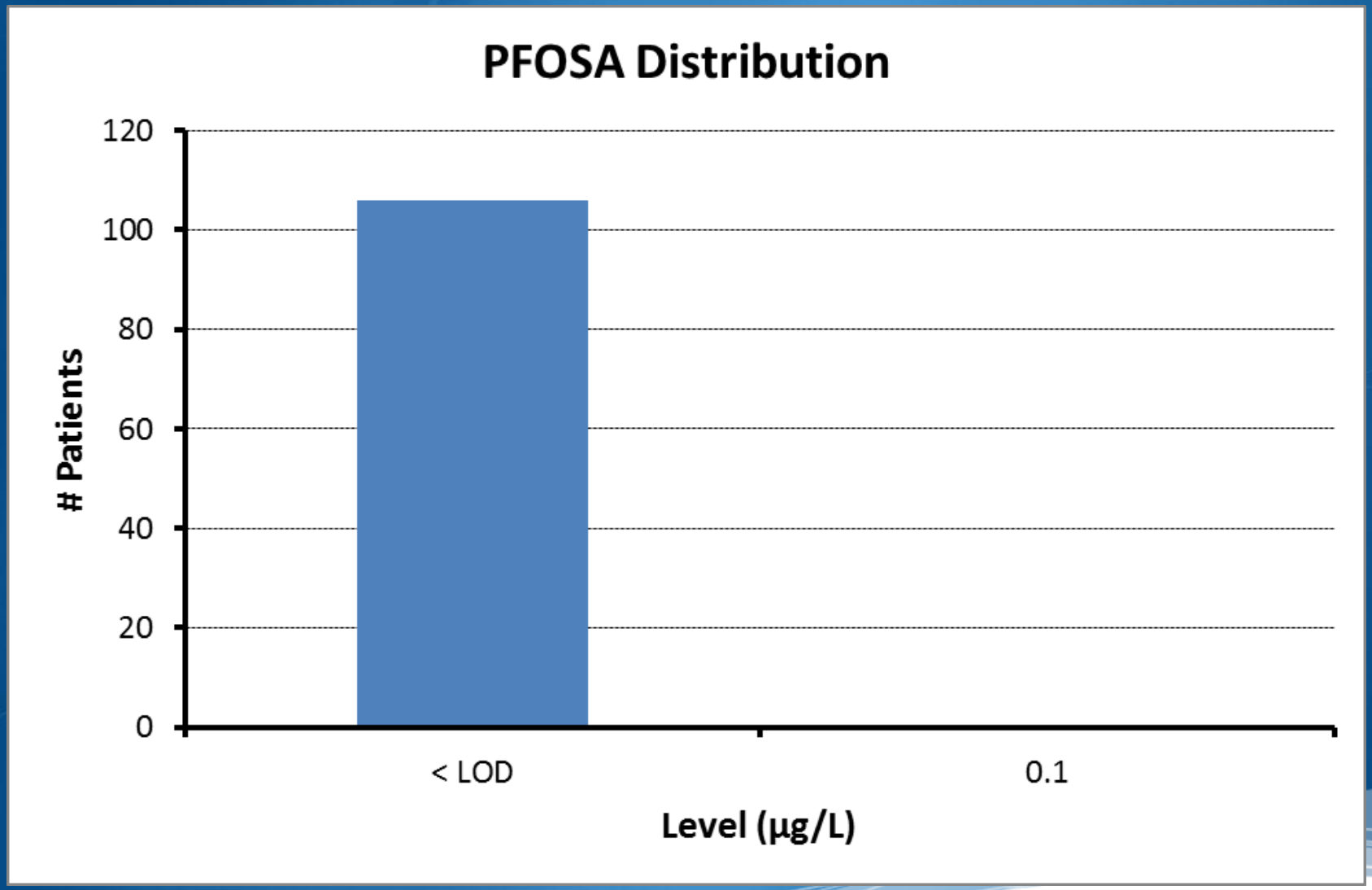
PFDeA Distribution of Results



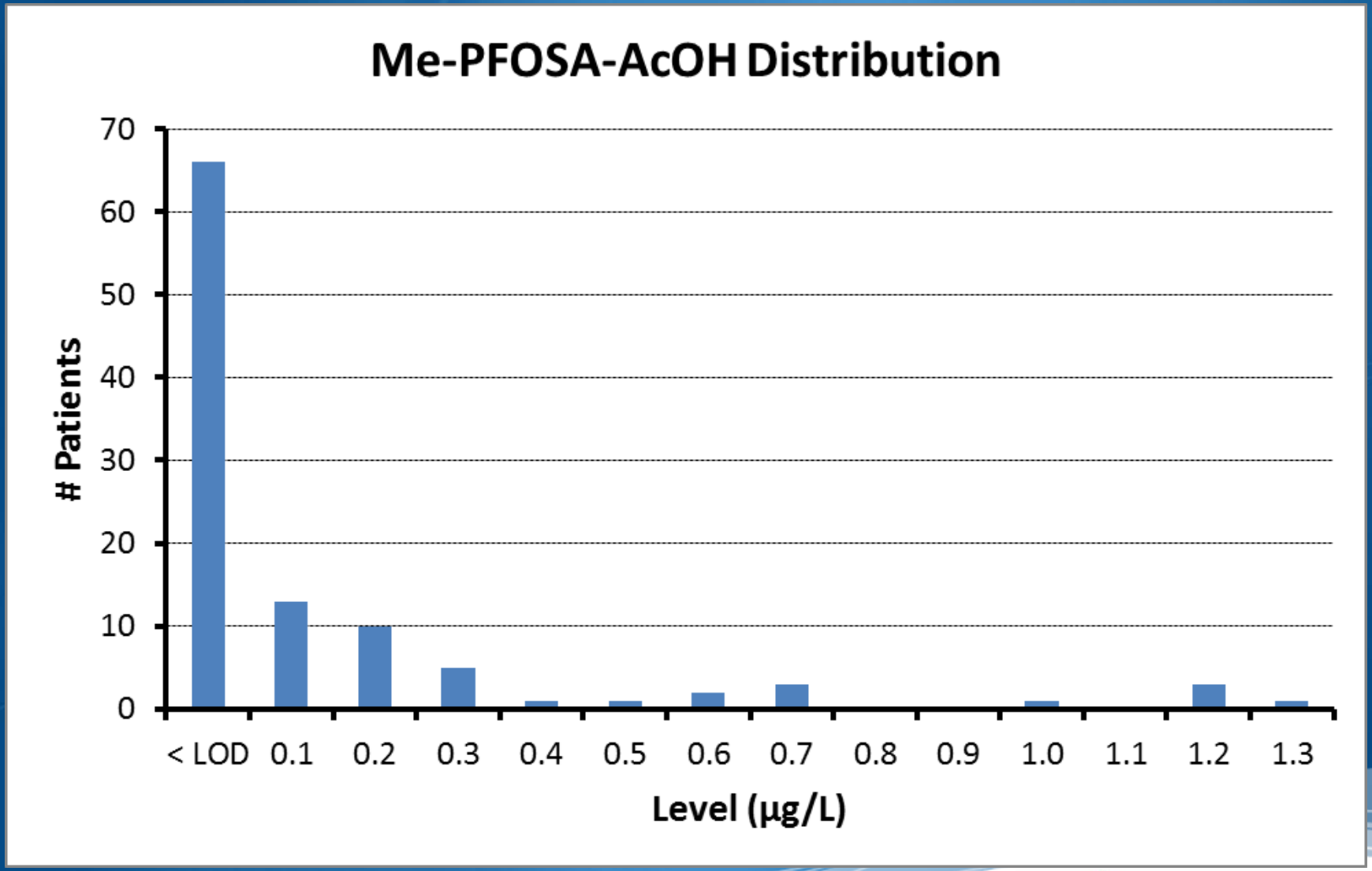
PFUA Distribution of Results



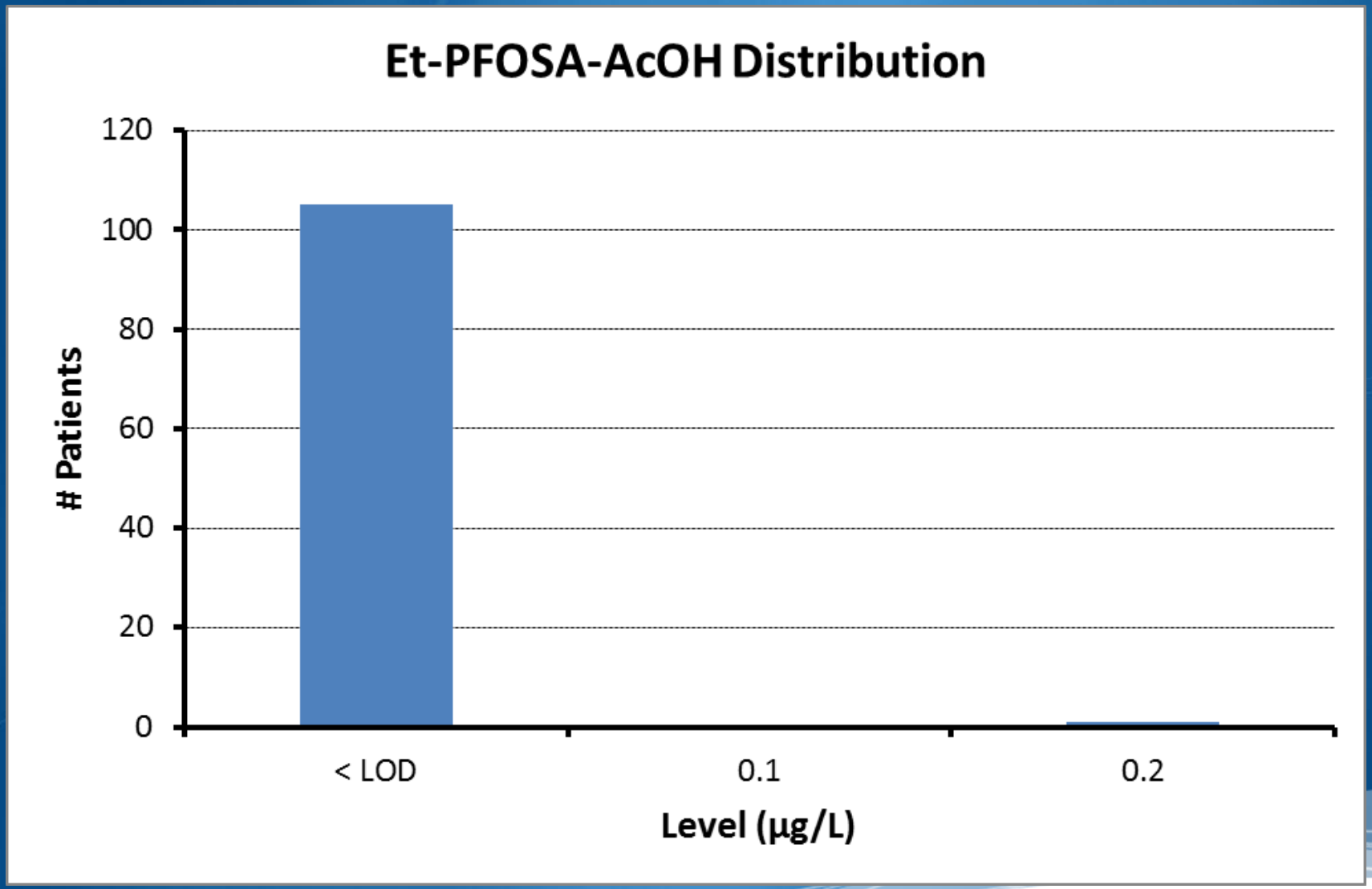
PFOSA Distribution of Results



Me-PFOSA-AcOH Distribution of Results



Et-PFOSA-AcOH Distribution of Results



Overall Summary

- The levels of PFOA and PFOS in the Pease pediatric community are similar to, or lower than, other pediatric populations in the U.S. and the general U.S. adult population within the last 10 years
- The levels of PFHxS in the Pease pediatric population are higher than the general U.S. adult population, and slightly higher compared to other U.S. pediatric populations, but still within the range of levels seen in these pediatric populations
- The levels of the other PFCs were similar or lower than comparisons populations

Perfluorohexane Sulfonic Acid (PFHxS)

- Found in firefighting foams called aqueous film-forming foams (AFFF)
- Detected in the Haven well (April-May 2014) possibly from contamination with AFFF used while Pease operated as an Air Force base
- Also found in stain resistant sprays for carpets and furniture
- PFHxS is one of the main PFCs commonly found in studies analyzing household dust (along with PFOS and PFOA)

What do the results mean for your child's health?

- PFC blood test tells you about how much PFCs are in your body at the time of the test
- A PFC blood test **cannot:**
  - tell you where or how you were exposed to PFCs
  - tell you what, if any, health problems might occur, or have occurred, because of PFCs in your body
  - be used by your doctor to guide treatment decisions or additional medical tests

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Is there anything I can do now that I know I have PFCs in my Body?

- Maintain general good health practices
- Talk to your primary care provider about any concerns you may have about your health
- There are no medically approved “treatments” or ways to remove PFCs from your body

Responding to Your Concerns

- Northern New England Poison Center (NNEPC) is available by phone for questions about individual results
- DHHS posted a healthcare provider Webinar to our website to inform healthcare providers about PFCs
- Boston Environmental Health Medical Group is available through primary care provider referral for individual medical evaluations – this requires an in-person medical visit after referral from your primary care provider
- Coordinate our efforts with the Community Advisory Board (CAB)
- Communicating with the multiple agencies involved to keep the community updated

Thank You!

Questions?