



The Importance of Biomonitoring in Addressing National, Regional, and Community Chemical Exposures

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National Center for Environmental Health
Agency for Toxic Substances and Disease Registry



NCEH/ATSDR Priorities

- **Be a leader in public health surveillance**
- **Eliminate harmful sources of lead from children's environments**
- **Take national action to ensure Americans have access to safe drinking water**
- **Expand ATSDR's capacity to investigate harmful exposures in communities**
- **Expand our laboratory**



ROLE OF STATE-LEVEL BIOMONITORING

State-Level Biomonitoring

- Provide **population-based, representative** exposure information by state or locality
- Perform testing for local investigations of environmental chemical exposure
- Characterize exposure in communities



EXAMPLE OF INTEGRATED DATA/ACTIVITIES

National, State and Community Level

Per- and Polyfluoroalkyl Substances (PFAS)

■ Past and Current Uses

- Non-stick cookware
- Carpet and clothing treatments
- Paper and cardboard packaging
- Fire-fighting foams

■ Sources

- Waste from manufacturing facilities
- Fire-fighting foam run-off
- PFAS-containing sludge used as soil amendment

■ Exposure Pathways

- Drinking water sources
- Fish (in contaminated areas)
- Consumer products
- Food containers/wrapping
- Clothing
- Cookware

Why is this important?

**Widespread
human
exposure**

**May affect
developing fetus
and child**

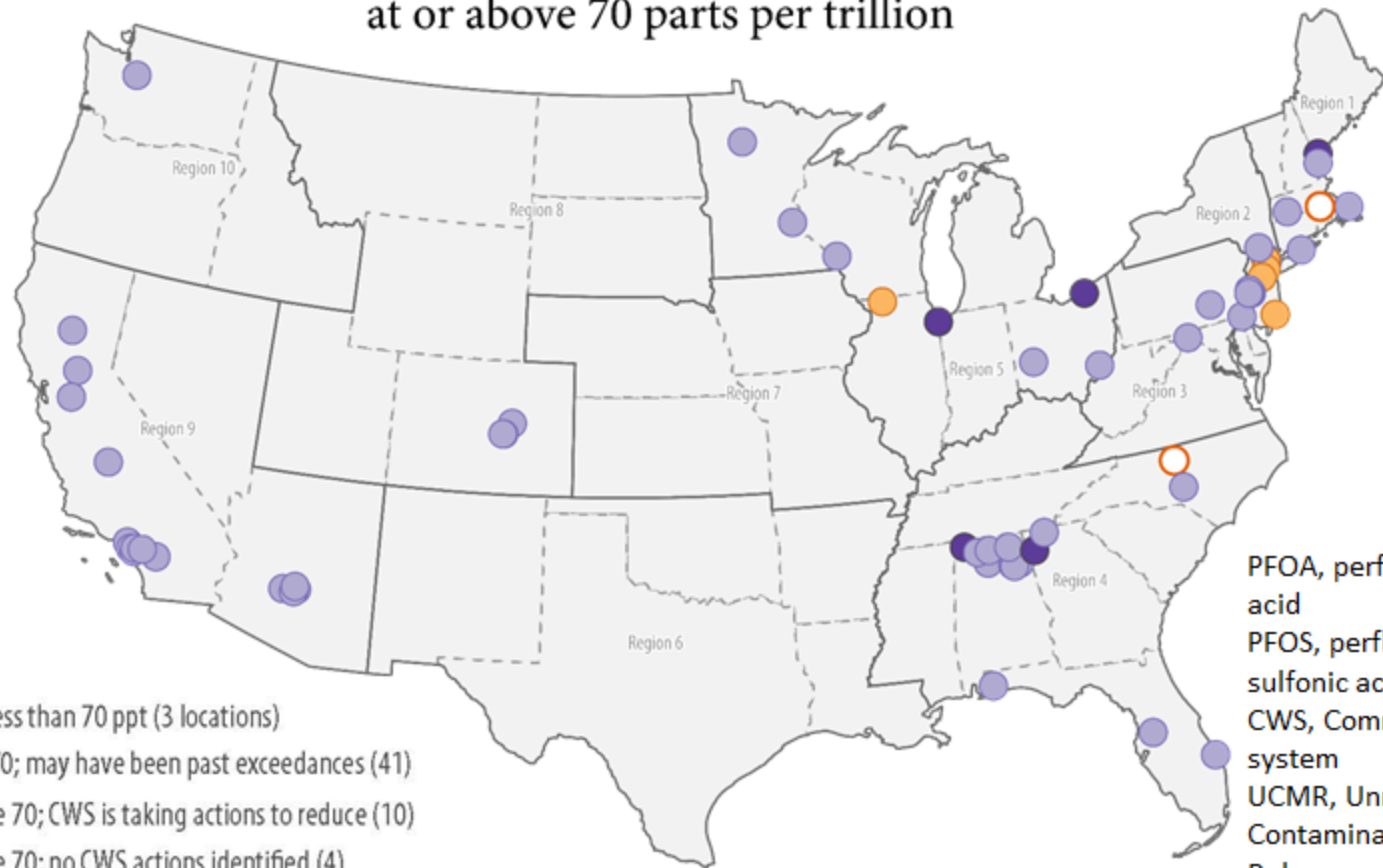
**“contaminant of
emerging
concern” - EPA**

**PFOA and PFOS
found above EPA
LTHAs in drinking
water in many
states**

**Persistent in the
environment**

**May increase
cancer risk**

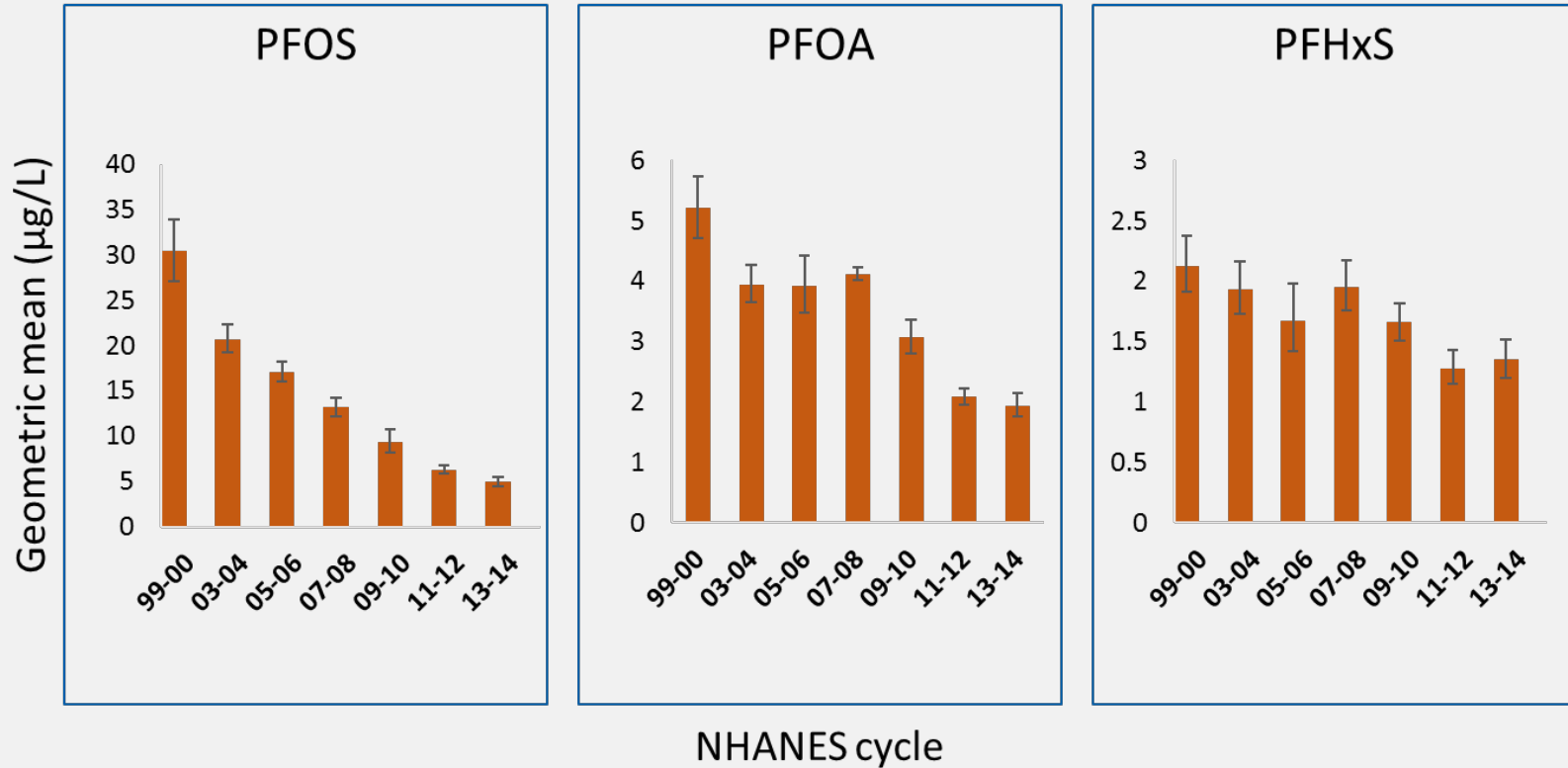
Status of CWS (n=65) with UCMR3 reported levels of PFOS + PFOA (sum) at or above 70 parts per trillion



- Current and past levels less than 70 ppt (3 locations)
- Current levels less than 70; may have been past exceedances (41)
- Current levels at or above 70; CWS is taking actions to reduce (10)
- Current levels at or above 70; no CWS actions identified (4)
- Collecting information (7)

PFOA, perfluorooctanoic acid
PFOS, perfluorooctane sulfonic acid
CWS, Community water system
UCMR, Unregulated Contaminant Monitoring Rule
ppt, parts per trillion

Long Alkyl Chain PFAS Serum Concentration Trends



PFAS – Integrated Data and Activities

ATSDR

- Performing site work, creating fact sheets, guidance documents, toxicology profiles, leverage GIS capabilities

Laboratory Sciences

- Developing laboratory guidance, laboratory analysis, tracking/sampling (environmental, blood), health studies

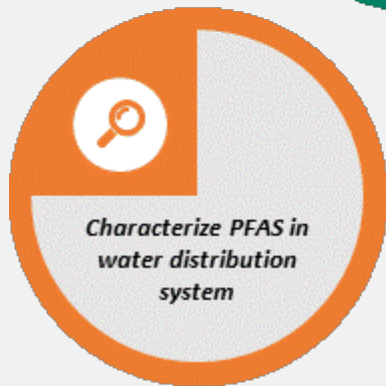
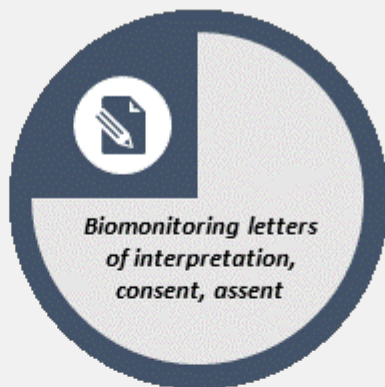
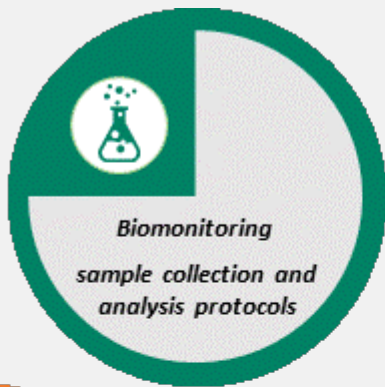
Public Health Tracking Network

- Piloting efforts in state health departments; integrating PFAS-related data

Safe Water

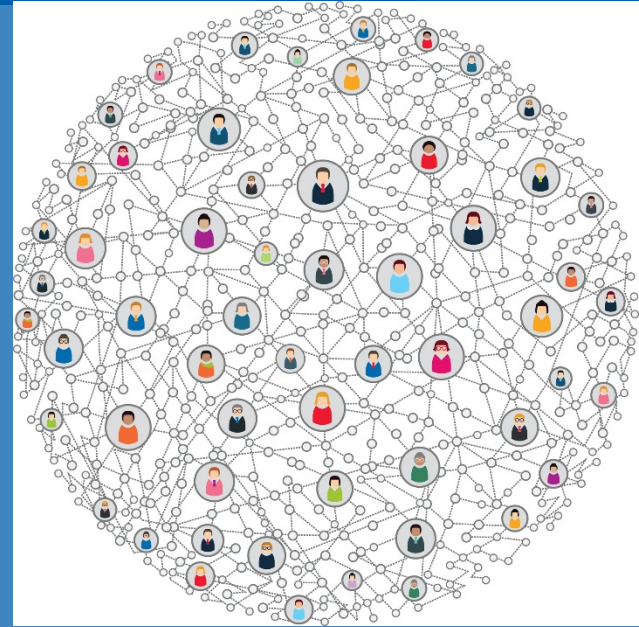
- Collecting data on water system-specific community exposure

PFAS Biomonitoring Technical Tools



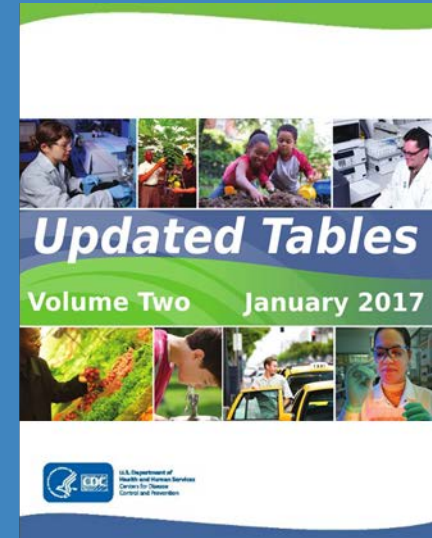
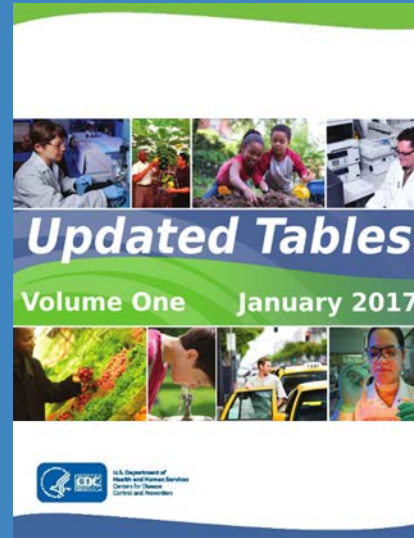
EXAMPLES OF INTEGRATED DATA FOR BIOMONITORING

International Level



European Commission's European Human Biomonitoring Initiative

- **Creating a European joint program for monitoring and assessment of human exposures to chemicals and potential health impacts**
- **Key Objectives**
 - Harmonizing procedures for human biomonitoring
 - Linking data
 - Generating evidence on causal links
 - Adapting chemical risk assessment methodologies
 - Using information to inform policy decisions



2017 UPDATED TABLES

*Fourth National Report on Human Exposure
to Environmental Chemicals*

Updated Tables, January 2017

- **Updated Tables reported in 2 volumes**
 - Volume 1 – U.S. general population
 - Volume 2 – Pooled samples, adult cigarette smokers and nonsmokers
 - ❖ POPs and pesticides in individual and pooled samples
 - ❖ Data for special sample of adult smokers and nonsmokers
- **Presents data for 304 chemicals**
 - 20 reported for the first time
 - 96 with updated data since Updated Tables, February 2015

What's New and Different?

- **New chemicals measured include DEET metabolites, atrazine and metabolites, triclocarban, and 6 blood VOCs**
- **CAS registry numbers for chemicals that have assigned numbers are included**
- **Linear and branched isomers of PFOS and PFOA newly measured in NHANES 2013-2014**
 - Isomers represent >95% of total PFOS and total PFOA (as previously measured)
 - Summed measures of PFOS and PFOA can be used to compare previous measurements of PFOS and PFOA

Chemicals Groups with Updated Data



- Hemoglobin Adducts (Acrylamide and Glycidamide)
- Blood VOCs, Including Disinfection By-products
- Urinary PBA, Benzophenone-3, Triclosan, Four Parabens, 2,4-dichlorophenol, and 2,5-dichlorophenol
- Whole Blood Metals and Mercury Species
- Serum Metals
- Urinary Metals and Arsenic Species
- Urinary Perchlorate, Nitrate, and Thiocyanate
- Serum Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS)
- Urinary Polycyclic Aromatic Hydrocarbon Metabolites
- Serum Polychlorinated Dibenzo-p-dioxins (Pooled)
- Serum Polychlorinated Dibenzofurans (Pooled)
- Serum Dioxin-like PCBs: Coplanar PCBs (Pooled)

New Chemicals Reported for First Time

Herbicides and Metabolite (NHANES 07 – 08)	Atrazine mercapturate Desethyl atrazine Desisopropyl atrazine Desisopropyl atrazine mercapturate Diaminochlorotriazine
Insect Repellent and Metabolites	3-(Diethylcarbamoyl) benzoic acid (DCBA) N,N-Diethyl-3-(hydroxymethyl) benzamide (DHMB)
Personal Care and Consumer Product Chemicals and Metabolites	Triclocarban
Perfluoroalkyl and Polyfluoroalkyl Substances: Surfactants	<i>n</i> -Perfluorooctanoic acid (<i>n</i> -PFOA) Branched Perfluorooctanoic isomers (Sb-PFOA) <i>n</i> -Perfluorooctane sulfonic acid (<i>n</i> -PFOS) Perfluoromethylheptane sulfonic acid isomers (Sm-PFOS)*
Volatile Organic Compounds (VOCs)	1,2,3-Trichloropropane 1,2-Dibromoethane Furan Isopropylbenzene (Cumene) Nitromethane



HARMONIZING BIOMONITORING APPROACHES

Building a National Biomonitoring Network

- **Longstanding collaboration with public health laboratories and APHL**
- **Goal: Increase capacity and capability to conduct high-quality biomonitoring**
 - The National Biomonitoring Plan
 - Funding for State Biomonitoring Programs
 - Technical and administrative resources for state and local programs
 - A formal National Biomonitoring Network

National Biomonitoring Network

Vision: A formal, national network of regional, state and local laboratories conducting high quality human biomonitoring science for use in public health practice and in response to environmental emergencies.

- **Formalize a network structure**
 - Steering Committee
 - Work groups addressing study design, laboratory methods, and membership
 - Create a central platform for biomonitoring practice
- **Harmonize biomonitoring measurements**
 - Quality Assurance Programs
 - Intended Purpose of Methods
 - Improve biomonitoring practices
- **Incorporate biomonitoring into public health surveillance and practice**



FINAL THOUGHTS

As we forge ahead...

- **Leverage expertise and resources outside of environmental health**
- **Use local and state level data**
- **Share your data-driven knowledge with other individuals and communities**

Questions



For more information, contact NCEH/ATSDR
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