



# Michigan Department of Health and Human Services (MDHHS)

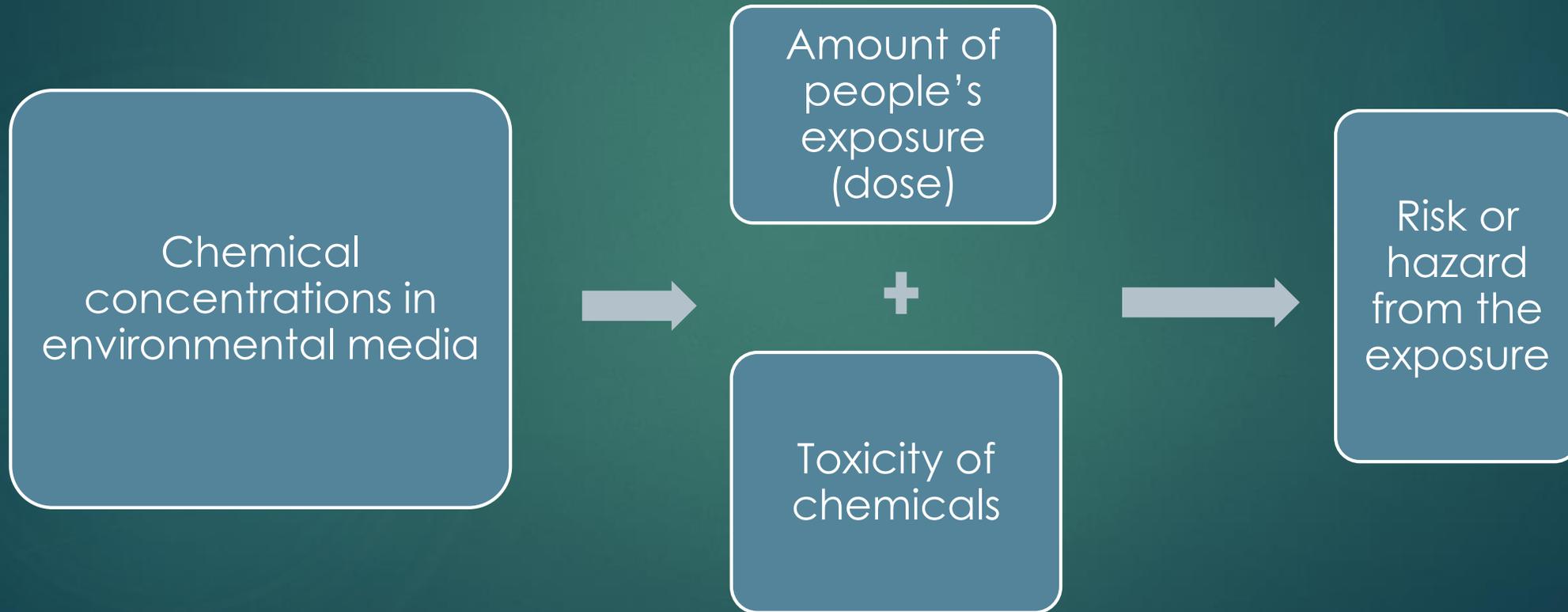
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DIVISION OF ENVIRONMENTAL HEALTH

MDHHS's Role =

# Provide Technical Support to Local Health

- ▶ Evaluate potential exposures to environmental chemicals
- ▶ Determine if harm may occur
- ▶ Provide recommendations
- ▶ Outreach to public, healthcare, others

# Assessing risk



# Evaluating toxicity of chemicals

- ▶ Evaluation includes:
  - ▶ Information from human epidemiology studies
    - ▶ May find associations with diseases or cancers
    - ▶ Exposure levels have varying levels of uncertainty (dose-response may not be available)
  - ▶ Information from laboratory animal studies
    - ▶ Do human and laboratory animals have similar health outcomes?
    - ▶ Are health outcomes biologically possible in humans?
    - ▶ Dose-response data used to develop toxicity values

# PFAS Toxicology

- ▶ PFOA and PFOS
  - ▶ Used in a wide variety of products in the past
  - ▶ Many published studies focusing on these two PFAS
- ▶ Other PFAS
  - ▶ Many other per- and polyfluorinated alkyl substances (PFAS) in products and the environment
  - ▶ Limited number of published studies on some other PFAS (no studies on others)

# Health Outcomes (PFOS and PFOA)

## In people:

- ▶ Alter cholesterol
- ▶ Thyroid disease (PFOA)
- ▶ Ulcerative colitis (PFOA)
- ▶ Testicular and kidney cancer (PFOA)
- ▶ Alter immune system function

## In laboratory animals:

- ▶ Developmental effects
  - ▶ Reduce ossification of the proximal phalanges
  - ▶ Decrease pup birth weight
  - ▶ Accelerated puberty in male pups
- ▶ Immune system dysfunction
- ▶ Alter liver and kidney weight

# EPA's Health Advisory Levels

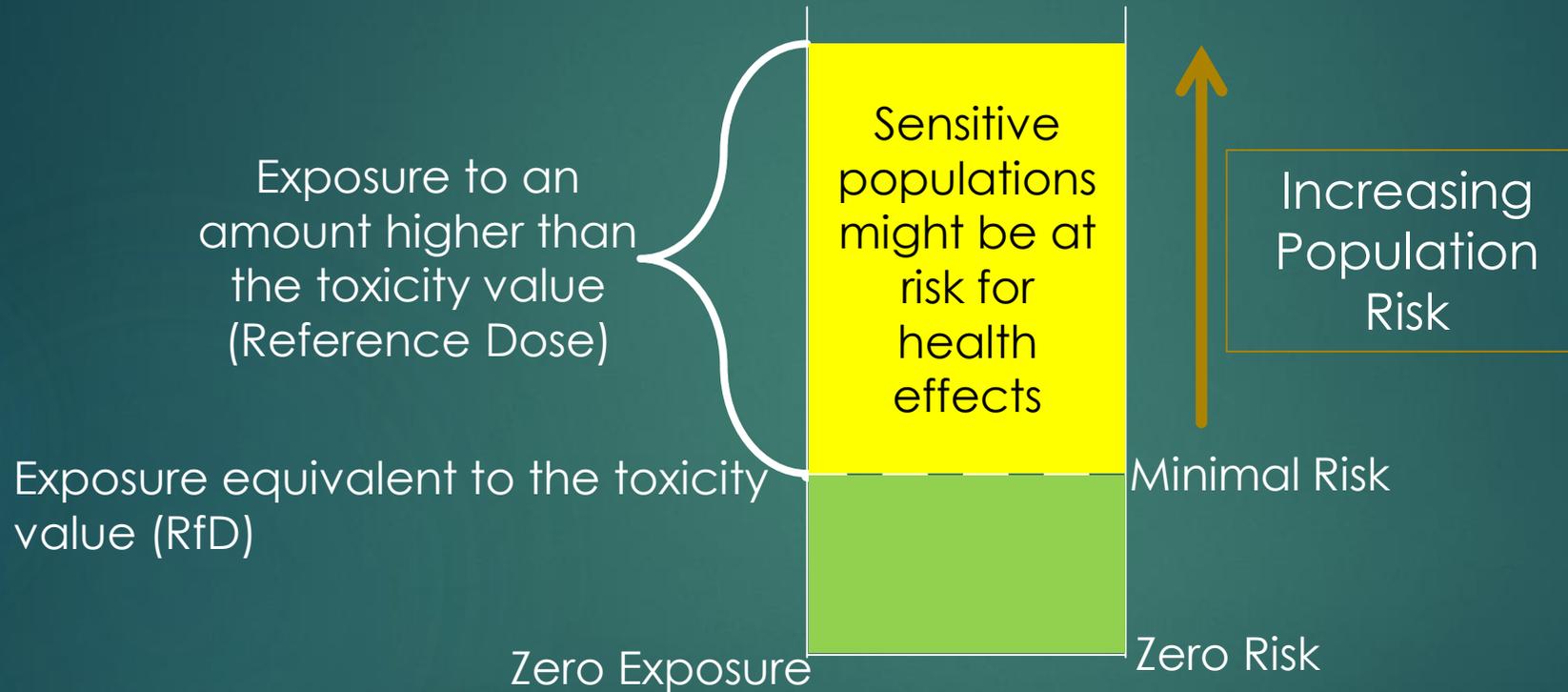
- ▶ Based on reference doses (RfD) derived from developmental toxicity study in mice (PFOA) and rats (PFOS)
- ▶ “Lifetime” Health Advisory
  - ▶ PFOA + PFOS = 70 ppt (ng/L)
  - ▶ Short-term and long-term exposure
- ▶ Protects fetus and others against noncancer health effects (also protective against development of cancer)

# More Information

- ▶ Deb Mackenzie-Taylor, PhD, MDHHS Toxicology and Response Section Manager
  - ▶ 800-648-6942
  - ▶ [mackenzie-taylor@michigan.gov](mailto:mackenzie-taylor@michigan.gov)
- ▶ <https://www.atsdr.cdc.gov/pfc/index.html>



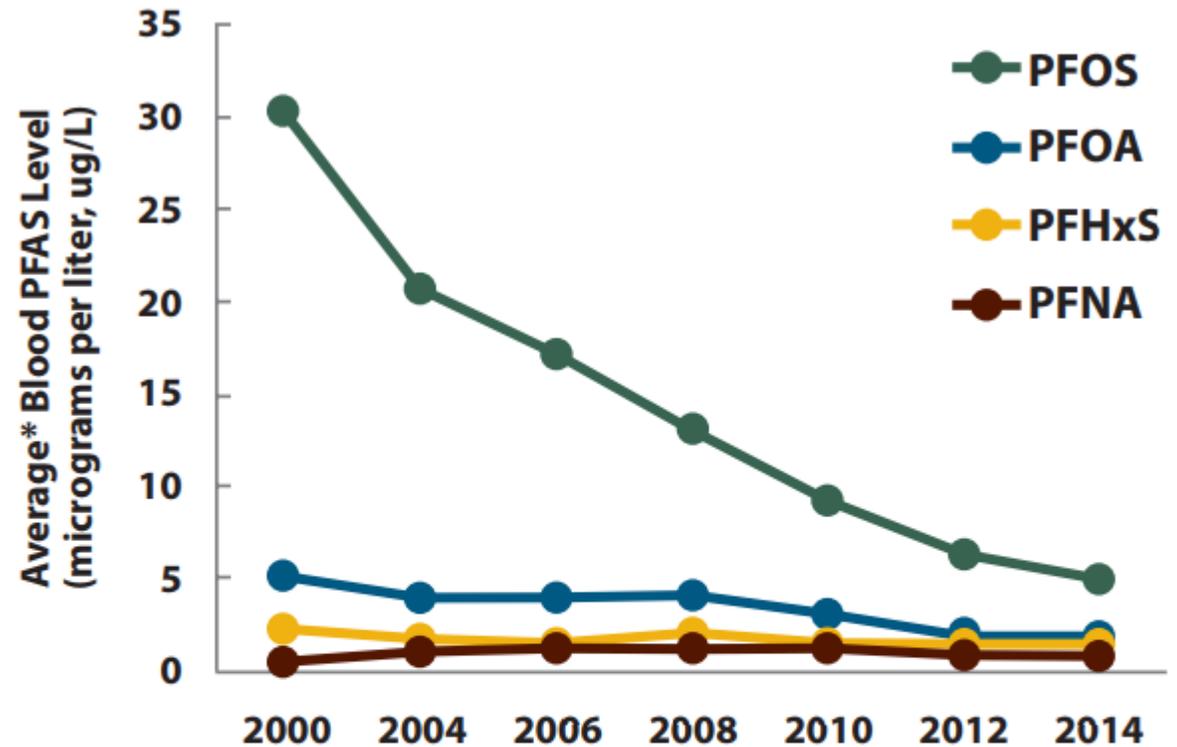
# Non-Cancer Risk



# Blood Testing

- ▶ PFAS are in many products commonly used
- ▶ People are expected to have some level of PFAS in their blood
- ▶ Blood testing:
  - ▶ CAN tell you the concentration in your blood at time of test
  - ▶ CANNOT tell you if current or future health conditions are due to PFAS or how you were exposed (where the PFAS came from)

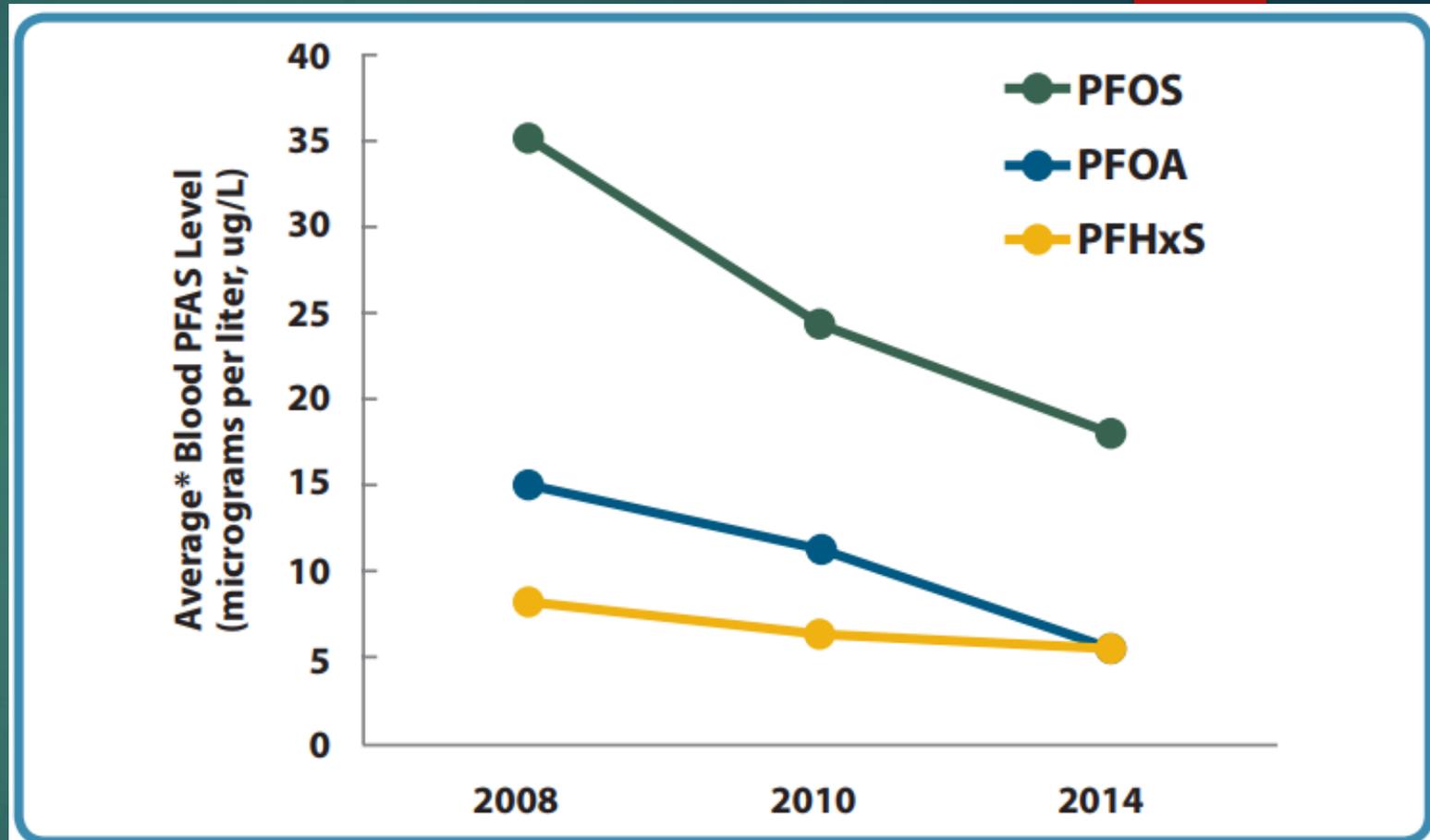
# Blood Levels of the Most Common PFAS in People in the United States from 2000-2014



\* Average = geometric mean

**Data Source:** Centers for Disease Control and Prevention. Fourth Report on Human Exposure to Environmental Chemicals, Updated Tables, (January 2017). Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

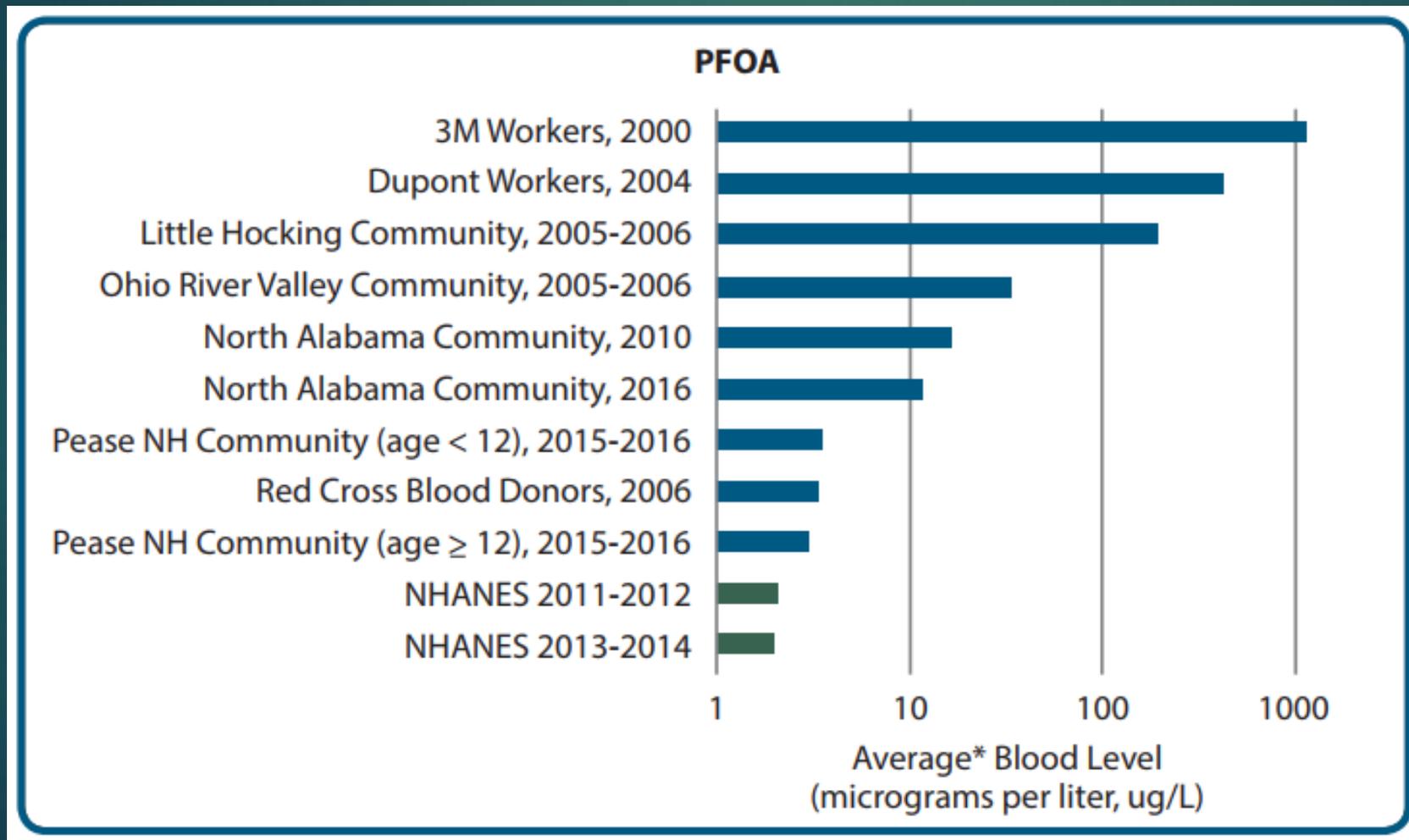
# Average Blood Level of Some PFAS after Installing a Water Filtration System



\* Data shown are geometric means

**Data Source:** Minnesota Department of Health, Environmental Tracking and Biomonitoring. East Metro PFC3 Biomonitoring Project, December 2015 Report to the Community.

# Blood Levels in People Who Were Exposed to PFOA

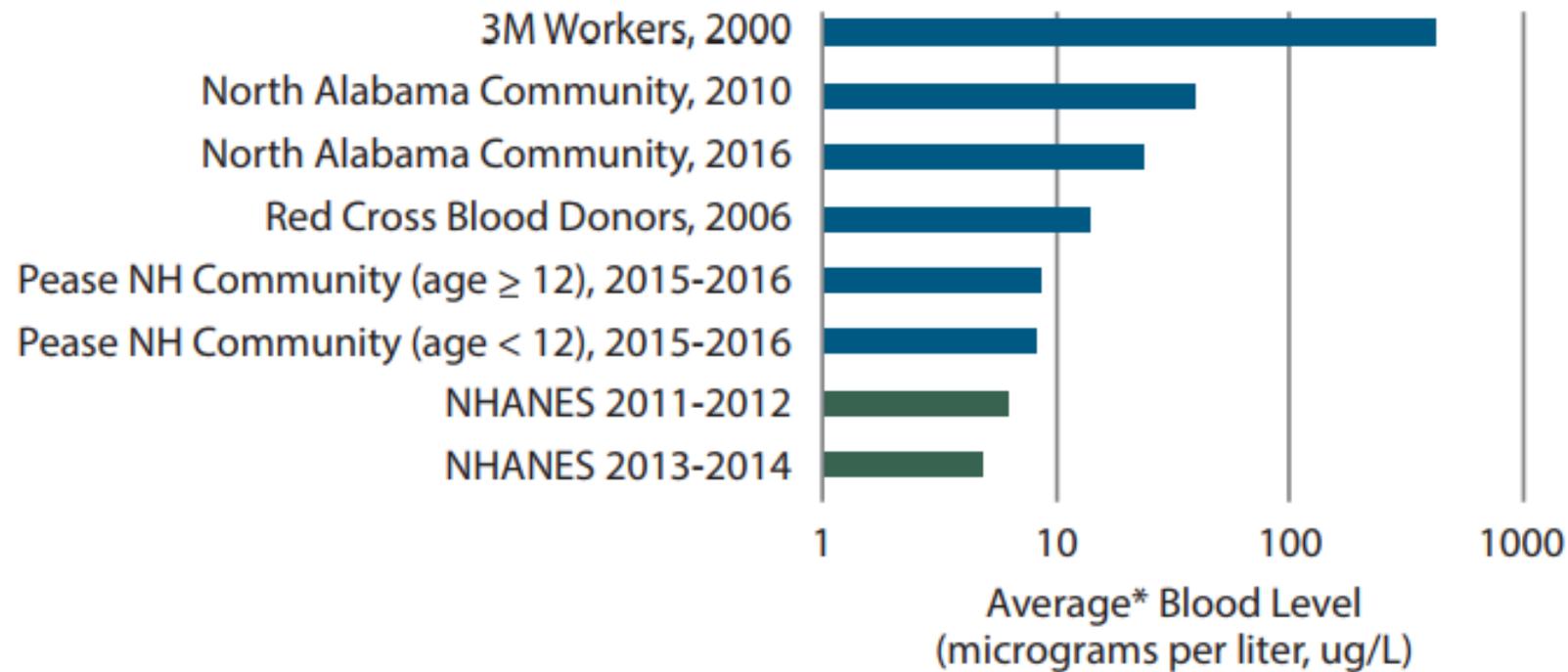


Laboratory animal average serum levels that correspond to LOAELS: 12.4 to 87.9 milligram/liter (mg/L) (U.S. EPA Health Effects Support Document, Table 4-8)

\* Average = geometric mean

# Blood Levels in People Who Were Exposed to PFOS

## PFOS



\* Average = geometric mean

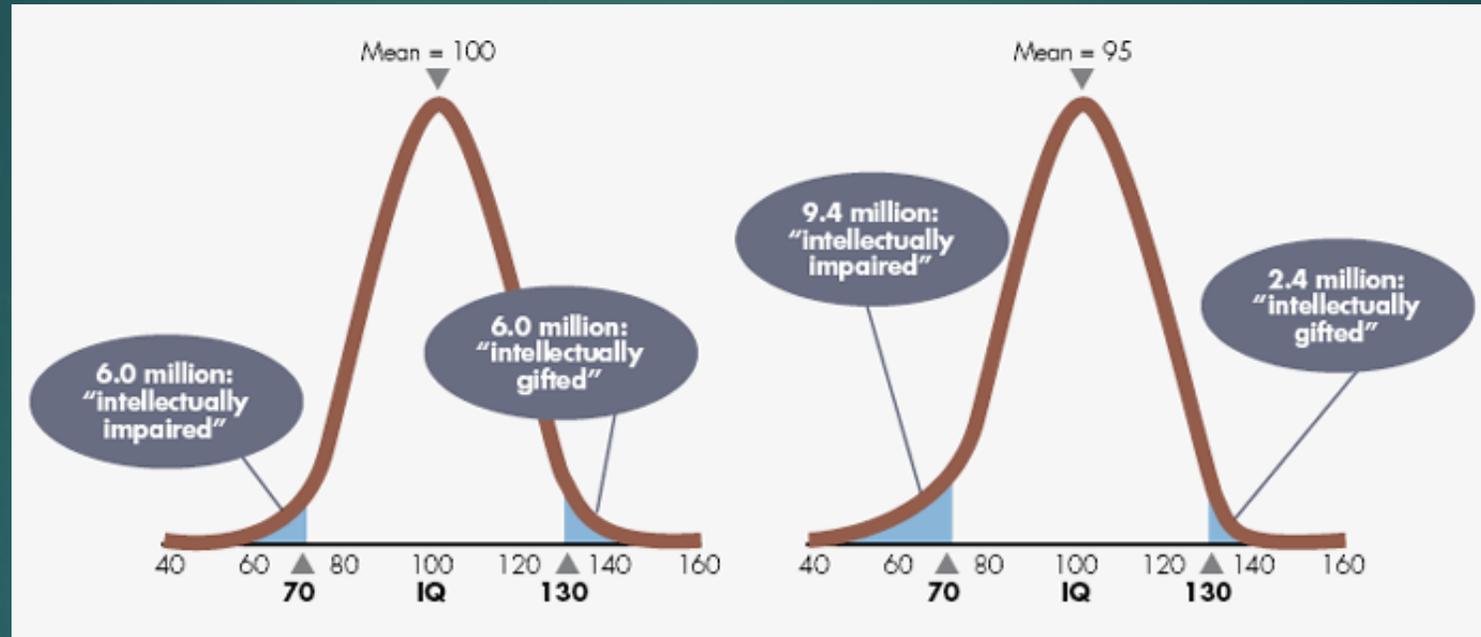
Laboratory animal average serum levels that correspond to NOAELs: 6.26 to 38 milligram/liter (mg/L)

LOAELs: 19.9 to 157 mg/L  
(U.S. EPA Health Effects Support Document, Table 4-6)

# Individual Risk

- ▶ Will a specific person develop cancer or some other health effects from a chemical exposure?
  - ▶ There is no way for us to know.
  - ▶ Individual health status best evaluated by a medical doctor
- ▶ Individual risk depends on other exposures, genetics, organ system functioning, health/nutritional status, and other complex parameters.

# Population Risk (Example)



Population with low or no exposure.

Population with elevated exposure.

No way to know who would be in the shaded areas.

# Sequence of Chemical Exposure to Disease

