



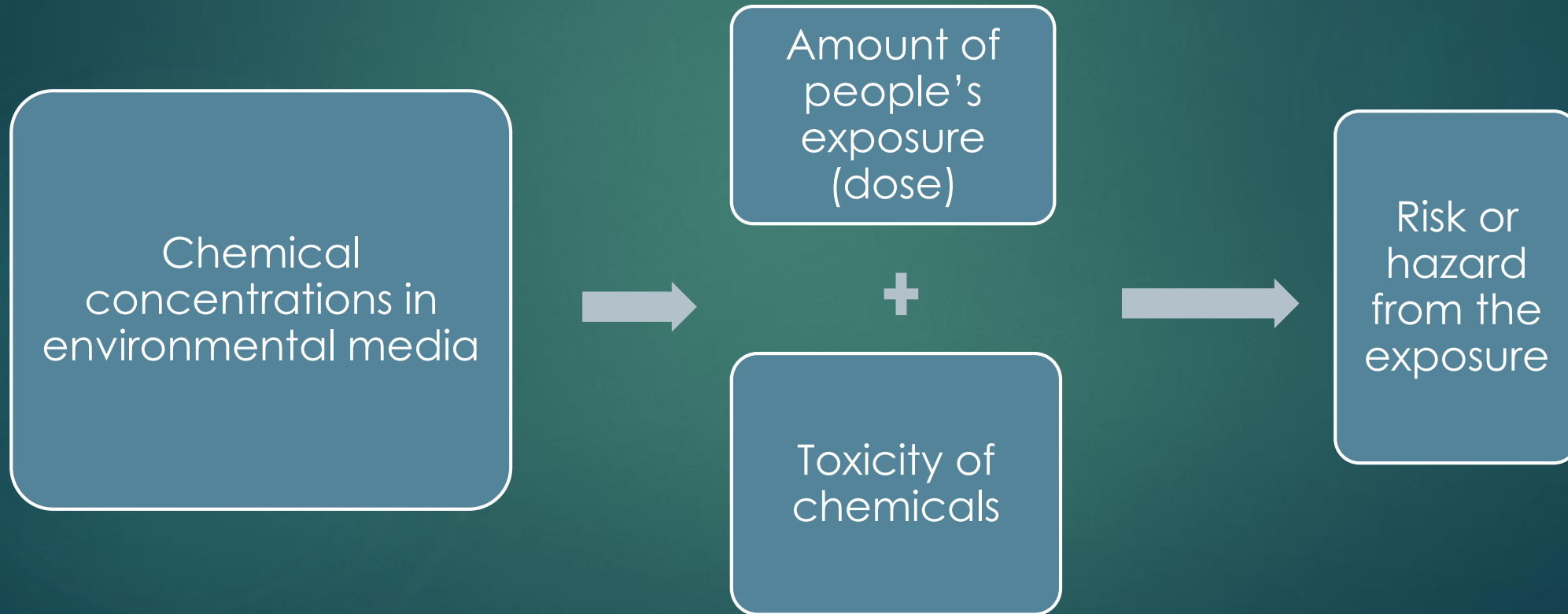
Michigan Department of Health and Human Services (MDHHS)

DEB MACKENZIE-TAYLOR, PHD
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

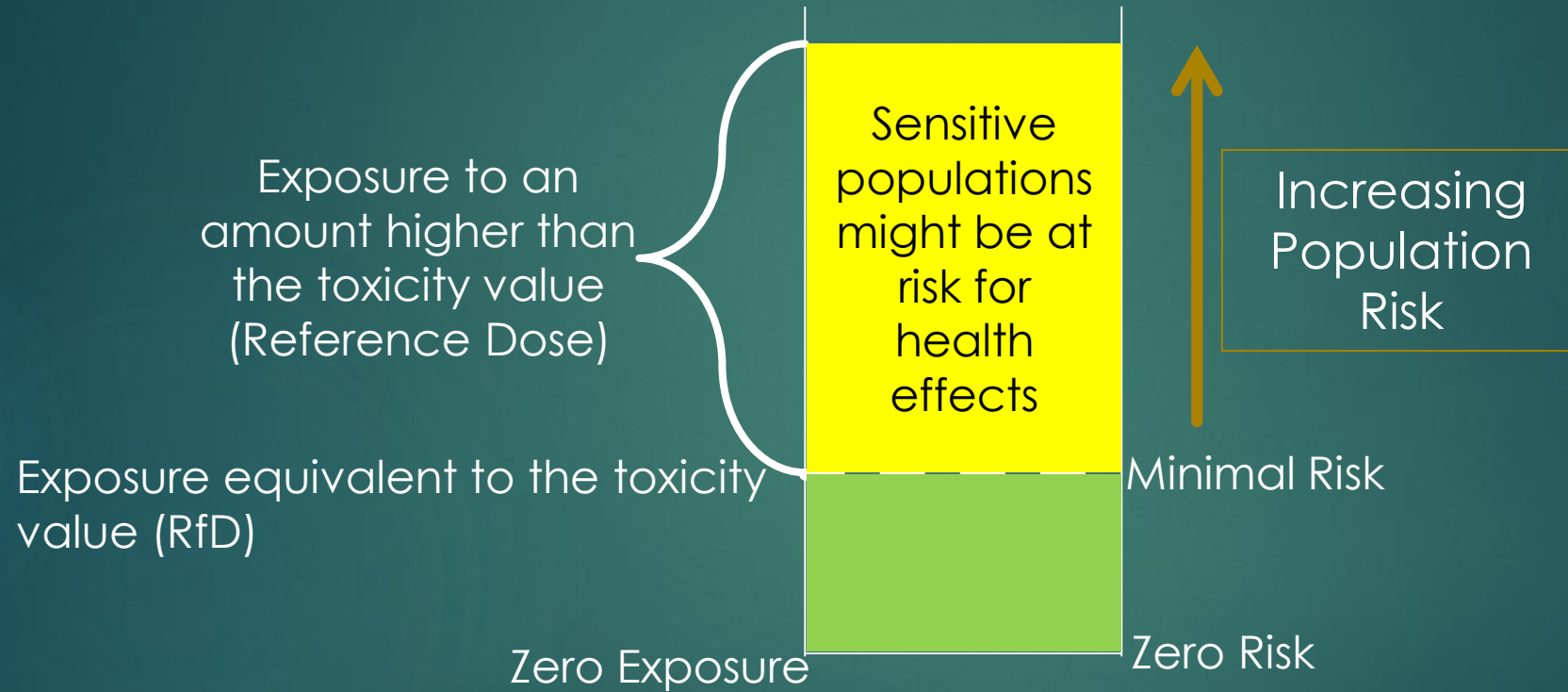
EPA's Health Advisory Levels

- ▶ 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-taylord@michigan.gov
- ▶ <https://www.atsdr.cdc.gov/pfc/index.html>

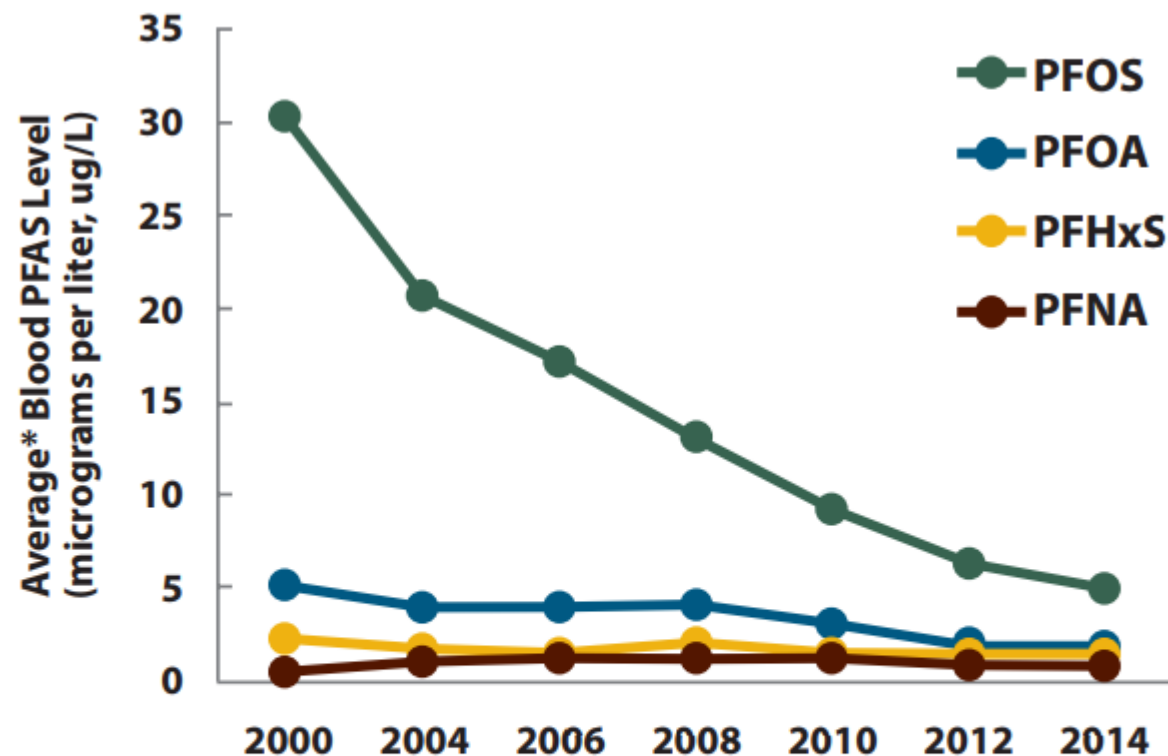
Non-Cancer Risk



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)

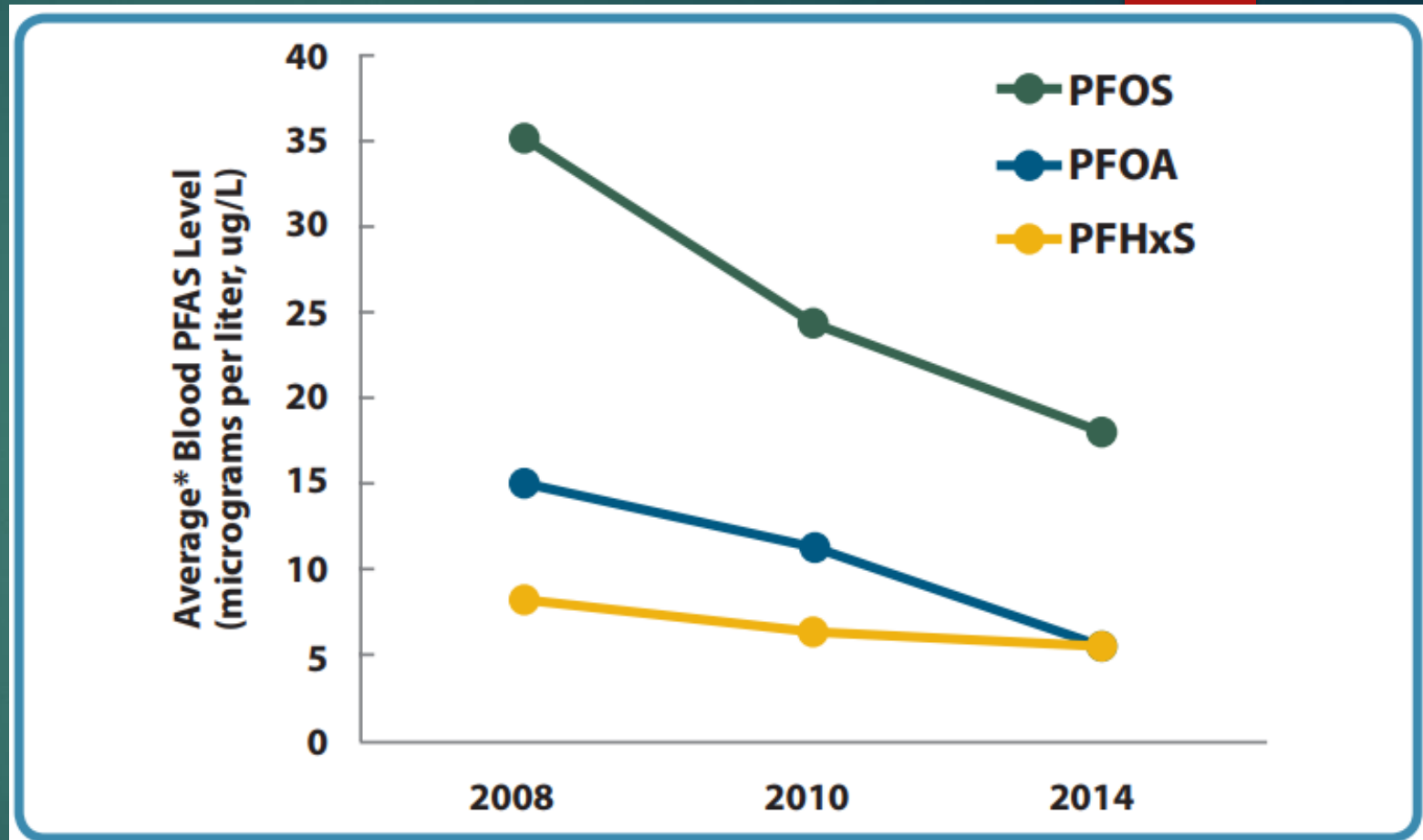
Blood Levels of the Most Common PFAS in People in the United States from 2000-2014



* 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.

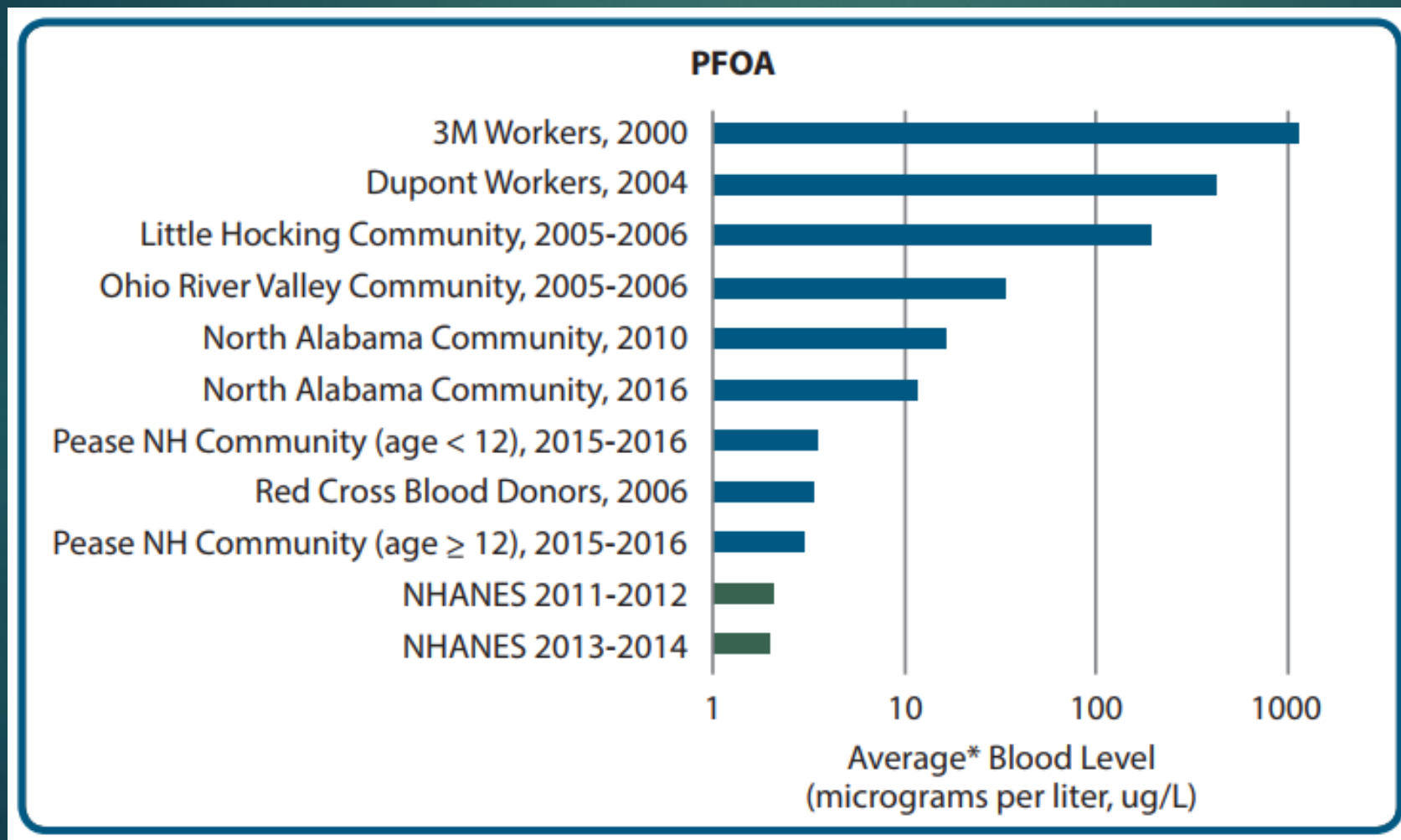
Average Blood Level of Some PFAS after Installing a Water Filtration System



* 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.

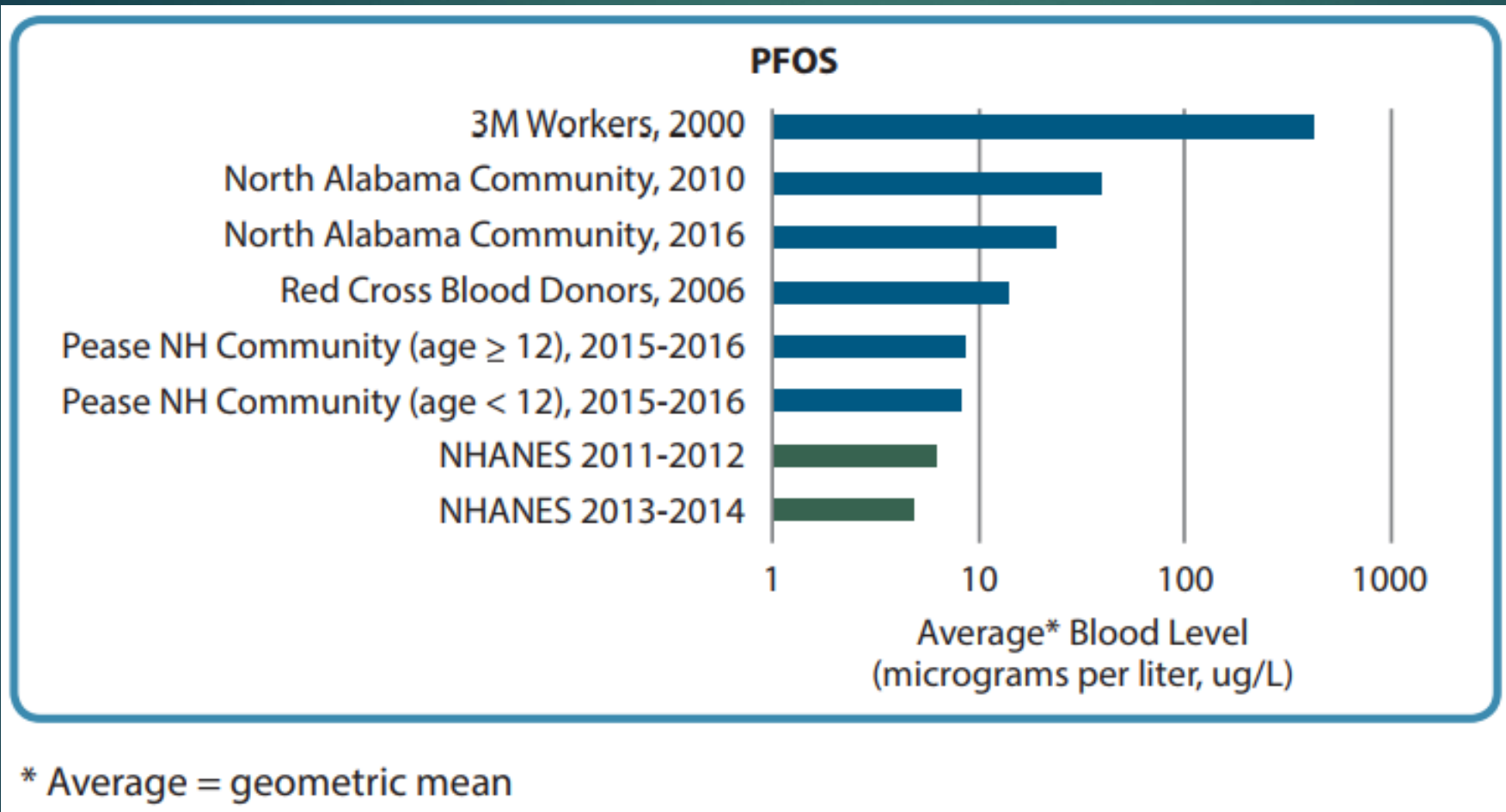
Blood Levels in People Who Were Exposed to PFOA



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



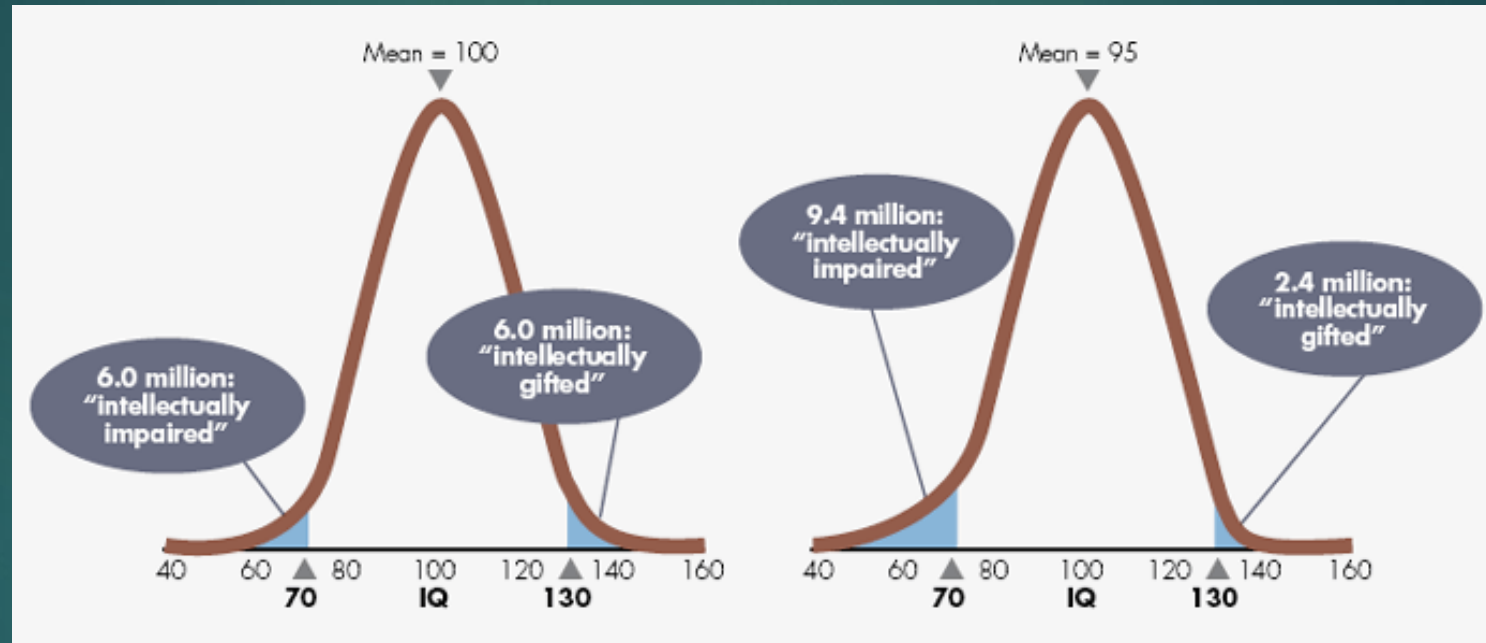
Laboratory animal
average serum levels
that correspond to
NOAELs: 6.26 to 38
milligram/liter (mg/L)

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

