Environmental Health & Toxics 101
Health Leaders Fellowship Program

April 9, 2021

Rebecca Meuninck, Ph.D.
Ecology Center

Learning Objectives

1. List three routes of human exposure to toxic chemicals in our homes and the environment.

2. List three health problems linked to exposure to toxic chemicals in products, home and the environment.

Outline

1. Our Toxic Problem
2. Routes of exposure
3. Vulnerable populations
4. Considerations
5. Pollution in people
6. CHHOPS
7. Why are we so toxic?
8. What can we do?

Occupation

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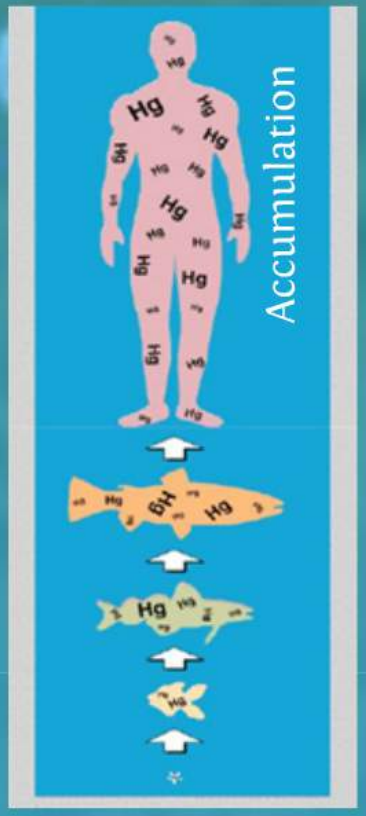
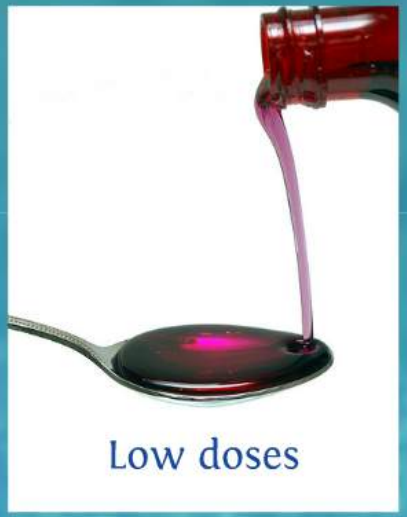
Our Toxic Problem

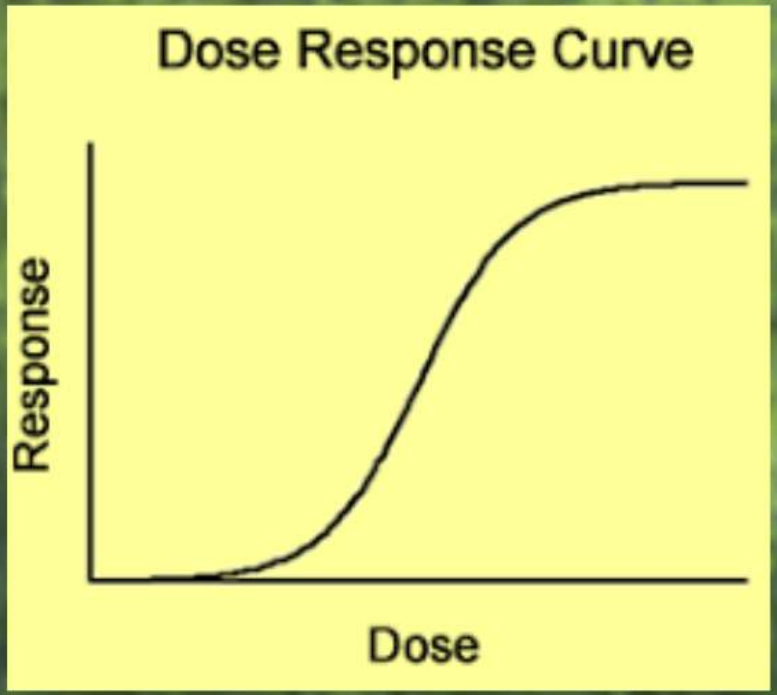
How are we exposed?

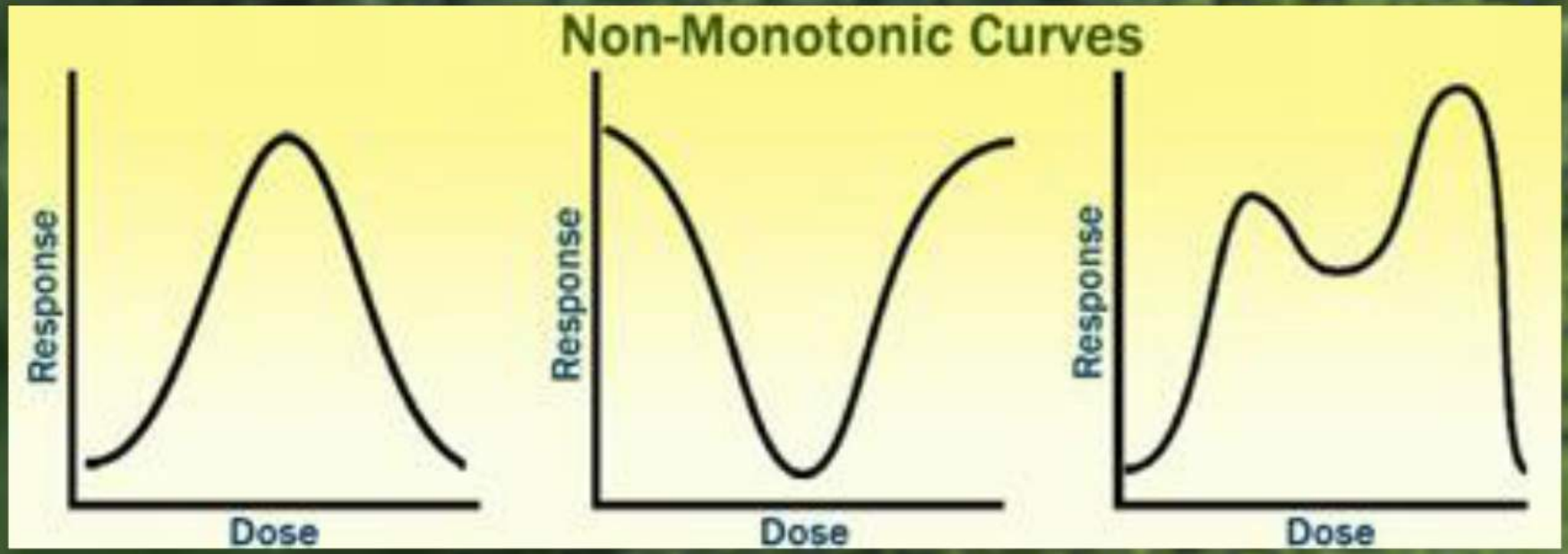
Considerations…





Individual Susceptibility

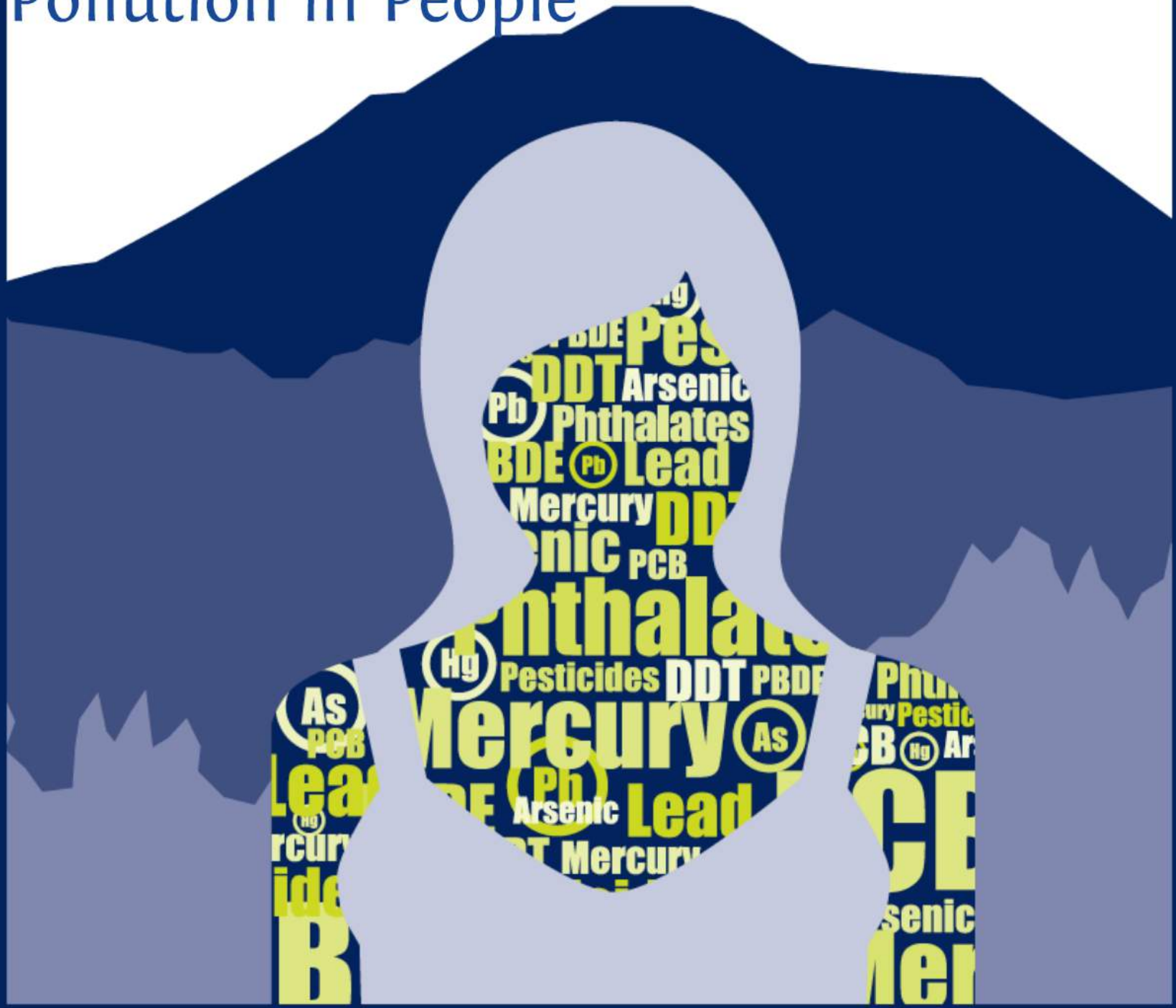

Dose Response Curve
Response
Dose


Non-Monotonic Curves
Response
Dose
Response
Dose
Response
Dose

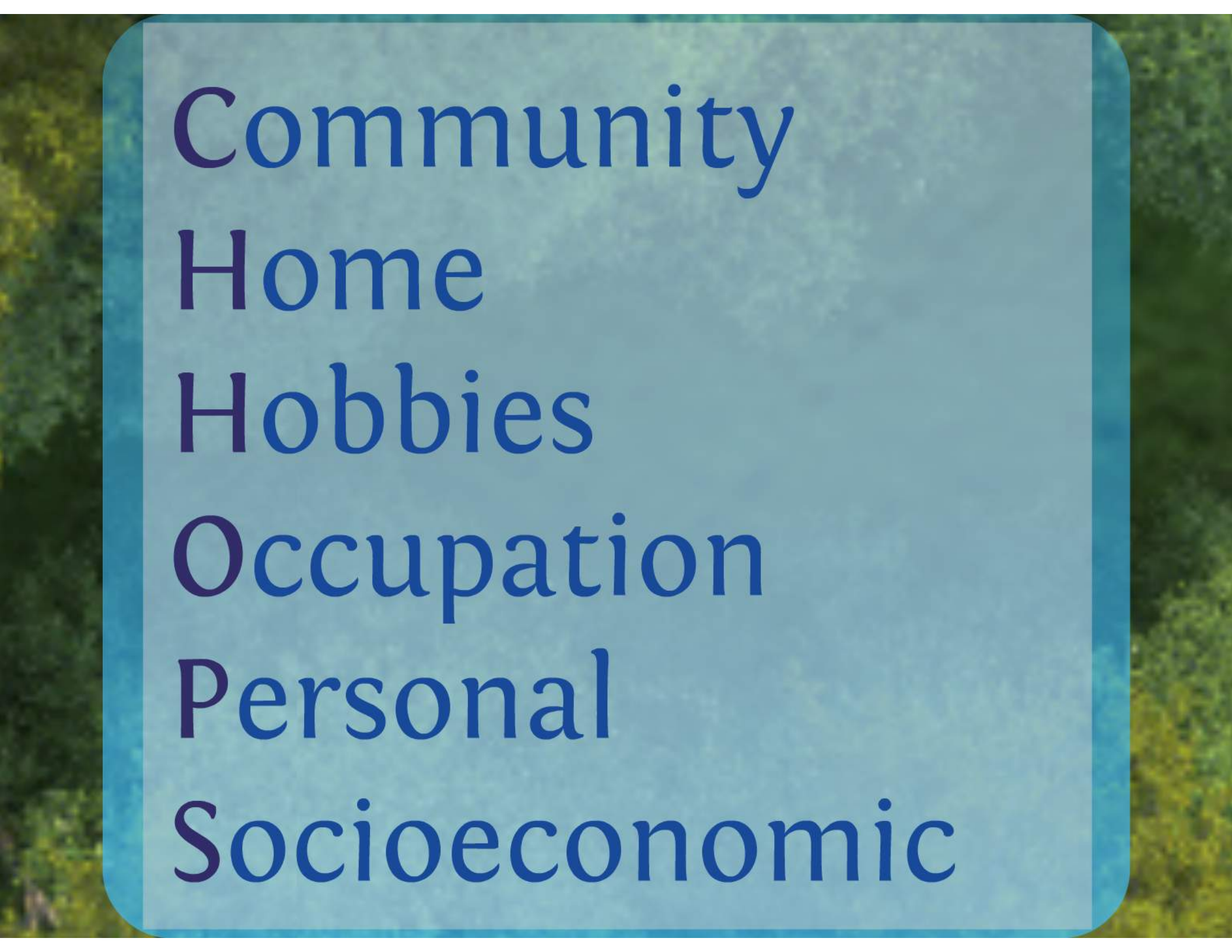
Vulnerable populations

- Children, babies, developing fetus
- Pregnant women
- Workers
- Hot spot communities

Pollution in People



Where do exposures occur?


Community
Home
Hobbies
Occupation
Personal
Socioeconomic

Community

Home & Hobbies


Lead paint

MI Drinking Water Contamination

Lead: Flint & schools

Arsenic: Well Water

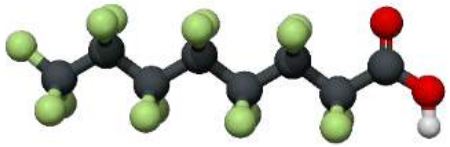
PFAS: Oscoda, Rockford, Parchment, Ann Arbor, Traverse City, etc.

1,4 dioxane: Ann Arbor

What are PFAS?

- Per- and polyfluoroalkyl substances
- Long Chain, C8
  - PFOA: Perfluoroocotanoic acid
  - PFOS: Perfluorooctane sulfonic acid
- Short Chain, C6 or GenX

  PFHxS: Perfluorohexane sulfonic acid
- 5,000 PFAS substances known
- 3,000 PFAS substances found in commercial use



Many uses of PFAS chemicals

- Fluorochemical manufacturing & production or use of PFAS-containing products
  - Non-stick coatings
  - Grease- and oil-resistant coatings
  - Water-repellent fabrics
  - Stain-resistant coatings
  - Firefighting foams
  - Manufacturing surfactants
  - Mist suppressants for metal plating
  - Aids in microchip fabrication
  - Ski/snowboard wax

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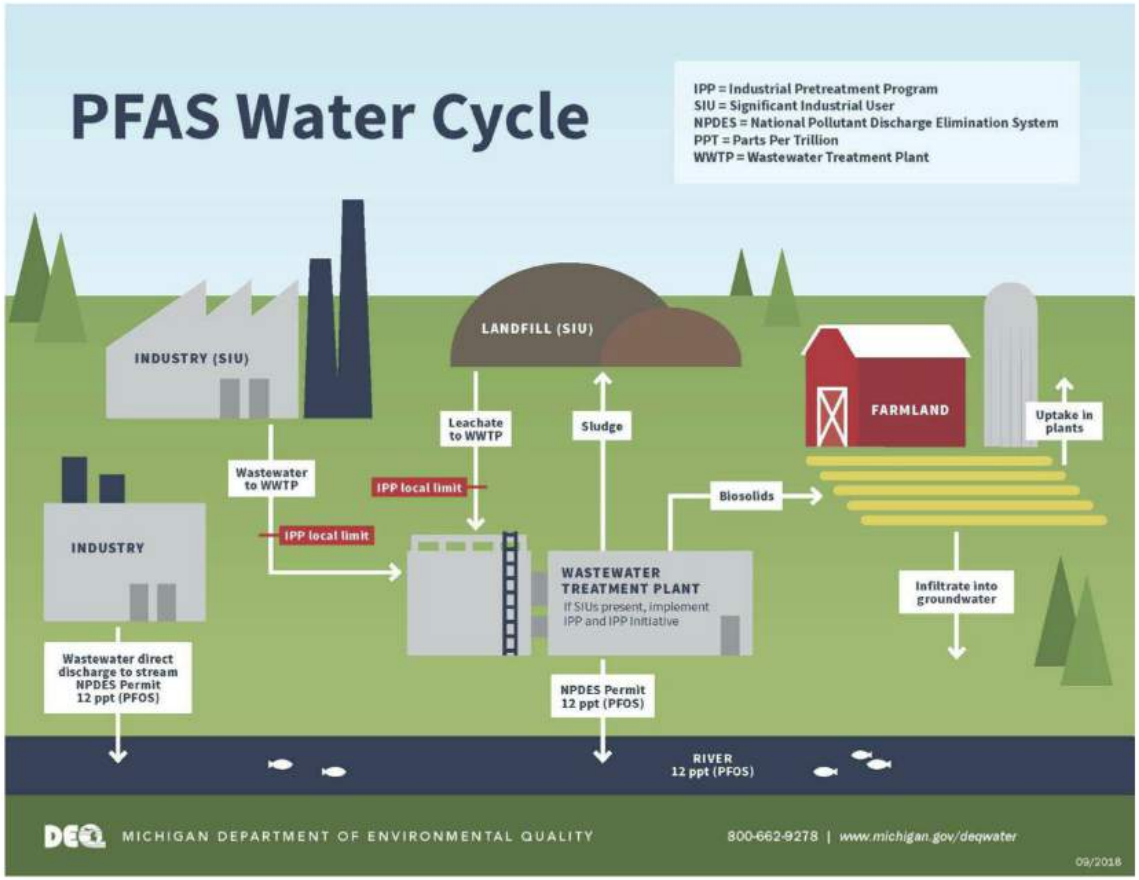
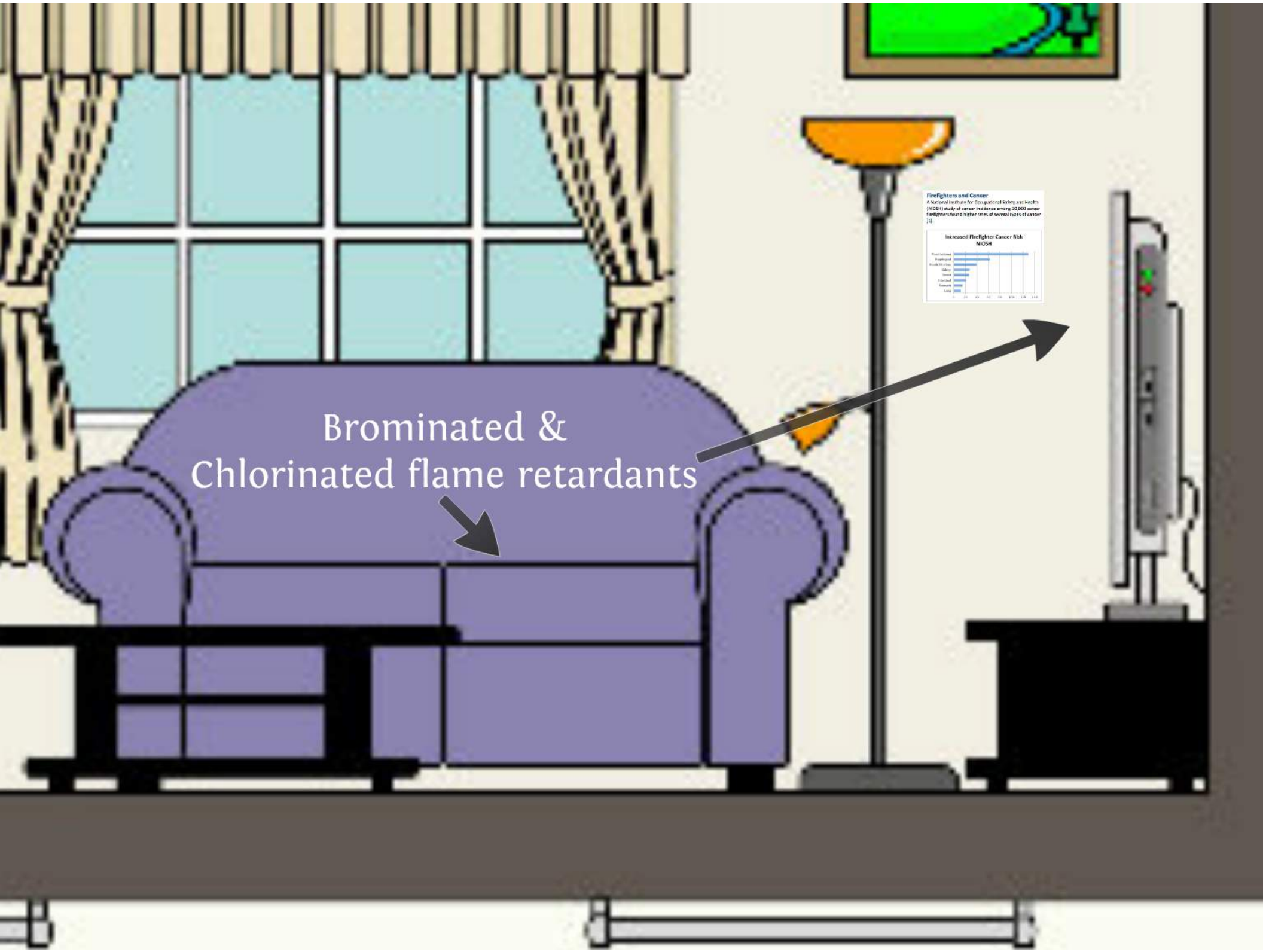
Health risks associated with PFAS

- Suppressed immune response
- Elevated cholesterol
- Thyroid disease
- Kidney disease/cancer
- Testicular cancer
- Reproductive health problems
  - Difficulty becoming pregnant
  - Endometriosis
- Altered liver function
- Cardiovascular disease
- Osteoarthritis
- Low birth weight
- Preterm birth
- Hypertension/ preeclampsia
- Delayed puberty
- ADHD

PFAS Entering the Environment

- Wastewater discharge
- Sewage sludge
- Firefighting training runoff
- Chemical manufacturers & industries emit into air & water




FireFighters and Cancer
Increased Firefighter Cancer Risk
NIOSH
Brominated &
Chlorinated flame retardants

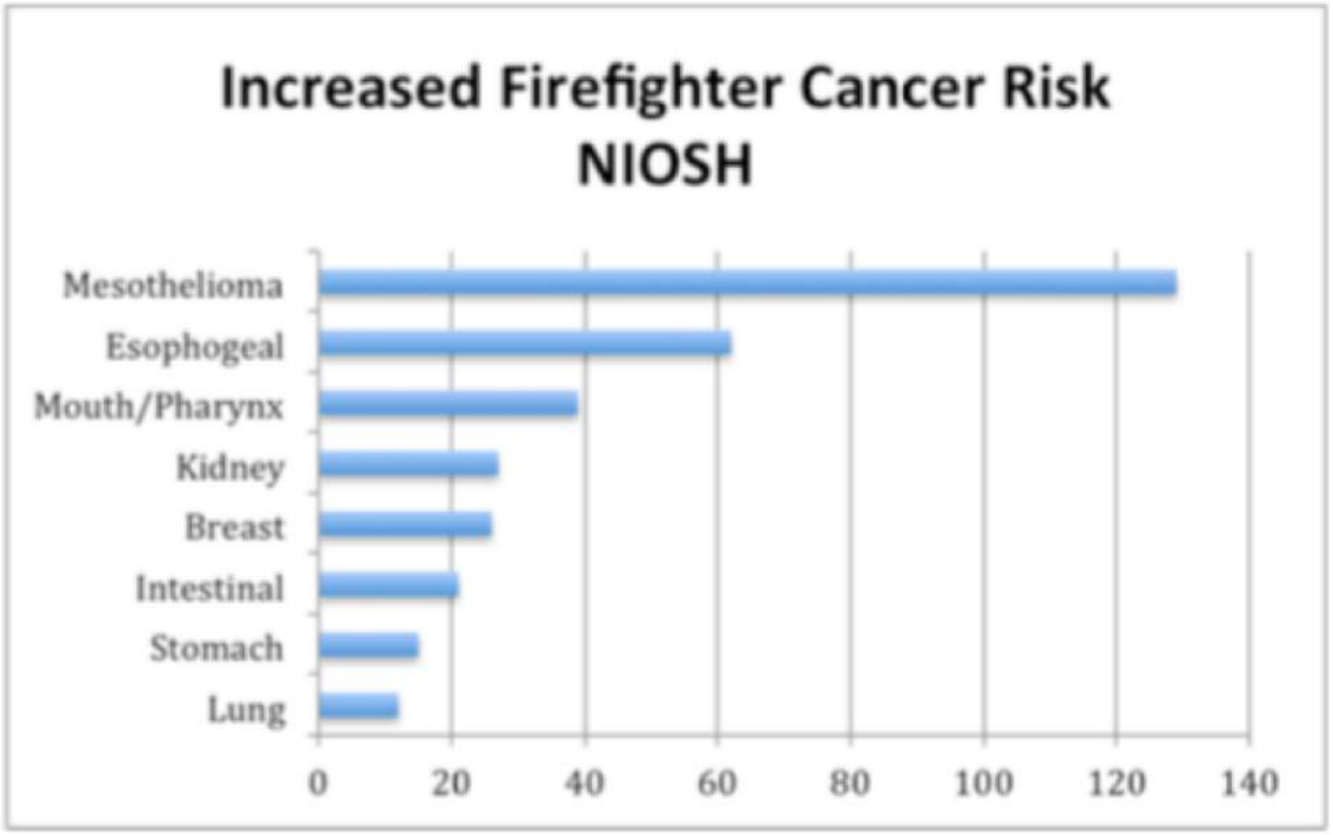
Occupation

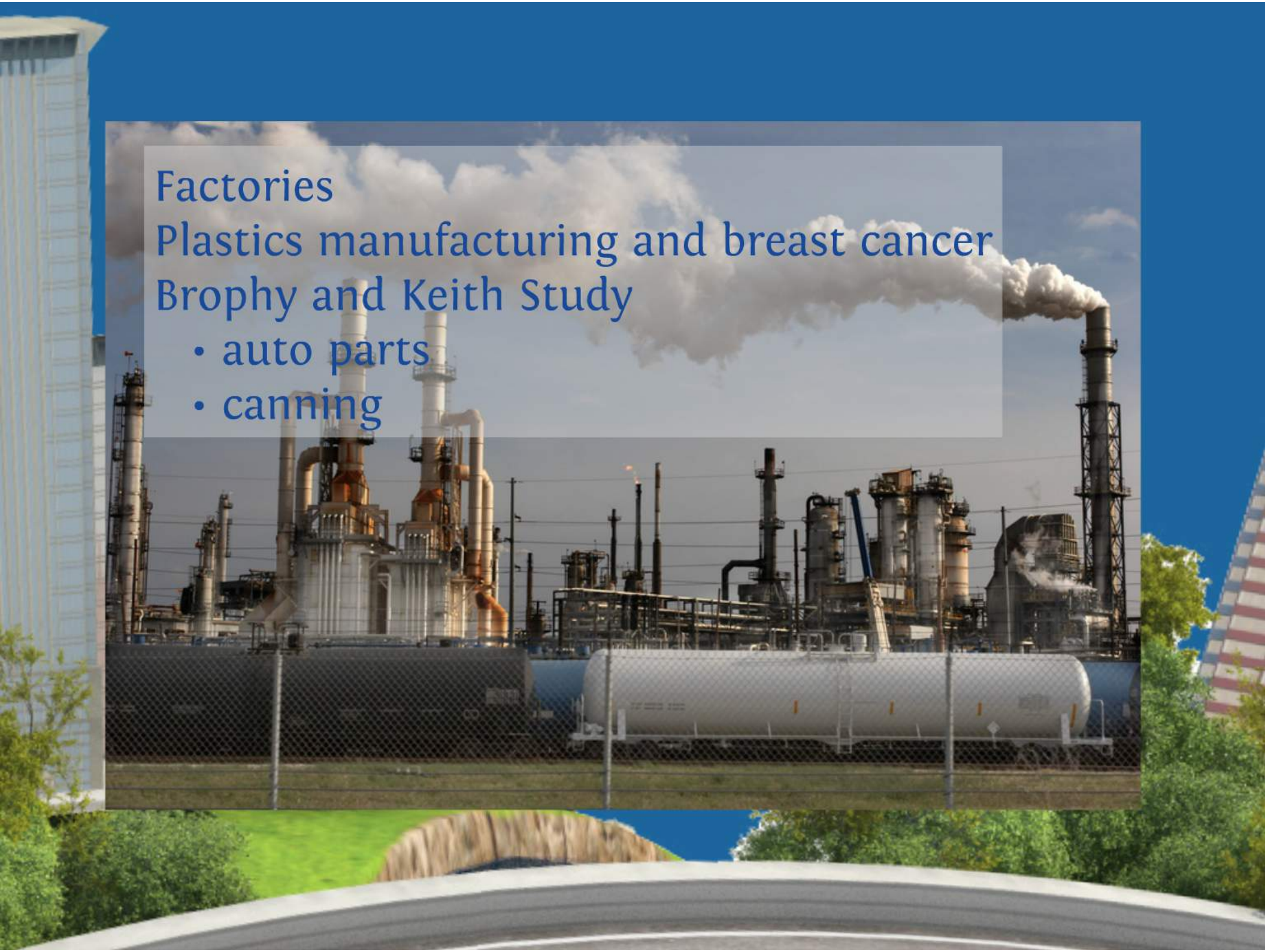

Radiation, shift work, second hand smoke and diseases like breast cancer
Hospital
Factories
Plastics manufa
Brophy and Keith
• auto parts
• canning


Radiation, shift work, second hand smoke and diseases like breast cancer

Firefighters and Cancer

A National Institute for Occupational Safety and Health (NIOSH) study of cancer incidence among 30,000 career firefighters found higher rates of several types of cancer [1].




Factories
Plastics manufacturing and breast cancer
Brophy and Keith Study
• auto parts
• canning

Hospital

Exposures in health care workers

PSR 2009 Report
- 20 nurses and physicians
- Two from Michigan
- Tested positive for over 24 harmful chemicals
- PBDEs, phthalates, mercury, BPA, perflorinated compounds, triclosan…
- Links to: developmental/neurological effects, reproductive dysfunction, cancer, metabolic syndrome

Personal

Socioeconomic

What can we do?

Leading the Health Care Sector
to Sustainability

Leading the Health Care Sector to Sustainability

Health Care Without Harm

Move the Market

Change the law

Environmentally Preferable Purchasing

Toxic Chemicals in Building Products

We are exposed to hazardous chemicals in the buildings where we live, work, play, and learn. Credible scientific studies show clear links between these chemicals and health effects in humans. According to the U.S. Environmental Protection Agency, the average person spends about 90% of their time indoors. This fact sheet provides some basic information about where hazardous chemicals are found, how we're exposed, and how our health can be impacted. In many cases, safer alternatives exist or are emerging.

Flame Retardants

Flame retardants are a class of chemicals that frequently include bromine and chlorine. Products that commonly contain Flame retardants include building insulation, polyurethane foam, wire and cable, and electronics. We're commonly exposed to these chemicals by inhaling dust in our buildings.

Flame retardant chemicals have been shown to disrupt thyroid and estrogen hormones, which are linked to reproductive and developmental health effects including reduced sperm count in males, changes in ovarian cell structure in females, and abnormal brain development in children. Many flame retardants are also persistent in the environment and bioaccumulative, building up in children's bodies through breast milk and dust inhalation.

Perfluorochemicals (PFCs)

PFCs are commonly found in stain and non-stick treatments, including Scotchguard®, Teflon®, and Stainmaster® on furniture, carpet, and other office products with fabric. Common PFCs include perfluorooctanoic acid (PFOA) and perfluoroactane sulfonate (PFOS).

These chemicals do not break down in the environment and are found in indoor dust as well as human breast milk, where they are passed on to infants. PFCs can cause reproductive and developmental health effects in children including impaired behavior, learning, and memory as they become adults.

Metals

Metals commonly found in building materials include lead, cadmium, and mercury. Mercury is found in synthetic gypsum board (also known as drywall or wallboard) and can leach into water from landfills, where it comprises about 15% of construction and demolition debris. Mercury is particularly toxic to children, where exposure results in a loss of intelligence and impaired learning, attention and memory. In adults, low levels of mercury exposure over time are linked to diseases similar in nature to Alzheimer's.

Phthalates

Phthalates are a class of chemicals that are used in a wide variety of products as a plastic additive. Phthalates, and specifically Di(2-ethylhexyl) phthalate (DEHP) is used in PVC building materials.

Phthalates are a concern given their potential reproductive and developmental health effects on children, particularly to children exposed in the womb. Exposure to phthalates, and specifically DEHP has been linked to cancer, skeletal malformations, developmental delays, and adverse effects on the male and female reproductive tract.

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INCORPORATED 1851
MICHIGAN

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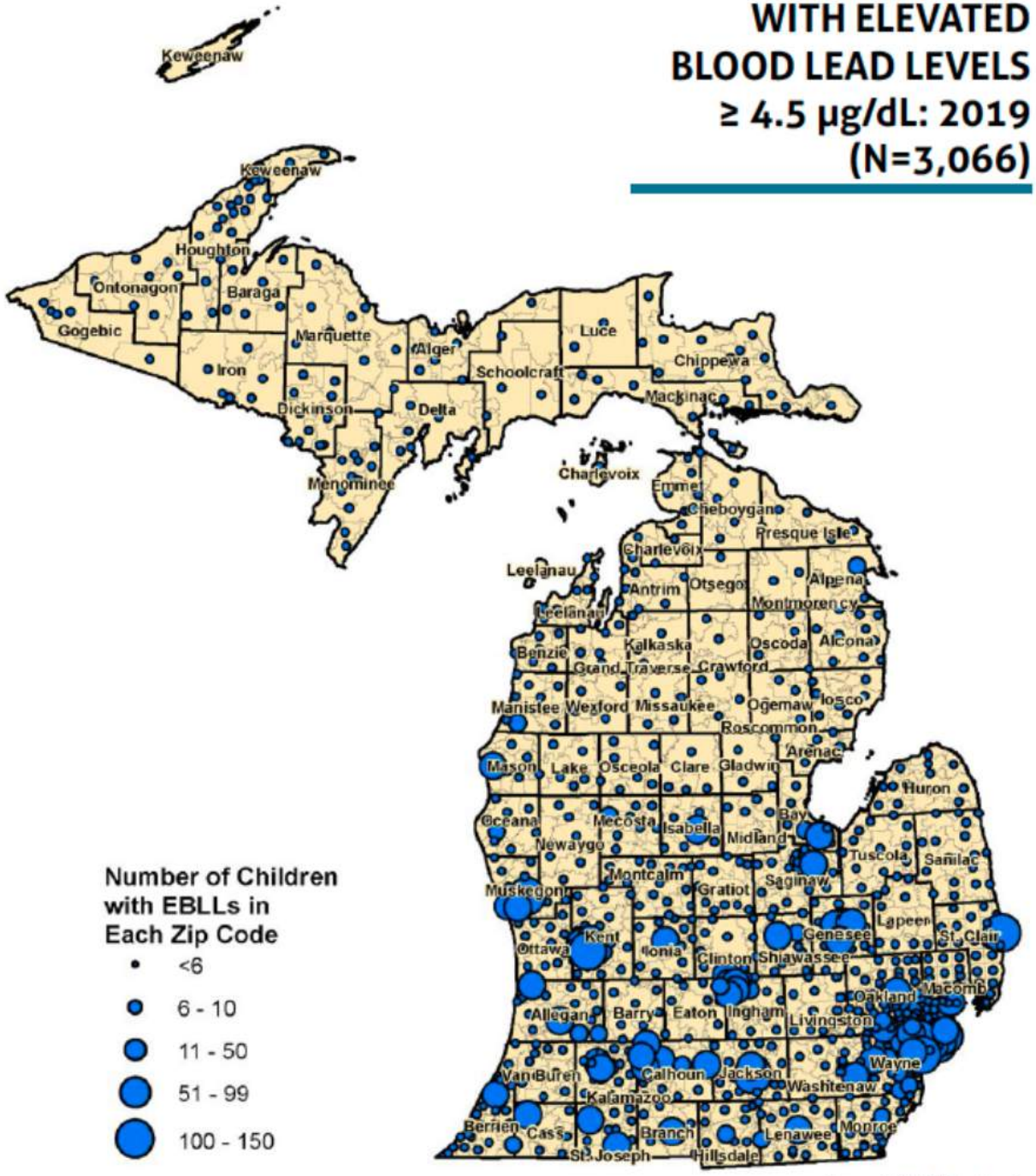
MICHIGAN CHILDREN LESS THAN AGE 6 WITH ELEVATED BLOOD LEAD LEVELS ≥ 4.5 µg/dL: 2019 (N=3,066)



Source: MDHHS Data Warehouse

State Level Policy

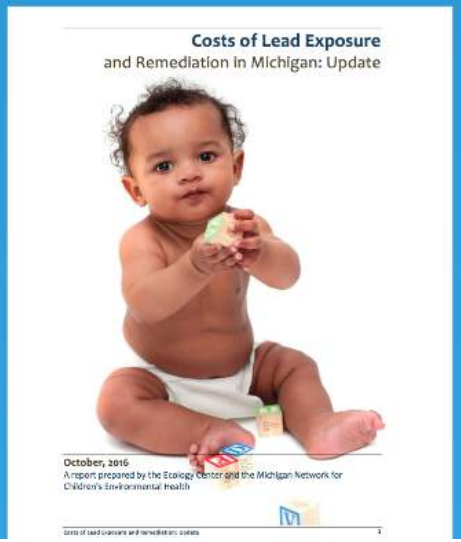
Ending lead poisoning in Michigan

Primary Prevention

1. Lead test of homes at sale or transfer (LIRA + abatement)
2. Filter first policies for lead in School Drinking water

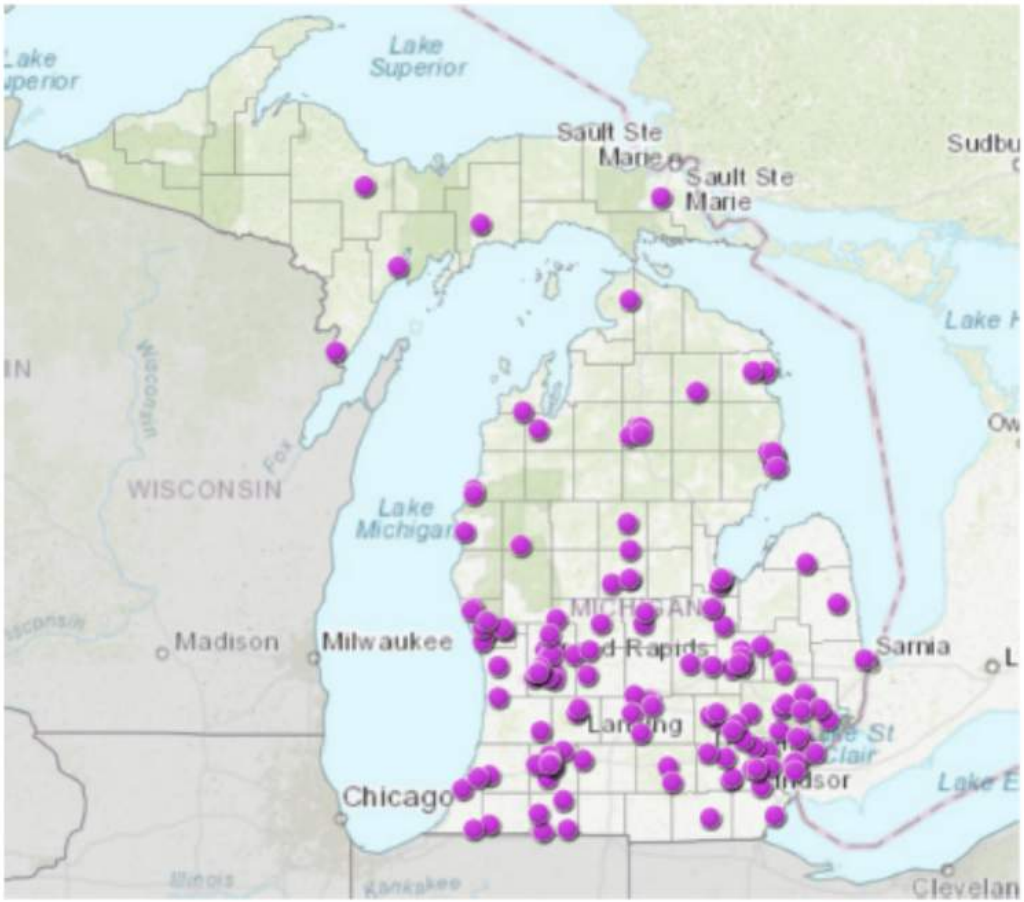
Secondary Prevention

3. Testing ALL 1 & 2 year olds for lead
4. Identifying and remediating lead hazards - funding



Where is PFAS Contamination Found?

- Groundwater contamination sites as of February 16, 2021
- Does not include contaminated surface water



What is Michigan Doing About PFAS?

- Adopted new maximum contaminant level (MCL) standards for PFAS in drinking water
- Started firefighting foam takeback program to collect and dispose of PFAS-containing foams
- Collected 40,000+ gallons; Program ended July 2020

What Else Must Be Done?

- Focus on prevention, not just treatment, by banning PFAS-containing firefighting foams and prohibiting use of PFAS in food contact materials
- Eliminate state purchasing of PFAS-containing products when not essential or safer alternatives exist
- Provide adequate funding for PFAS testing, remediation of contaminated sites, and treatment funds to provide safe drinking water
- Create public database and maps of all known contamination sites along with test results as available
- Establish state medical monitoring and biomonitoring programs, to be paid for by insurance and/or parties responsible for contamination
- Hold polluters accountable for contamination so taxpayers aren't left footing the bill

Thank you!!!

Questions and Discussion

Hospital
Community
Home
Hobbies
Occupation
Personal
Socioeconomic