Addressing environmental threats to children's health still matters

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UCSF

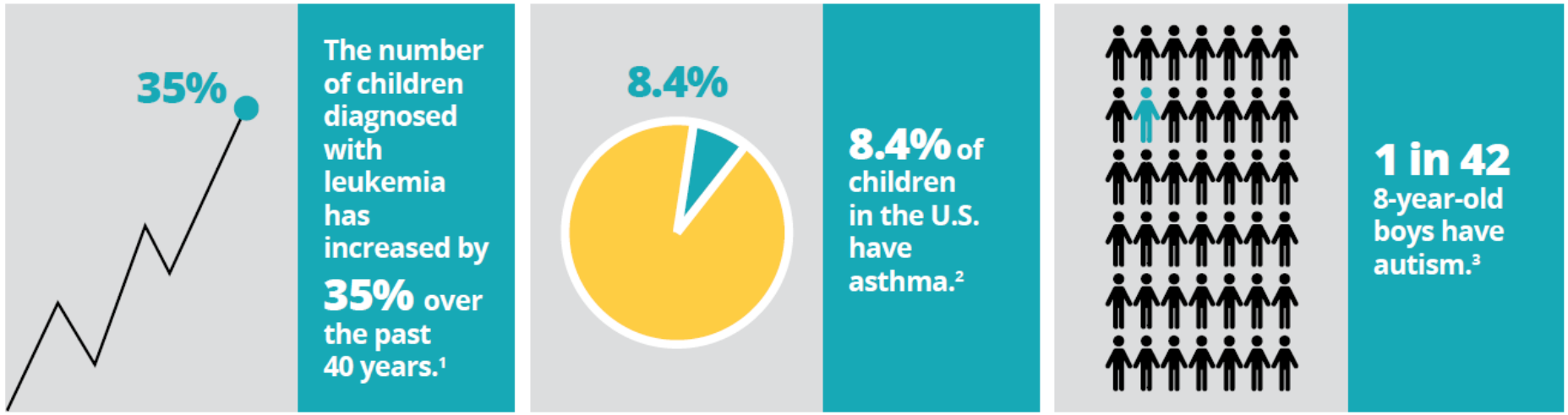
August 1, 2022

Nothing to Declare

Outline

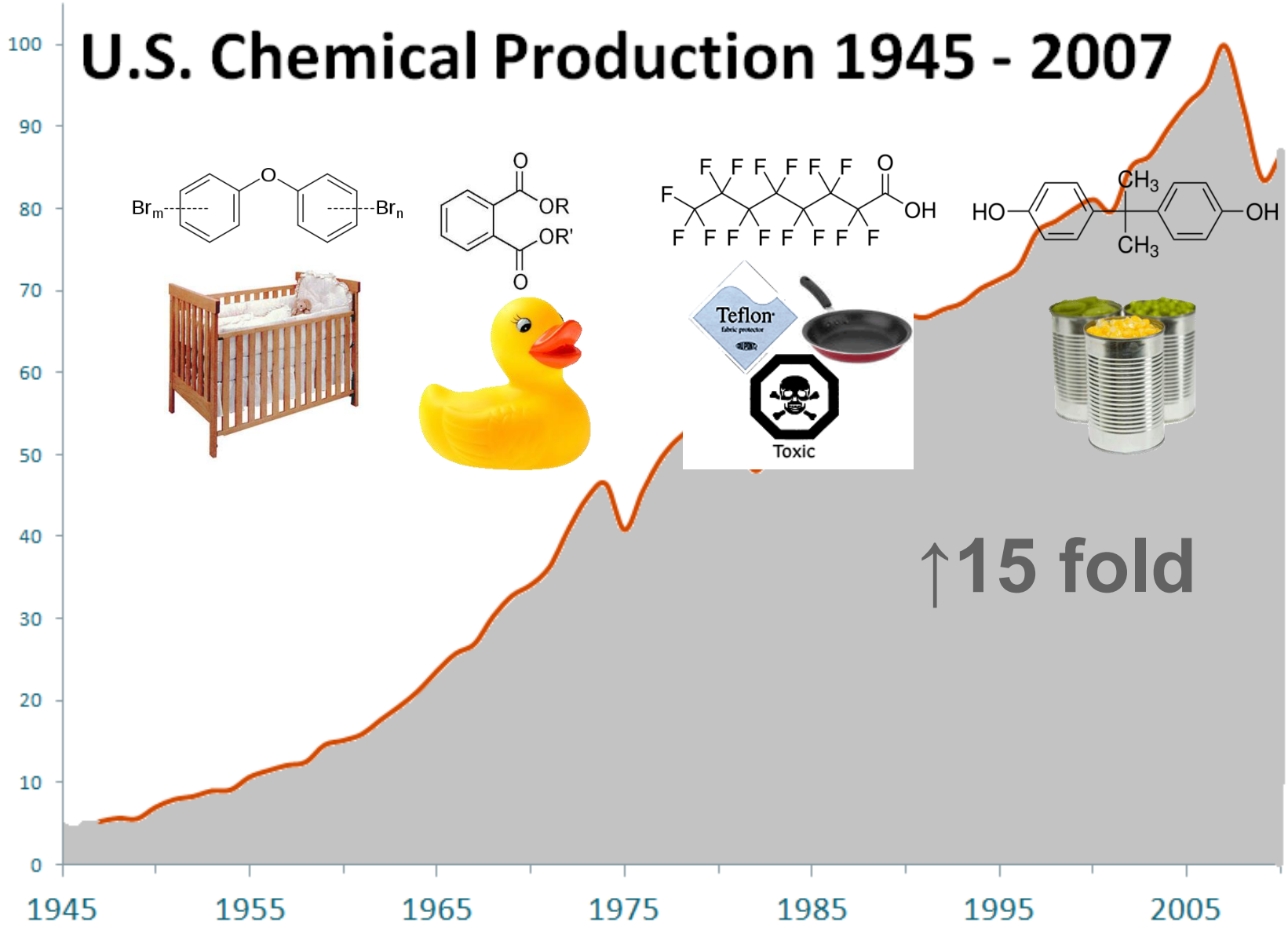
- We have made important progress in addressing environmental influences on children's health
- More progress needed/opportunities
  - Comprehensive approach to addressing chemical exposures
  - Identifying and understanding exposures
  - Addressing developmental risks via systemic change
    - Opportunity via Toxics Substances Control Act
      - Upgrading approaches to use best available science to address children's health risks

Our Children Could Be Healthier



Children in the U.S. are at high risk for chronic disease

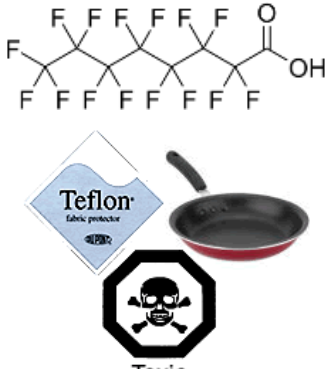
2017Source: NIEHS/EPA Children's Environmental Health and Disease Prevention Research Centers Impact Report



Federal reserve data on chemical production is only offered as relative production, which is unit-less. A specific reference year is chosen and values are calculated relative to that years production. In this particular data set 2007 is the reference year and is assigned a value of 100.

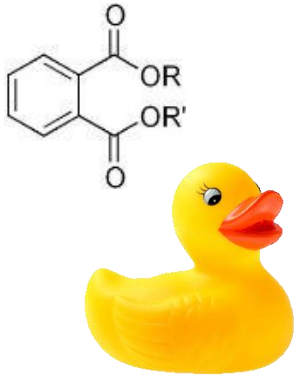
Data from: U.S. Federal Reserve Board, Division of Research and Statistics

~30,000 lbs of industrial chemicals produced for each person in the U.S. each year

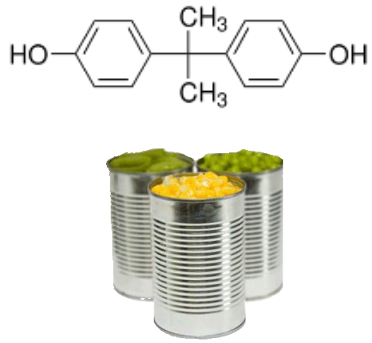


PFAS

Flame Retardants



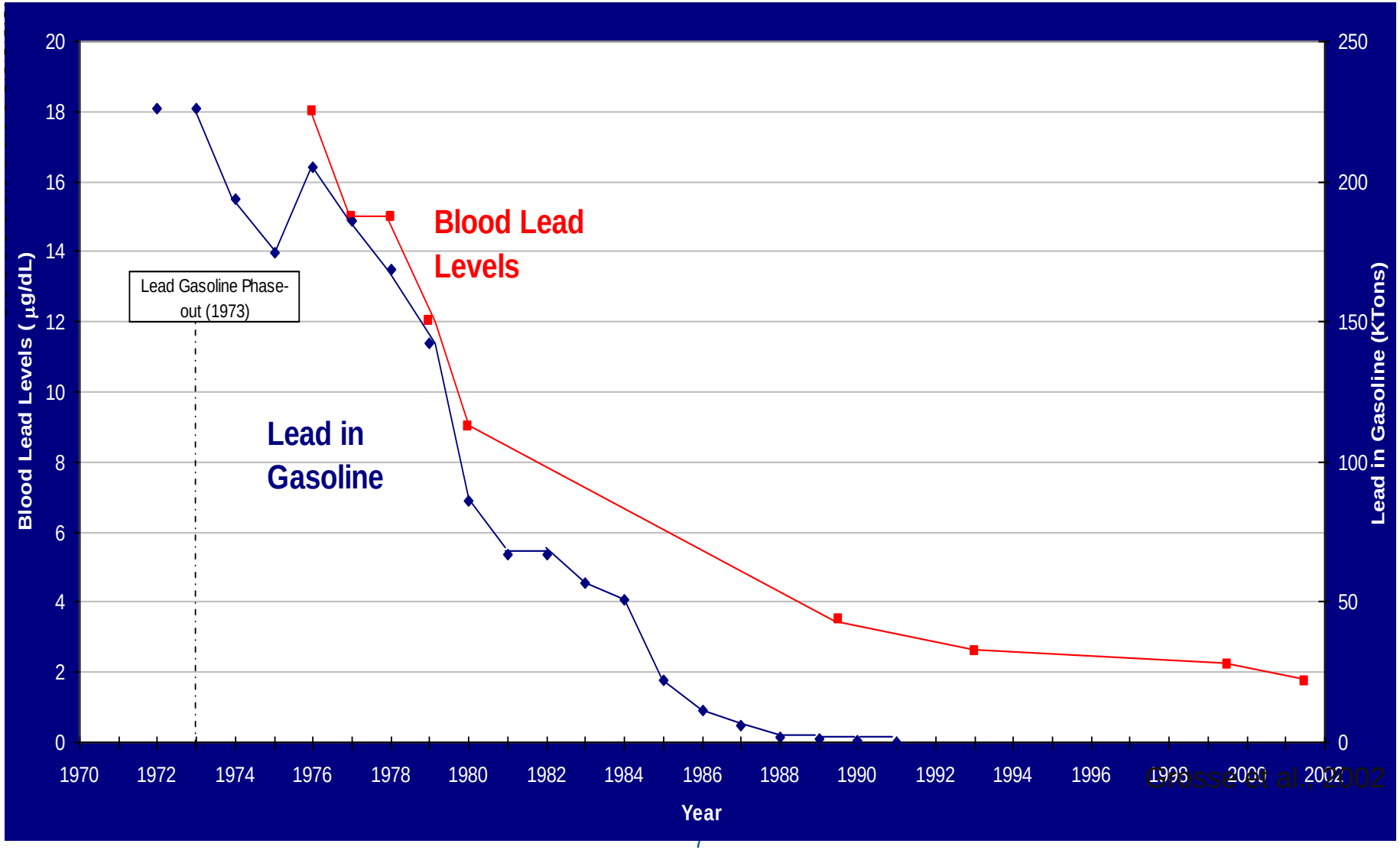
Phthalates



Phenols

EPA Chemical Data Reporting 2015

Systemic changes via public policy can decrease exposures



Grosse et al., 2002

↑ 5-6 points IQ, estimated annual economic gain ↑ $100-300 billion USD

Increased recognition by health care professionals that environmental exposures matter during development and can contribute to health inequities

ACOG
The American College of Obstetricians and Gynecologists

ACOG COMMITTEE OPINION

Number 832 (Replaces Committee Opinion Number 575, October 2013)

Committee on Obstetric Practice

The American College of Nurse-Midwives endorses this document. This Committee Opinion was developed by the Committee on Obstetric Practice in collaboration with liaison member Nathaniel DeNicola, MD, MSc and committee member Ann E. Borders, MD, MSc, MPH, and with the assistance of Veena Singla, PhD and Tracey J. Woodruff, PhD, MPH.

Reducing Prenatal Exposure to Toxic Environmental Agents

ENDOCRINE SOCIETY
Hormone Science to Health

POSITION STATEMENT

ENDOCRINE-DISRUPTING CHEMICALS

POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

International Journal of Gynecology and Obstetrics 131 (2015) 219–225

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www.figo.org

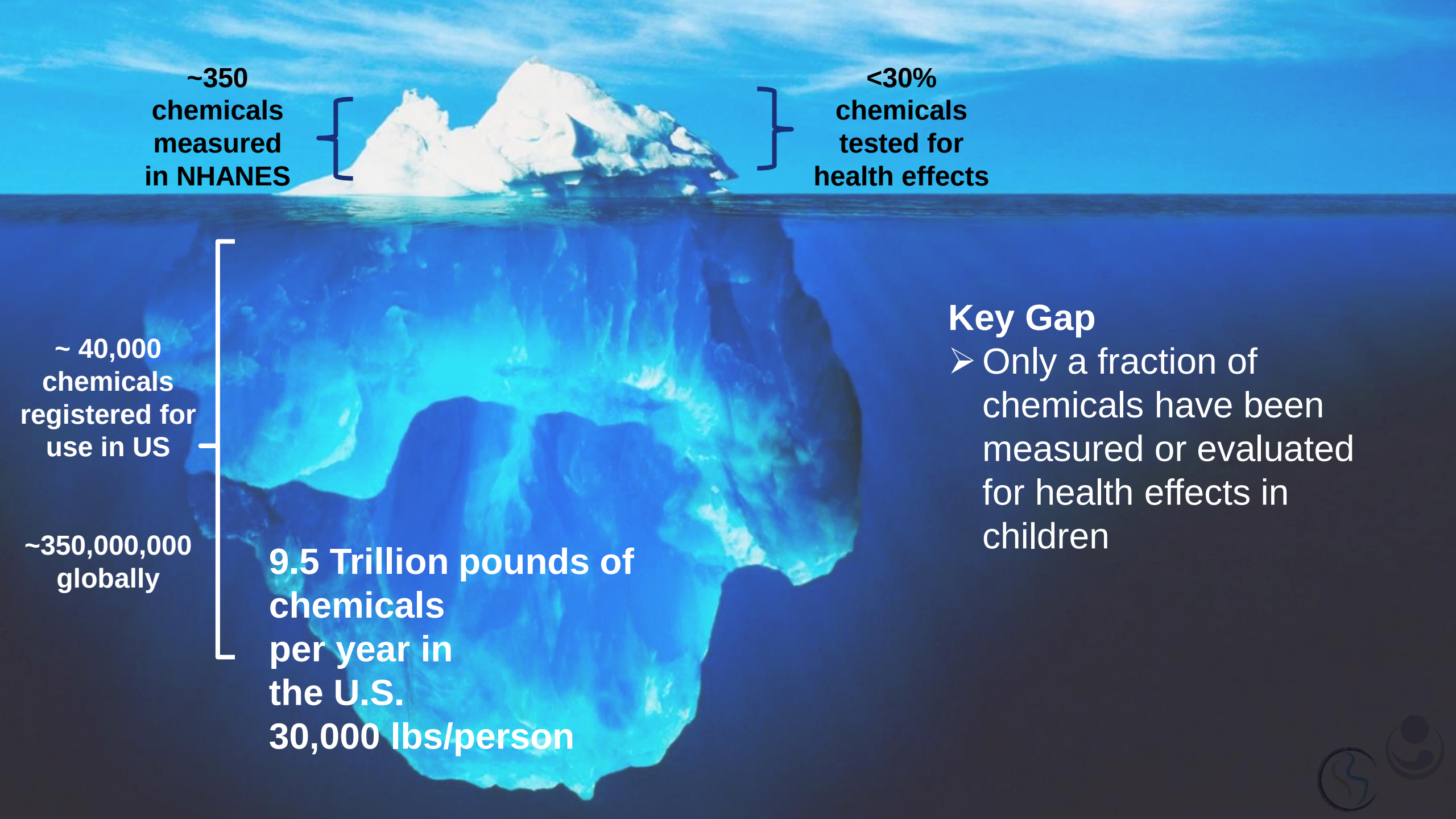
SPECIAL COMMUNICATION

International Federation of Gynecology and Obstetrics opinion on reproductive health impacts of exposure to toxic environmental chemicals☆

Gian Carlo Di Renzo [a], Jeanne A. Conry [b], Jennifer Blake [c], Mark S. DeFrancesco [b], Nathaniel DeNicola [b], James N. Martin Jr. [b], Kelly A. McCue [b], David Richmond [d], Abid Shah [d], Patrice Sutton [e], Tracey J. Woodruff [e,*], Sheryl Ziemin van der Poel [f], Linda C. Giudice [g]

Ambient Air Pollution: Health Hazards to Children

Heather L. Brumberg, MD, MPH, FAAP,[a] Catherine J. Karr, MD, PhD, FAAP,[b] COUNCIL ON ENVIRONMENTAL HEALTH



Key Gap

- Only a fraction of chemicals have been measured or evaluated for health effects in children

Identify ‘new’ chemicals for biomonitoring not well covered in ECHO or existing studies (NHANES)

Review

A Section 508–conformant HTML version of this article is available at https://doi.org/10.1289/EHP5133.

Identifying and Prioritizing Chemicals with Uncertain Burden of Exposure: Opportunities for Biomonitoring and Health-Related Research

Edo D. Pellizzari,[1] Tracey J. Woodruff,[2] Rebecca R. Boyles,[3] Kurunthachalam Kannan,[4] Paloma I. Beamer,[5] Jessie P. Buckley,[6] Wang,[2] Yeyi Zhu,[7,8] and Deborah H. Bennett[9] (Environmental influences on Child Health Outcomes)

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Background: The National Institutes of Health’s Environmental influences on Child Health Outcomes (ECHO) initiative aims to understand the impact of environmental factors on childhood disease. Over 40,000 chemicals are approved for commercial use. The challenge is to prioritize chemicals for biomonitoring that may present health risk concerns.

Objectives: Our aim was to prioritize chemicals that may elicit child health effects of interest to ECHO but that have not been biomonitored nationwide and to identify gaps needing additional research.

Methods: We searched databases and the literature for chemicals in environmental media and in consumer products that were potentially toxic. We selected chemicals that were not measured in the National Health and Nutrition Examination Survey. From over 700 chemicals, we chose 155 chemicals and created eight chemical panels. For each chemical, we compiled biomonitoring and toxicity data, U.S. Environmental Protection Agency exposure predictions, and annual production usage. We also applied predictive modeling to estimate toxicity. Using these data, we recommended

THE HILL

POLICY

Pregnant women increasingly exposed to chemicals that could harm development: study

BY SHARON UDASIN - 05/10/22 12:01 AM ET

Pregnant women are incurring increasing exposure to an array of toxic chemicals that may be harmful to fetal development, a new study has found.

Many of these substances are so-called "replacement chemicals" — new forms of compounds that have been banned or phased out, but that may be just as injurious as the ones they replaced, according to the study, published on Tuesday in Environmental Science & Technology.

ECHO
Environmental influences on Child Health Outcomes
A program supported by the NIH

Program on Reproductive Health and the Environment
University of California, San Francisco

UCSF

Long-term Study of Pregnant Women Finds Increasing Chemical Exposure

MAY 10, 2022 ~ PRHE

A national study that enrolled a highly diverse group of pregnant women over 12 years found rising exposure to chemicals from plastics and pesticides that may be harmful to development.

Environmental Science & Technology

pubs.acs.org/est Article

Exposure to Contemporary and Emerging Chemicals in Commerce among Pregnant Women in the United States: The Environmental influences on Child Health Outcome (ECHO) Program

Jessie P. Buckley, Jordan R. Kuiper, Deborah H. Bennett, Emily S. Barrett, Tracy Bastain, Carrie V. Breton, Sridhar Chinthakindi, Anne L. Dunlop, Shohreh F. Farzan, Julie B. Herbstman, Margaret R. Karagas, Carmen J. Marsit, John D. Meeker, Rachel Morello-Frosch, Thomas G. O'Connor, Megan E. Romano, Susan Schantz, Rebecca J. Schmidt, Deborah J. Watkins, Hongkai Zhu, Edo D. Pellizzari, Kurunthachalam Kannan, and Tracey J. Woodruff*

45 chemicals detected in ≥50% of pregnancy urine samples

Benzophenones & Parabens (6)

Bisphenols (2)

Phthalates, Terephthalates, and phthalate alternatives (18)

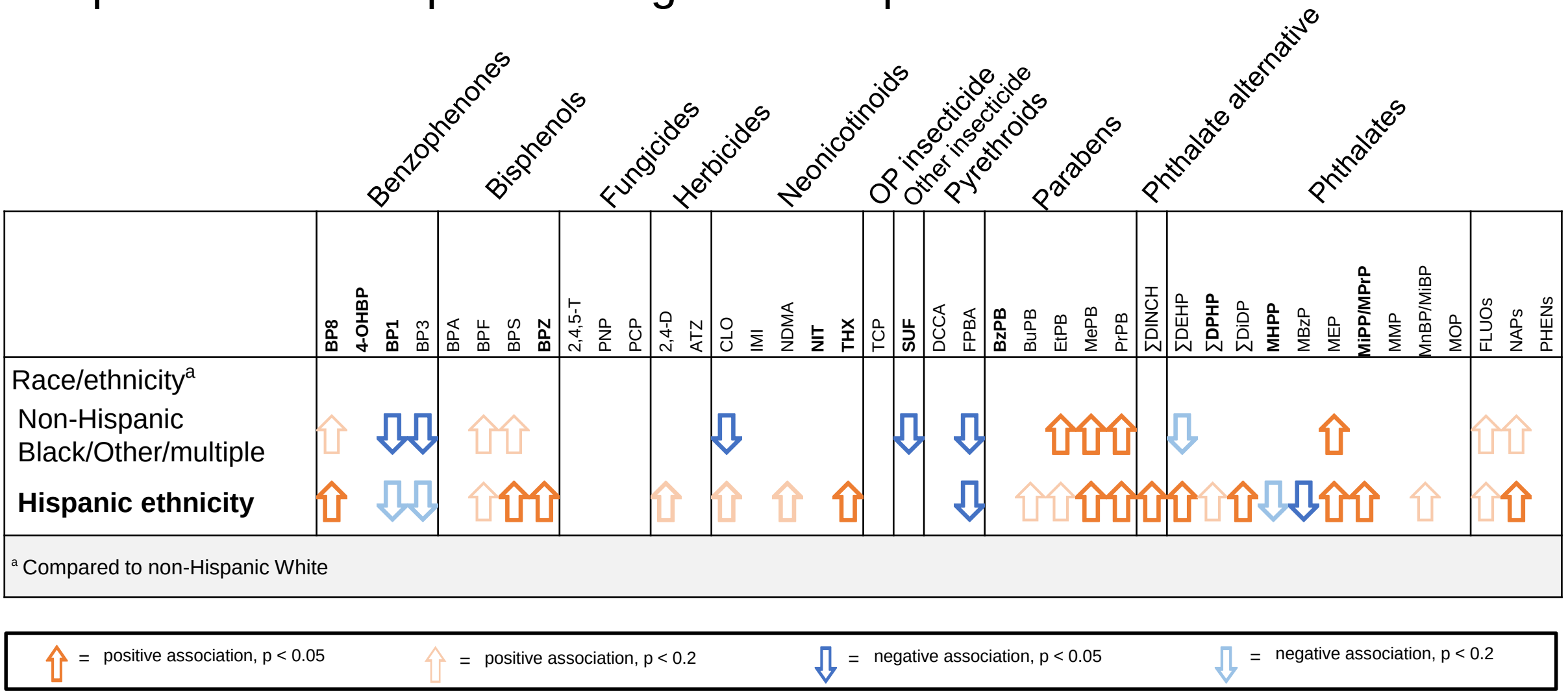
Fungicides and Herbicides (4)

Neonicotinoid insecticides (2)
Organophosphate insecticide (1)

Newer Flame Retardants (2)

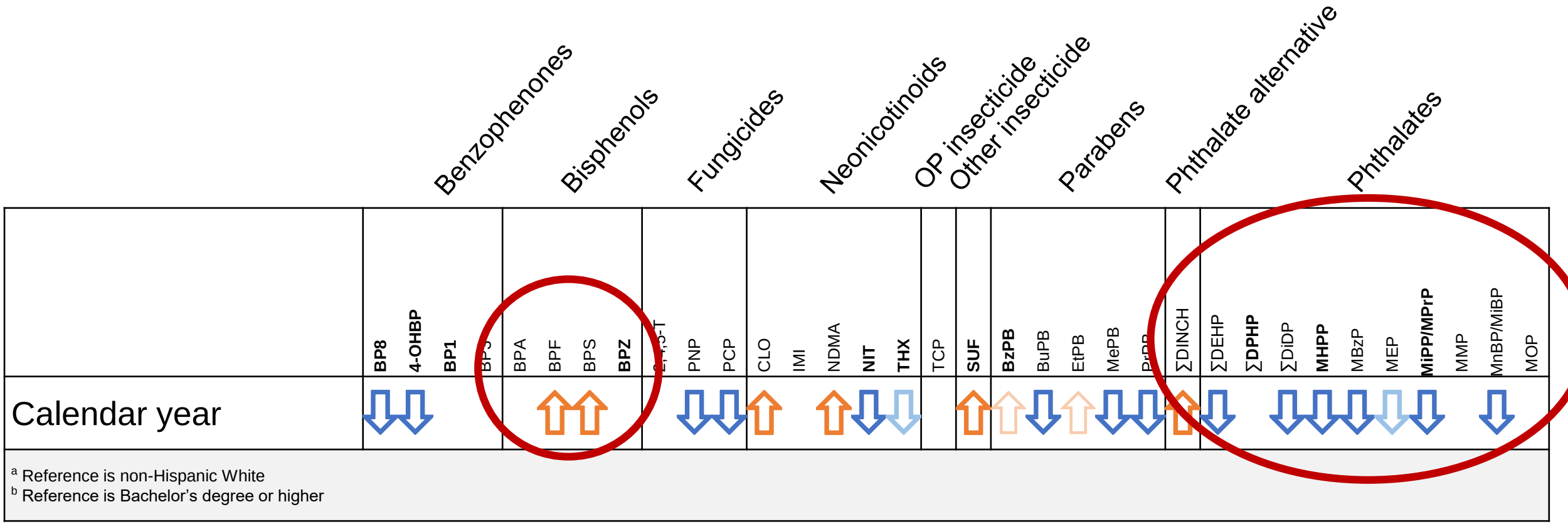
Polycyclic aromatic hydrocarbons (10)

Multiple chemical exposures higher in Hispanic women



Potential increasing levels of chemicals that are replacements for chemicals of concern

BPF, BPS increasing – potential replacements for BPA
DINCH increasing – potential replacement for phthalates like DEHP and DBP



Developmental susceptibility in public policy

- Toxic Substances Control Act
  - Amended in 2016 - Primary authority in U.S. regulating non-pesticide chemicals in commerce
  - Opportunity to address developmental susceptibility

Toxic Substances Control Act

Under amended TSCA, EPA is mandated to:

> determine whether a chemical substance presents an **unreasonable risk** of injury … to a potentially exposed or **susceptible subpopulation**…§2605(b)(4)(A)

Potentially exposed or susceptible subpopulation is defined as:

> a group of individuals within the general population identified by the Administrator who, due to either greater susceptibility or greater exposure, **may be at greater risk** than the general population of adverse health effects from exposure to a chemical substance or mixture, **such as infants, children, pregnant women,** workers, or the elderly. §2602(12)

EPA can address developmental susceptibilities under TSCA

EPA is required to:

- Evaluate higher exposures that can occur to children
- Can evaluate higher susceptibility due to developmental stage
- EPA can require data to better document exposures/susceptibilities
- Opportunity still being realized

1-Bromopropane

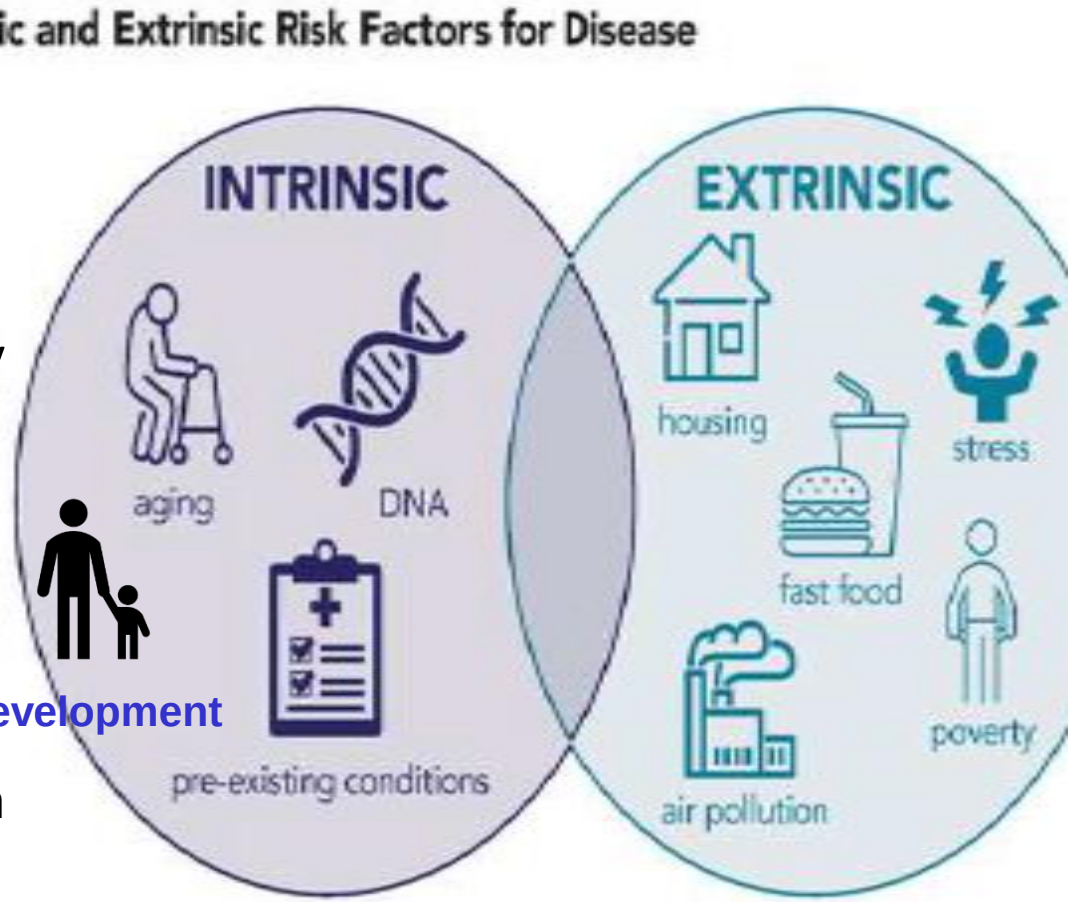
- *Dry-cleaning solvent, also used as degreaser, spot remover etc*
  - Widespread use, annual 2007 emissions of 20,000- 30,000 metric tons
  -
- *EPA Risk Assessment*
- *Did not fully account for children's increase health susceptibility*
- *Identified single exposure to this dry-cleaning chemical during critical window of fetal development may be sufficient to produce adverse developmental effects.*
- *But - it "did not calculate risk for children associated with acute exposure at dry cleaners because the acute health domains (developmental effects) are not applicable to children."*

- *Did not calculate risks for chronic exposure for children at dry cleaners because*
  - *"EPA believes exposure to children at workplaces are unlikely to be chronic in nature."*
  - *This assumes exposures to children happen only in a four-hour period after school*

Human variability

- Typical EPA assessment of population risks include a 10x adjustment to account for human population variability
  - Variability is due to multiple factors including – genetics, pre-existing conditions, developmental stage, psychosocial stress
  - NAS concluded 10x does not account for full range of variability

- Food Quality Protection Act requires an additional adjustment factor for age-related susceptibility
- TSCA does not
  - Opportunity to look to other authoritative bodies that have upgraded adjustment factors
  - California Office of Environmental Health Hazard Assessment has increased adjustment factor from 10 to 30 primarily based on age-specific differences in chemical metabolism (between children and adults).
  - Other data indicate greater differences in susceptibility
    - E.g. cancer



Conclusions

- Newer exposure data find multiple chemical exposures, some of which appear to be increasing, can adversely influence children's health
  - Policies need to comprehensively reduce chemical exposures without leading to other toxic exposures
- Public policy has capacity to address children's health – but need to switch paradigm to put onus on those that financially benefit pay for cost of testing prior to use/stay on market
- But best available science is needed to upgrade approaches
  - Need to move upstream and use early indicators of harm and animal/in vitro systems to identify



Thank you!

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