Endocrine Disrupting Chemicals and Women's Health Symposium

A Virtual Symposium

July 18–19, 2023

9am–4pm ET

OASH | Office on Women's Health

Welcome

Admiral Rachel L. Levine, MD
Admiral, U.S. Public Health Service
Assistant Secretary for Health
U.S. Department of Health and Human Services

Successful Interventions To Ameliorate the Impact of EDCs

Linda Giudice, M.D., Ph.D.

Moderated by LT Abayomi Walker

Successful Interventions to Ameliorate the Impact of EDCs

Linda Giudice, M.D., Ph.D.

Distinguished Professor of Obstetrics, Gynecology and Reproductive Sciences

University of California, San Francisco

Successful Interventions to Ameliorate the Impact of EDCs

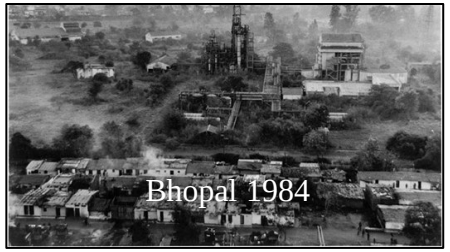
Linda C. Giudice, MD, PhD
Distinguished Professor
Founder UCSF Program on Reproductive Health and the Environment
University of California San Francisco
Past Chair, FIGO Committee on Climate Change and Toxic Environmental Exposures

No disclosures

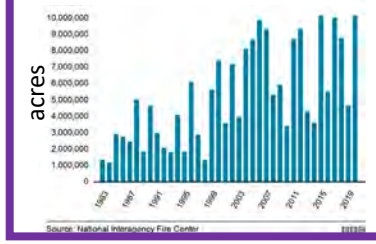
Endocrine Disrupting Chemicals and Women's Health Symposium
Office of Women's Health
U.S. Department of Health and Human Services
July 18-19, 2023

Why Am I Giving This Presentation?

- As a physician in reproductive medicine
- As a concerned citizen of the world



U.S. Land burned by fires
1983-2020

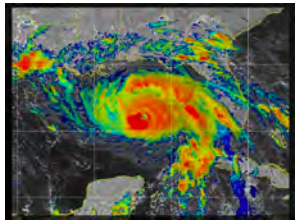


Brazil severe fires
2020

Severe fires Europe, China
U.S., other 2021

Massive flooding UK, Europe,
China, Amazon 2021

Hurricanes
IR map Ida Aug 28 2021



Objectives

- Identify EDC exposures and who is at risk for impaired health outcomes
- Understand models of evidence of harm and challenges to getting evidence about interventions to ameliorate EDC impacts
- Learn about evidence showing interventions successfully ameliorate the impact of EDCs

Exposures to EDCs

The backbone of intervention strategies

Environmental and Occupational

General Population:

- Diet (food, drink)
- Personal care products (BPA)
- Cosmetics (phthalates)
- Plastics (phthalates, BPA)
- Textiles
- Construction materials
- e-waste (Br, Cl flame retardants)
- Digital receipts
- Pesticides – home use, food
- Air pollution – O_3, PM, Pb, diesel
- Household
  - dust/furniture (PBDEs, CH_2O)
  - Cleaning products

Occupational Exposures:

- Pesticides (agricultural workers)
- Phthalates, benzophenones, parabens, siloxanes (cosmetologists, hair dressers, nailists)
- Organic solvents/alkyl phenols (agricultural workers, life science technicians)
- Phthalates, drugs (health care workers)
- Many others…..

– Common: Every person in U.S. has contaminants, mixtures are the rule, babies are born “pre-polluted”

Some differences: doses, duration of exposures, methodologies to evaluate exposures, measurements, race/ethnicity, SES

Woodruff TJ, et al, Environ Health Perspect 2011;119:878–885; US DHHS. President’s Cancer Panel 2008–2009 Annual Report. Available at: https://deainfo.nci.nih.gov/advisory/pcp/annualreports/pcp08-09rpt/pcp_report_08-09_508.pdf; Birnbaum LS Trends Endocrinol Metab 2013;.24:321-323

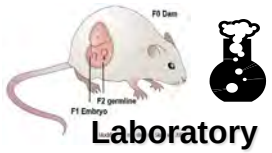
Who is at risk?

- ***Everybody* but some more than others**
  - **Most vulnerable**:
    - children
    - pregnant persons
    - the elderly
    - those with chronic diseases
    - marginalized populations
    - low sociodemographic status
    - workers in hazardous jobs

How do we know when and how EDCs increase risk of adverse health outcomes?

The Scientific Evidence

- **Animal and *in vitro* human cell models** – mechanisms
- **Epidemiologic studies** reveal data ***correlating*** environmental exposures and human health outcomes.
- **Navigation Guide** (bridging clinical and environmental health)
- **Mixture risk assessment** (MRA statistical modeling)
- **Job exposure matrices (JEM)** (occupational health intersection)
- **Systematic reviews, scoping reviews, meta-analyses**
- **Wildlife** observations



Laboratory


Humans

Modeling/informatics


Wildlife

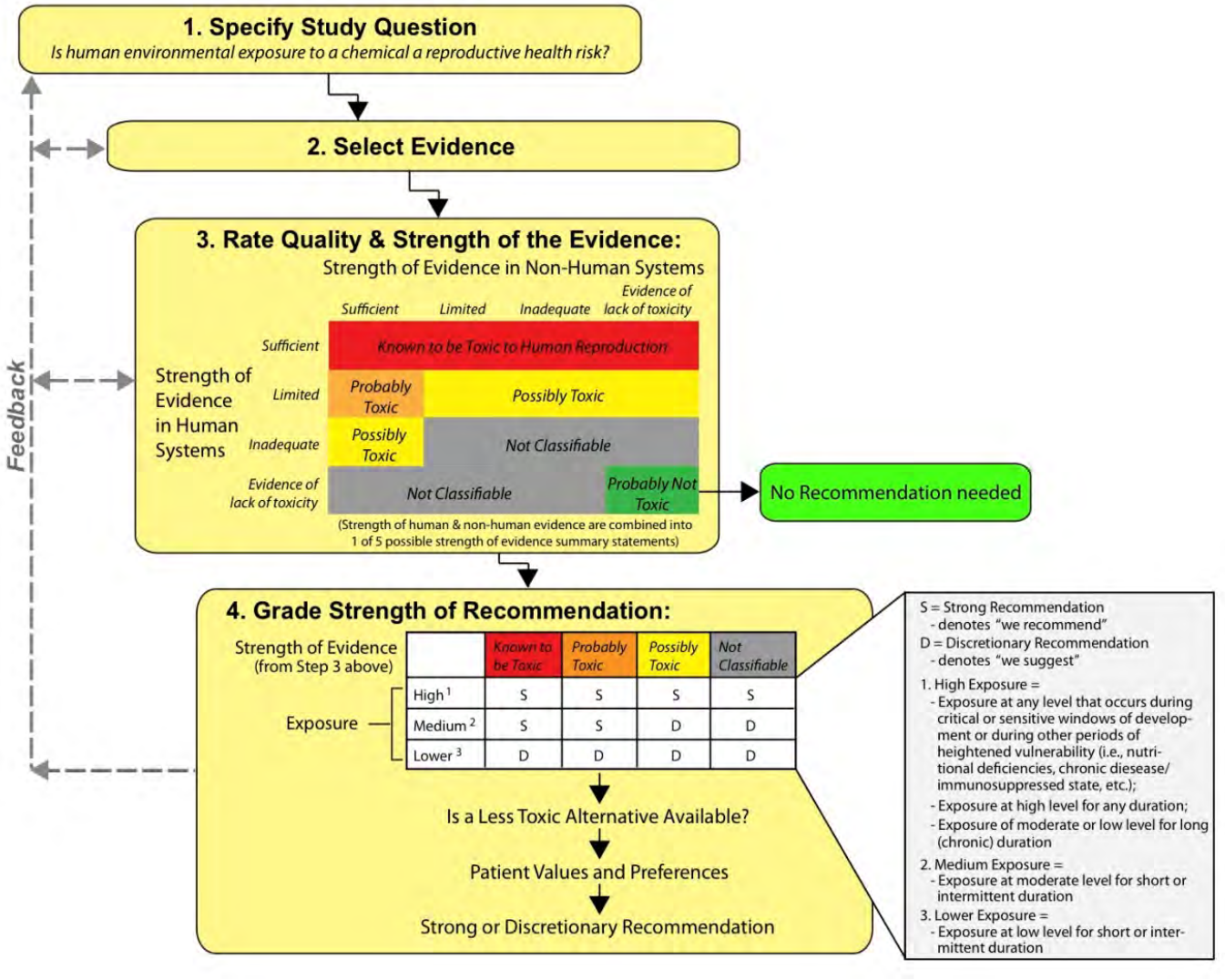
How to Bridge Clinical and Environmental Health?

THE COCHRANE COLLABORATION®

Organizes research findings and facilitates evidence-based interventions involving health professionals, patients and policy makers.

GRADE

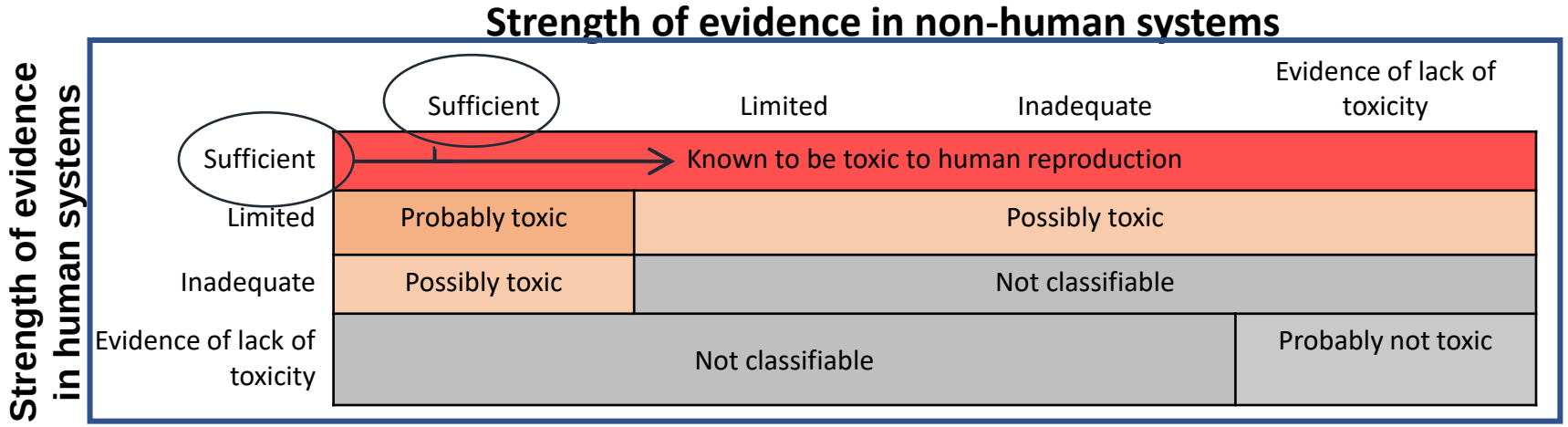
Systematic approach to rate certainty of evidence in systematic reviews and other evidence syntheses



The Navigation Guide: A rulebook for "moving from knowing to doing"
Woodruff and Sutton Environ Health Perspect 2009, 2014

Evidence integration - an example of PFOAs and IUGR

Woodruff TJ, et al. Health Aff (Millwood) 2011;30:931–937.



***Conclusion*: Human exposure to *PFOA is known to be toxic* to human reproduction and development based on sufficient evidence of decreased fetal growth in both human and non-human mammalian species.**

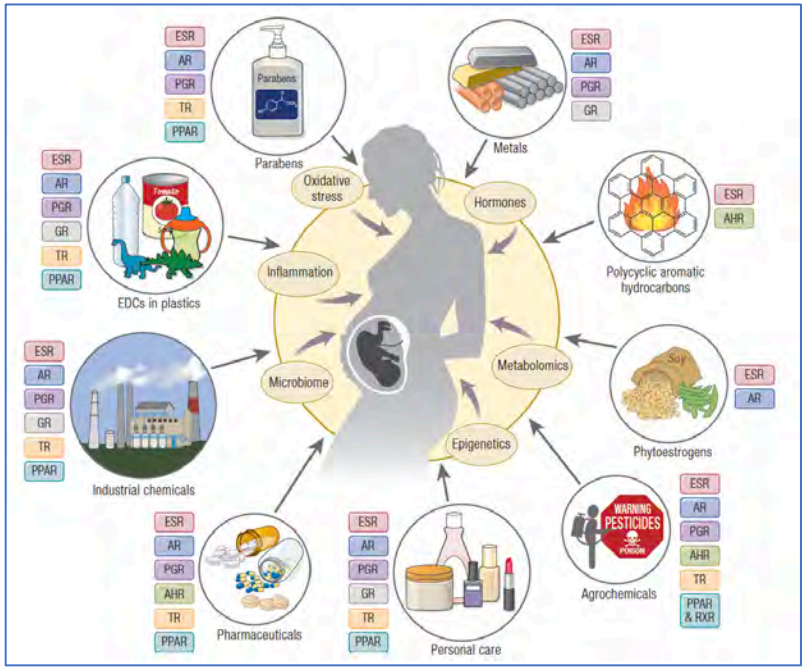
The Navigation Guide, Cochrane and GRADE have been acclaimed as exemplary approaches for transparency, rigor, and reproducibility by the National Academy of Medicine.

NRC. Review of EPAs Integrated Risk Information System (IRIS) Process. Washington, DC: National Academies Press, 2014

Labor and time intensive and expensive, one by one approach

Challenges to Intervention Strategies
A Case Study: Pregnancy

Humans are exposed to multiple chemicals of different classes with similar or differing signaling mechanisms that can lead to synergistic, additive, antagonistic or no effect on physiologic outcomes



Padmanabhan et al. Endocr Reviews 2021;42:295-353

Challenges in Risk Assessment, Data Interpretation, and Quality Evidence for Intervention Strategies: *Pregnancy*

- What to sample? (maternal urine, plasma/serum, placenta, cord blood, amniotic fluid)
- Most studies sample at a single gestational time point
- Inconsistent attention to:
  - Fetal organ-specific differences in susceptibility windows across gestation
  - fetal sex can modulate EDC effects
  - confounders (ethnicity, age, diet, pre-pregnancy weight, weight gain, lifestyle factors)
  - mixtures
- Some cohorts now following the children longitudinally
- Less focus on correlations and subsequent maternal morbidities (e.g., T2D, CVD)

Padmanabhan et al. Endo Reviews 2021;42:295-353

Mixture Risk Assessment (MRA)

Maternal exposures to ***same chemical class*** (e.g., phthalates) or **same mechanism of action** (e.g., xenoestrogens). *Padmanabhan et al. Endo Reviews 2021;42:295-353*

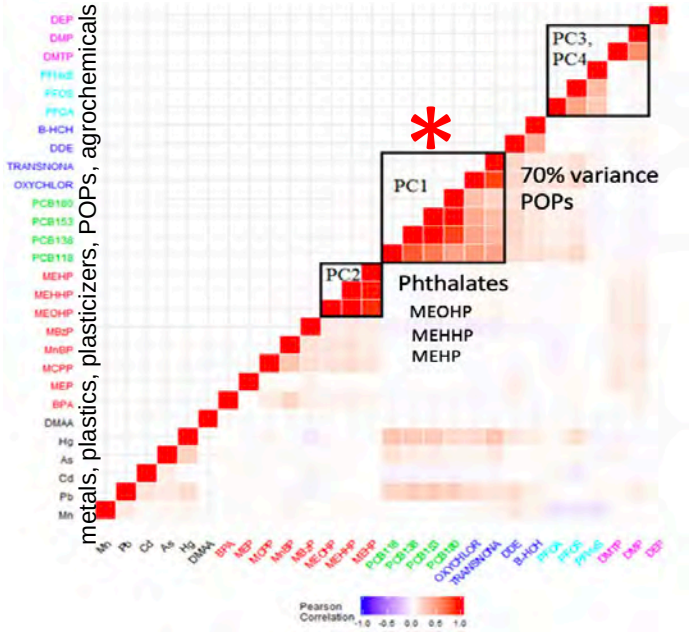
- 1st Δ maternal serum POPs = weak association with LBW; as a class (OC pesticides, PBDE, PCB mix)→ **strong associations**.

Exposures to **Mixtures of Different EDC Classes** Assessed by **Statistical Modeling**

Lee et al. Identification of chemical mixtures to which Canadian pregnant women are exposed: The MIREC Study. Environ Intl 2017;99:321-330.

- 50 chemicals, **divergent characteristics and dis/similar modes of action** in maternal & fetal samples
- **statistical modeling, clustering and PCA** to understand impact of complex chemical mixtures, between/among chemicals, geographic locations, SDS
    - **PC1 associated with lower SDS, BMI>25***

Heat Map of Pearson Correlation Matrix of 28 Chemicals



Challenges:

- Current regulatory guidelines of allowable concentrations of environmental EDCs were developed on chemical-by-chemical basis.
- Statistical modeling needs standardization as several inputs with increased rigor including biomonitoring approaches .

Job Exposure Matrix Hx, Methodology, Exposure Scores

2002: Occupational exposure to EDCs and risk of hypospadias and cryptorchidism in UK.
2009 Brouwers updated → basis for emerging JEMs

- **353 Job classifications identified** (UK Standard Occupational Classification 2000 (SOC2000))
- **Exposure risk scores**: 0-9 (no, low, medium, high exposure levels)
- **Scoring chemical categories, subcategories and occupational setting** –from environmental health literature, agencies, WHO *Global Assessment and State of the Science on EDCs*.
- **Result: 10 Chemical groups** (& 33 subgroups)

Job Exposure Matrix 5 Different Job Titles

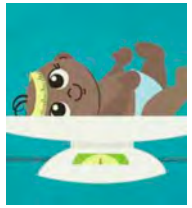
SOC2000 job title	Exposure Score	Chemical Group
Senior govt officials	0	-
Electrical workers	1	Metals
Glass ceramic makers Decorators	2	Organic solvents Metals
Beauticians/related occupations	2	Phthalates Organic solvents Alkylphenolics
Chemical processors	9	Multiple

Challenges: Differences in exposures over time; +/- task-specific information (questionnaires, interviews) to minimize job misclassification; Biomonitoring data; methodologies for evaluating

Van Tongeren et al. Annals Occup Hygeine 2002;;46:465-477;Brouwers et al. Occup Environ Med 2009;66_607-614.

Occupational Exposure to EDCs and Birth Weight and Length of Gestation

A European Meta-analysis



Study:

- N=133,957 mother-child pairs in 13 European cohorts; births 1994 - 2011
- Maternal job titles were linked with exposure to 10 EDC groups assigned in a JEM.
- Birth outcomes were correlated with exposure categories (0,1,2,3,9); meta-analysis of cohort-specific estimates.

Results:

- 11% of pregnant persons were exposed to EDCs at work in pregnancy based on job title
- **Exposure to ≥1 EDCs** was associated with **increased risk of term LBW** (OR 1.25; 95% CI 1.04-1.49)
- **Risk increased** with exposures to **increasing # of EDC gr**oups: OR 2.11; 95% CI: 1.10-4.06 (>4 EDCs)
- **Highest risk jobs**: **agricultural workers, house cleaners, hairdressers, medical assistants**
- **Data were consistent across all cohorts**

Conclusion: employment during pregnancy in occupations classified as possibly or probably exposed to EDCs was associated with an increased risk of term LBW.

Birks et al. Environm Health Persp 2016; 124:1785-1793

Intervention Studies to Ameliorate EDC Effects

- Animal
  - epigenetic modifiers to rescue phenotypes
- Human:
  - Individual level
  - Policy changes
  - Entrepreneurial opportunities (“safer alternatives”)
- Education
- Advocacy

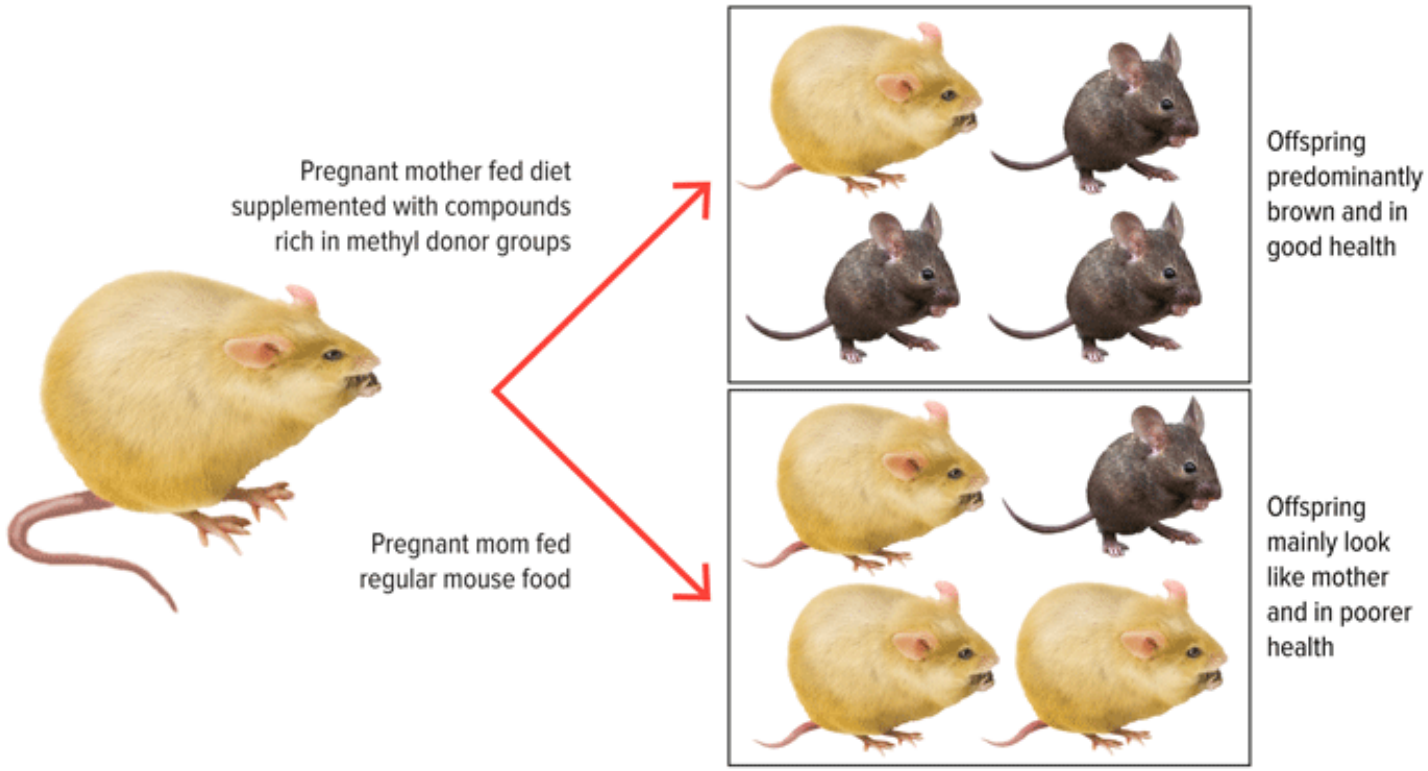
What is the evidence that interventions will impact EDC levels?

What is the evidence that interventions will improve health?

Agouti Mouse Model Shows Maternal Diet and BPA Influence Fetal Development that Intervention Reverses

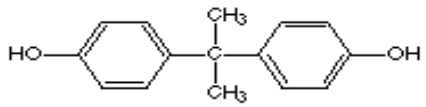
Genetically identical mice but different color (brown, yellow) and size Agouti gene product binds to melanocortin R blocking black pigment and is involved in feeding behavior and weight set point

Normal healthy mice – agouti gene is methylated and is off.
Yellow, obese sisters – agouti gene is unmethylated and is on.

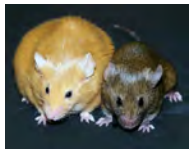


(Dolinoey 2007, Zeisel 2009)

Estrogen-like EDCs in Pregnant Dams Trigger the Agouti Phenotype in Pups and Me Donors Rescue the Phenotype



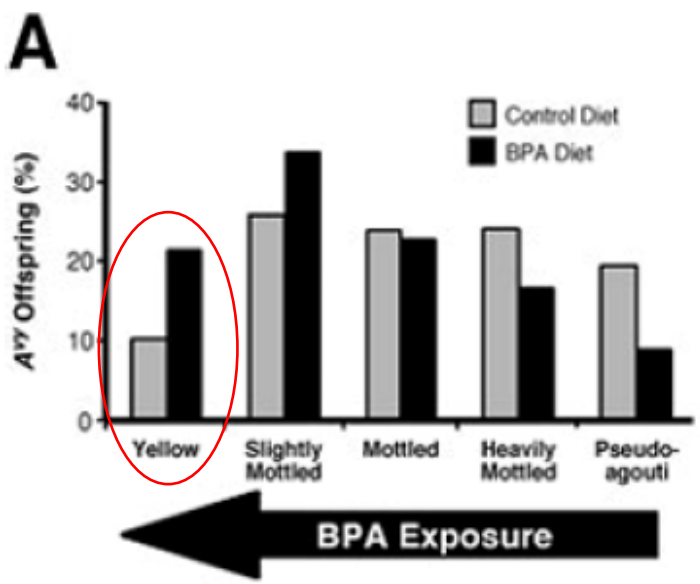
Bisphenol A

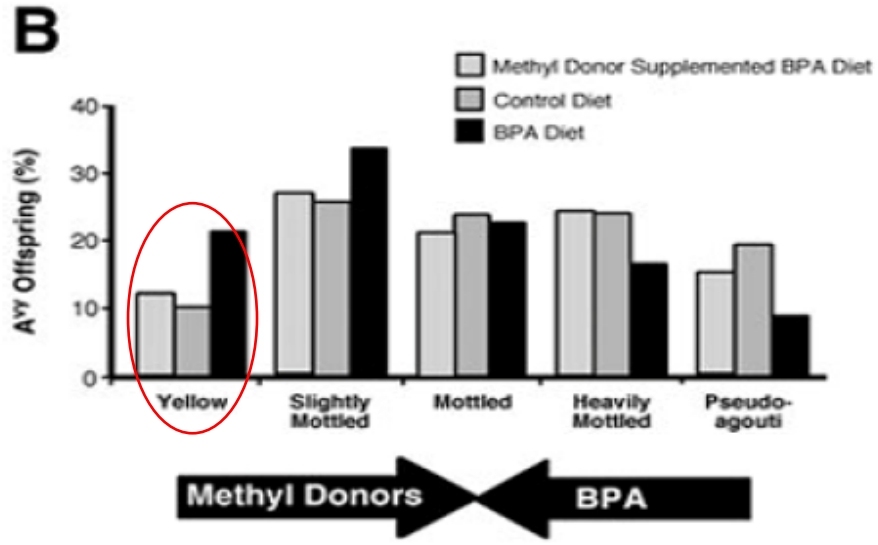


Environmental “protection”
Folic acid and Vitamin B12
rescue the phenotype

- higher ratio of yellow, obese progeny than expected
- global DNA hypomethylation
- 30% agouti gene DNA me sites

- increased DNA methylation
- normal ratio of pups



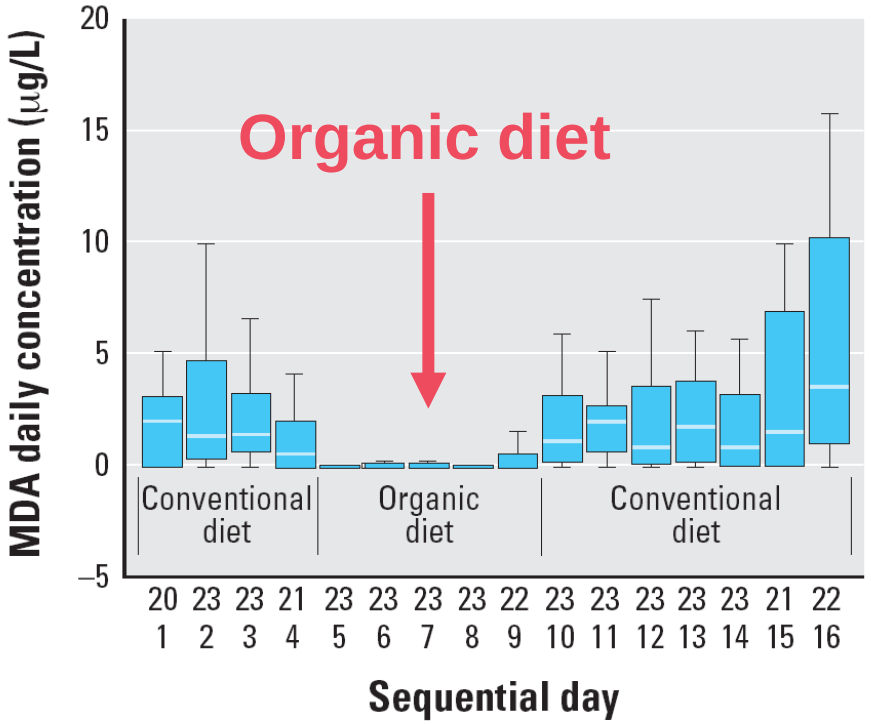


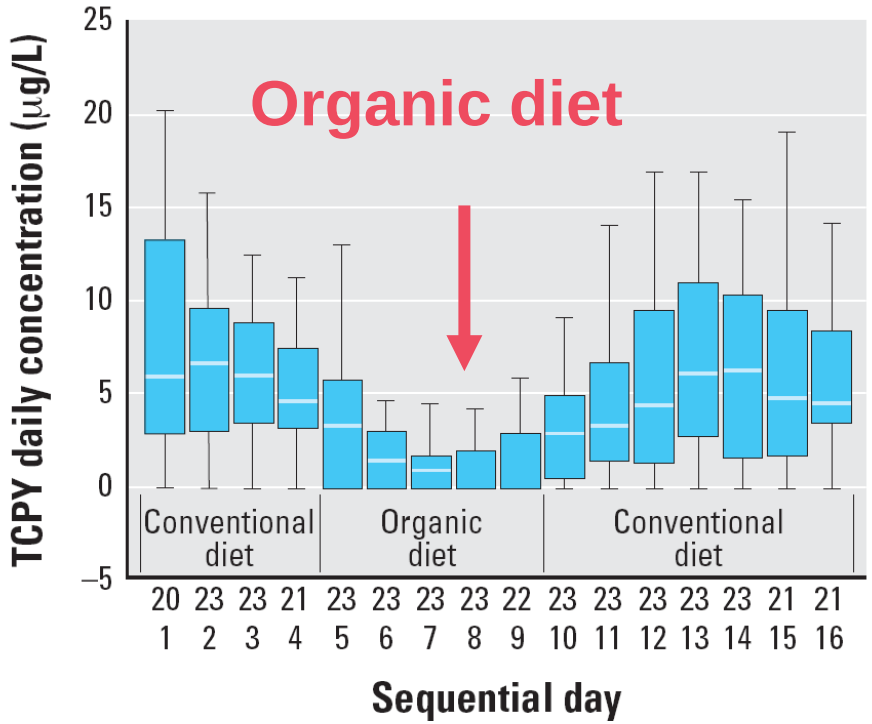
(Dolinoey 2008)

Interventional Studies Humans

- Diet
- Personal Care Products
- Household Products

Dietary Interventions in Children Can Reduce EDC Exposure





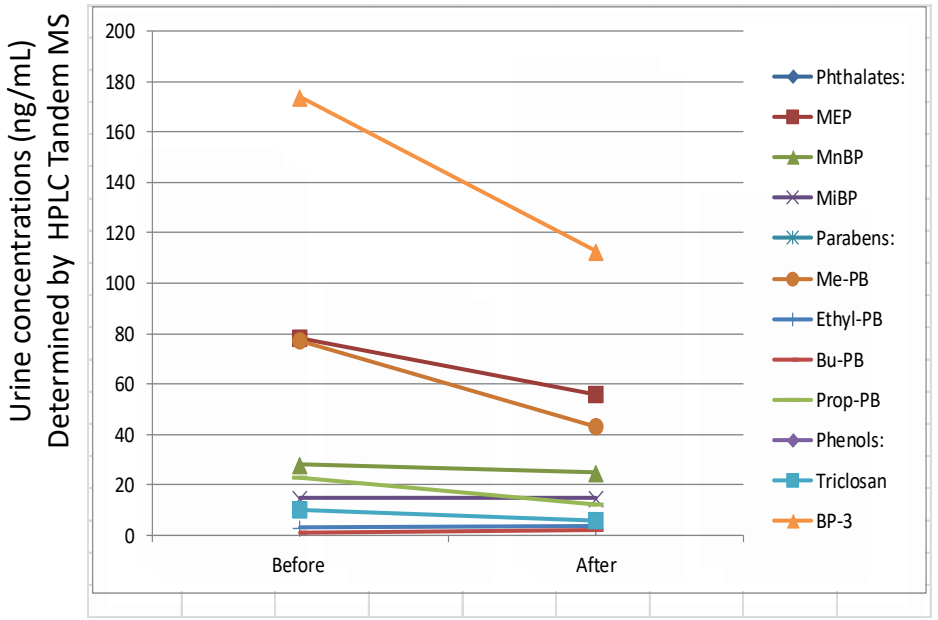
- 23 children monitored for metabolites before/after organic diet
- Levels of urinary metabolites for chlorpyrifos and malathion reduced to non-detectable
- Again elevated on re-introduction of conventional diet

Source: Lu C et al. 2006. Organic diets significantly lower children's dietary exposure to organophosphorus pesticides. Environ Health Perspect. 2006 Feb;114(2):260-3.

The HERMOSA Intervention Study

Personal Care Products

100 Latina girls in Salinas Valley community-based participatory research study to determine if using personal care products for 3 days would change urinary levels. Given OTC products without triclosan, BP-3/oxybenzone, parabens, phthalates



Analyte	Preintervention DF (%)	Preintervention GM (SE)	Postintervention DF (%)	Postintervention GM (SE)	Percent change (95% CI)[a]	Girls with decrease (%)
Phthalates						
MEP	100	78.2 (1.1)	99	56.4 (1.1)	−27.4 (−39.3, −13.2)	68
MnBP	97	28.3 (1.1)	98	25.1 (1.1)	−11.3 (−22.2, 1.1)	58
MiBP	99	15.2 (1.1)	99	15.2 (2.3)	−0.5 (−12.6, 13.3)	55
Parabens						
Methylparaben	93	77.4 (1.2)	87	43.2 (1.2)	−43.9 (−61.3, −18.8)	61
Ethylparaben	55	2.9 (1.2)	63	4.2 (1.2)	47.3 (−0.7, 118.4)	45
Butylparaben	49	0.8 (1.2)	62	1.7 (1.2)	101.7 (35.5, 203.2)	39
Propylparaben	90	22.6 (1.3)	87	12.3 (1.2)	−45.4 (−63.7, −17.9)	63
Phenols						
Triclosan	93	9.5 (1.3)	90	6.1 (1.2)	−35.7 (−53.3, −11.6)	65
BP-3	97	173.8 (1.2)	97	113.4 (1.2)	−36.0 (−51.0, −16.4)	65

Abbreviations: DF, detection frequency; GM, geometric mean; SE, standard error.
[a]From mixed-effects model adjusting for time of urine collection (using 24-hr clock hours and minutes).

This study demonstrates that techniques available to consumers, such as choosing personal care products that are labeled to be free of phthalates, parabens, triclosan, and BP-3, can reduce personal exposure to possible endocrine-disrupting chemicals.

Harley KG, Kogut K, Madrigal DS, Cardenas M, Vera IA, Meza-Alfaro G, She J, Gavin Q, Zahedi R, Bradman A, Eskenazi B, Parra KL. 2016. Reducing phthalate, paraben, and phenol exposure from personal care products in adolescent girls: findings from the HERMOSA Intervention Study. Environ Health Perspect 124:1600.

Nutritional Interventions to Ameliorate the Effects of EDCs on Human Reproductive Health - A Semi-structured Review by FIGO

Objective

To analyze evidence on nutritional interventions to reduce the negative effects of EDCs on reproductive, perinatal, and obstetric outcomes.

Search strategy

Searched MEDLINE (PubMed), Allied Health Literature (CINAHL), EMBASE, Web of Science, and Cochrane Database to 2009 - 2021.

Selection criteria

Experimental studies on human populations.

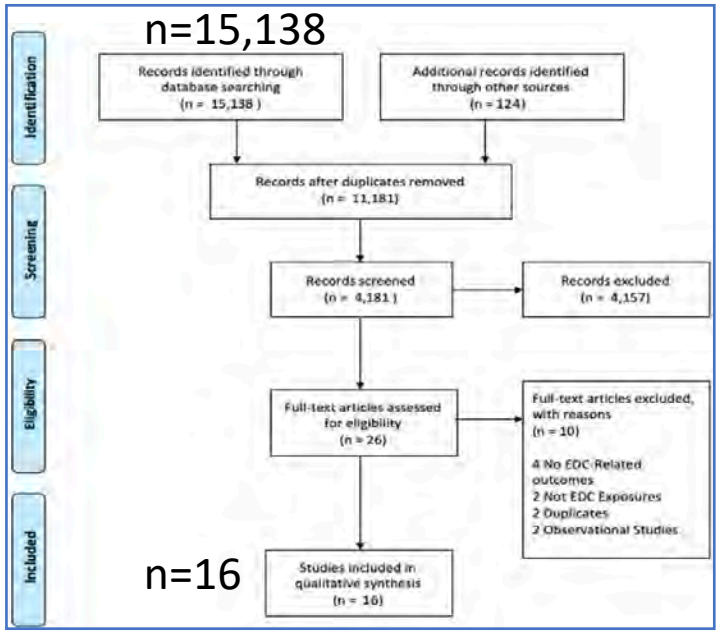
Data collection and analysis

Data were collected from eligible studies.

Risk of bias assessment was completed using the Cochrane risk of bias tool and the ROBINS-I Tool.

Corbett GA, Lee S, Woodruff TJ, Hanson M, Hod M, Charlesworth AM, Giudice LC, Conry J, McAuliffe FM and the FIGO Committees on Impact of Pregnancy on Long-term Health and Climate Change and Toxic Environmental Exposures *Int J Gynecol Obstet.* 2022;157:489.

Characteristics of the 16 studies



Population:

- Study size range 15–355 participants
- 3 included pregnant participants
- 6 included young healthy participants
- 2 included families (parents and children)
- 2 examined interventions in solely school-going children
- 4 included mixed-gender populations:
  - T2DM patients, cardiac atheromatous disease,
  - men and women aged over 60 years.

Risk of Bias:

- 7 were RCTs
- 3 RCTs crossover trials
- *6 non-randomized experimental trials*

Corbett IJGO 2022

Results of Some Intervention Randomized Trials

Study	Design, Population, n	Intervention Active Group	Findings
Carwile, 2011	Randomized single-blinded X-over trial Univ students/ staff n=75	Effect of canned (control) vs fresh soup x 5 days, 2 days washout between X over on urinary [BPA].	Int: 1.1 μg/L 95% CI 0.9-1.4 C: 20.9 μg/L, CI 17.9-24.1
Bae, 2014	Randomized double blinded X-over trial N-120 people >60 yo	Effect of canned (control) vs glass containers for drinking beverages on urinary BPA levels and blood pressure. 1 week each intervention, 1 week washout	Mean urinary BPA levels: Int: 1.13 μg/L ± 1.76 (SD) C: 7.93 μg/L + 6.02 No BP changes.
Hagobian, 2017	Double blinded RCT. N=24 researchers, lab staff, college women, nml BMI	Impact lifestyle interventions (education, BPA-free tupperware, H_20 bottles, cosmetics, hygiene feminine products; organic foods packaged in BPA-free glass/cardboard containers vs control with weekly newsletter/education on uBPA levels. 3 weeks duration	Significant (p=0.04) Rx × time Int effect on [BPA]. By 3 wks Int decreased mean u[BPA] by 0.71 ng/mL vs controls with increased u[BPA] by 0.32ng/mL (p = 0.04).

CONCLUSIONS:

- Evidence supports organic food consumption and avoiding plastics and canned foods and beverages reduce dietary exposures to EDCs.
- No fast foods, iodine supplementation, vegetarian diet, fatty fish diet, altering personal care products, removing dust are all supported by evidence to lower EDCs (some multiple EDCs).

- **CAVEATS**:
  - disparities in access to and affordability of organic foods, glass and stainless-steel bottles/containers
  - Most studies are still one EDC at a time. If BPA is decreased and phthalates not, what might be the consequences from a health perspective where people are exposed to mixtures not 1 EDC at a time?
  - So far rare evidence that reductions of EDCs lead directly to health improvement.

Risk Management and Healthcare Policy
2022;15:779-791
Open Access Full Text Article
Dovepress
REVIEW

Interventions on Reducing Exposure to Endocrine Disrupting Chemicals in Human Health Care Context: A Scoping Review

Jeongok Park [1,2], Hyejung Lee [1,2], Sejeong Lee [3], Hyojin Lee [3]

[1]College of Nursing, Mo-Im Kim Nursing Research Institute, Yonsei University, Seoul, Korea; [2]Yonsei Evidence Based Nursing Centre of Korea: A JBI Affiliated Group, Seoul, Korea; [3]College of Nursing and Brain Korea 21 FOUR Project, Yonsei University, Seoul, Korea

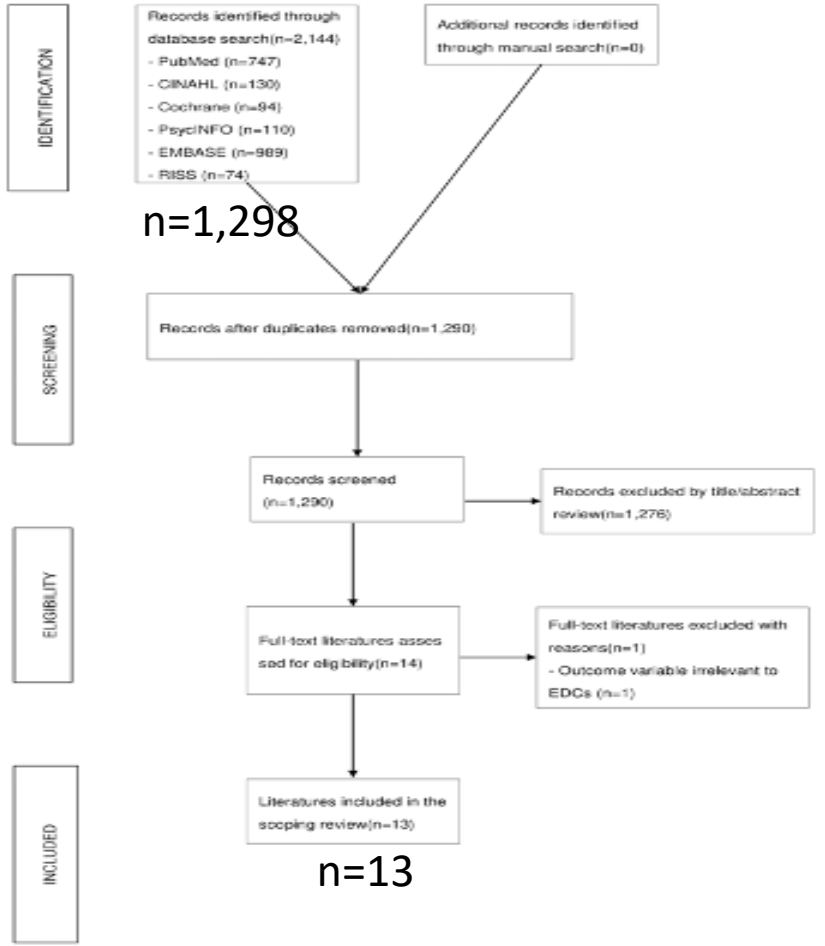
Study Inclusion Criteria:

- Provided intervention for humans regarding EDCs
- Published in English or Korean
- Were peer-reviewed

Study Exclusion Criteria:

- Cost-effectiveness on environment
- Techniques to discover/detect EDCs in bodies or materials
- Related professionals were participants

Year Published	**N (%)**
2011-2020	8 (61.54%)
2021	5 (38/46%)
Country	
U.S.	5 (38.46)
Europe	4 (30.77)
Asia	4 (30.77)



Salient Results of Park 2022 Scoping Review

- ~ 50% were single arm studies (no controls)
- Most interventions resulted in lowered EDC levels in blood and/or urine and some studies overlapped with Corbett 2022 review.
- Authors noted that compliance was challenging – e.g., most subjects didn't want to change their diet even with EDC levels demonstrated to be lower with interventions.
- 1 study revealed decreased uBPA levels and lower dysmenorrhea scores with 6 months of intervention but no control group
- 1 study revealed red Korean gensing (RKG) resulted in decreased VMS, uterine spotting, dysmenorrhea but no control group.

Park, et al. Risk management & Health Care Review ***2022;15:779-79***

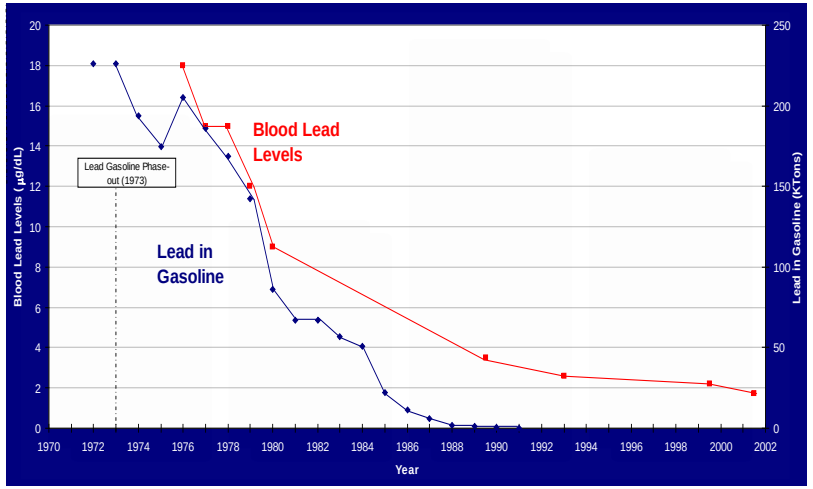
Overall Conclusions About Interventional Studies

- Most well-designed trials show benefit of lowering EDC levels (mostly 1 evaluated at a time) with interventions.
- Well-designed trials are essential to inform if interventions achieve their goals of significantly reducing EDC levels in fluids and tissues, and improvements in clinical outcomes.
- Question of patient awareness for buy in of changing behavior arises.
- Question arises if prospective interventional evidence is required before recommending some of these therapies, or, given their low side effect profiles and other benefits, whether they can be recommended based on existing observational evidence alone.

Interventions to Ameliorate EDC Effects

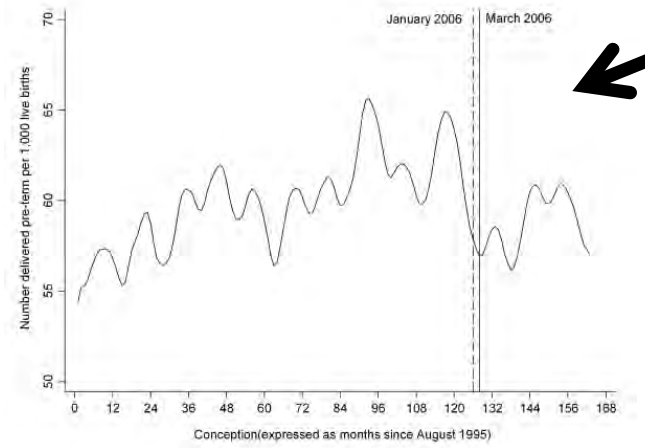
Policy Changes

Actions Can Reduce Exposures But **POLICY** Changes Are Also Needed



Removing lead from gasoline resulted in lowered blood levels at the population level over time

Preterm Births



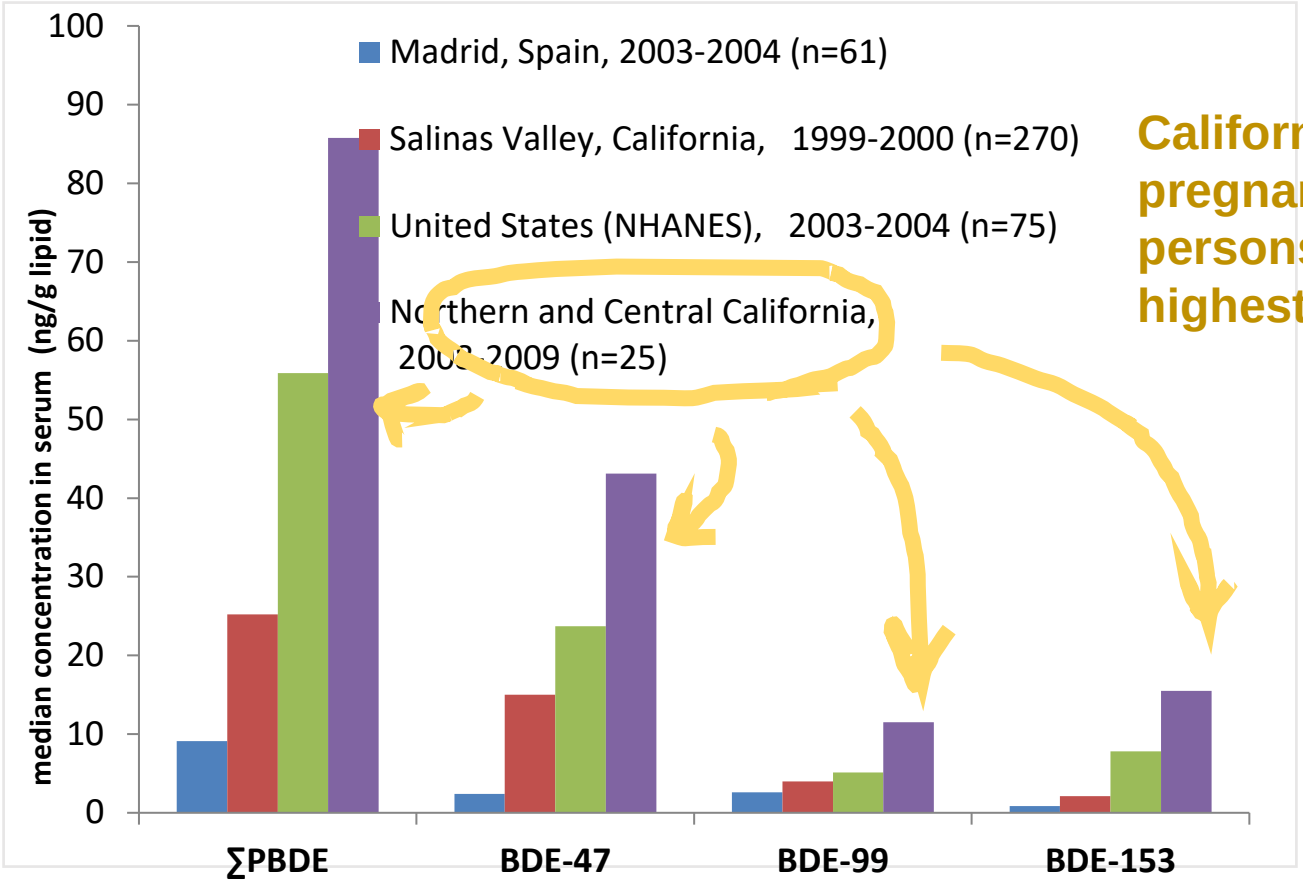
Scotland's public smoking ban

Mackay PLoS Med 2012

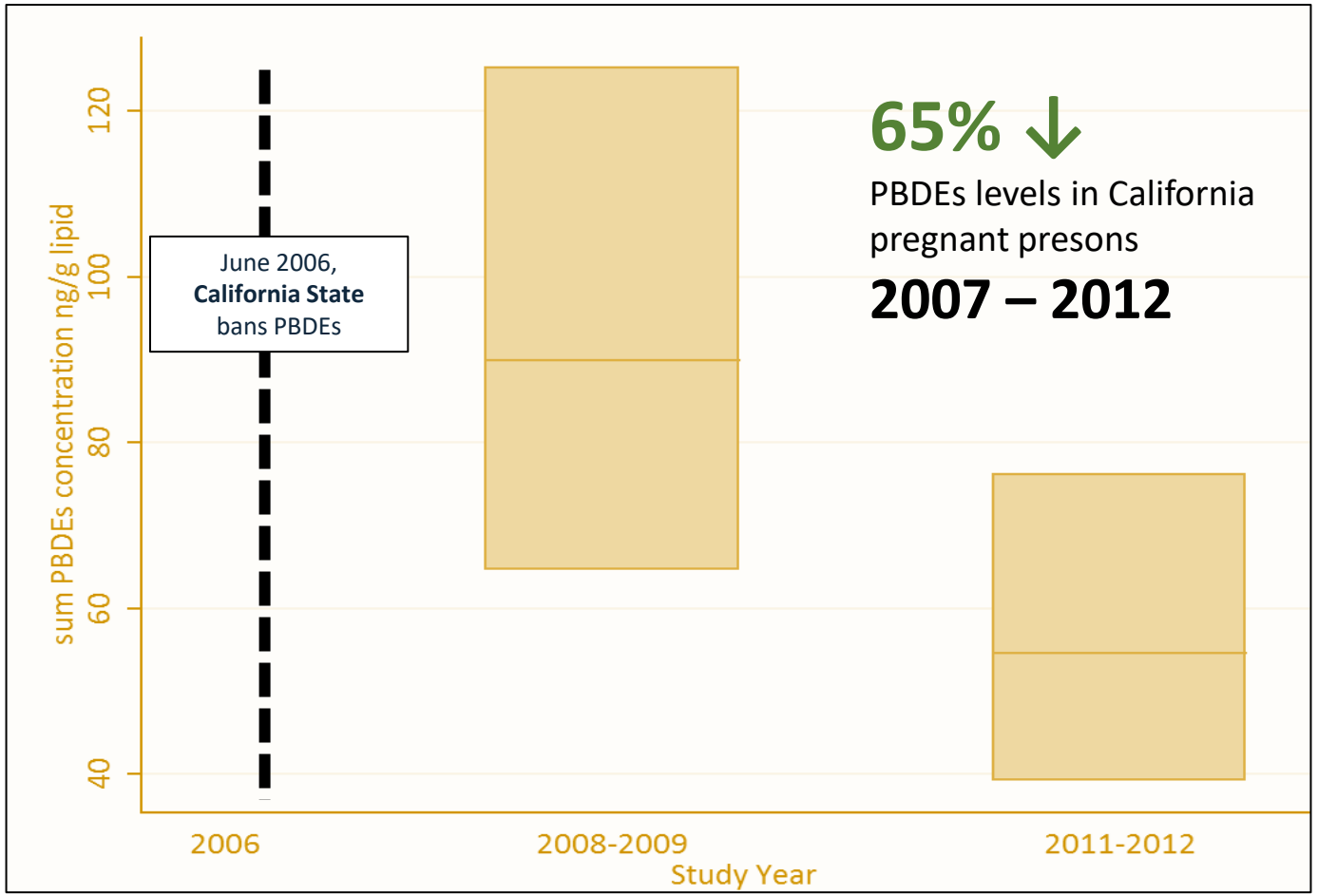
PBDEs

In humans, thyroid hormone disruption identified as possible mechanistic link
In vitro, disruption of developing fetal human brain cells
In animals, affects learning, memory, and attention
(Schreiber et al., 2010, Driscoll et al., 2008, Viberg et al. 2006)

Flame Retardants in Pregnant Persons Globally



Actions Matter – Policy
PBDEs Banned in California 2006



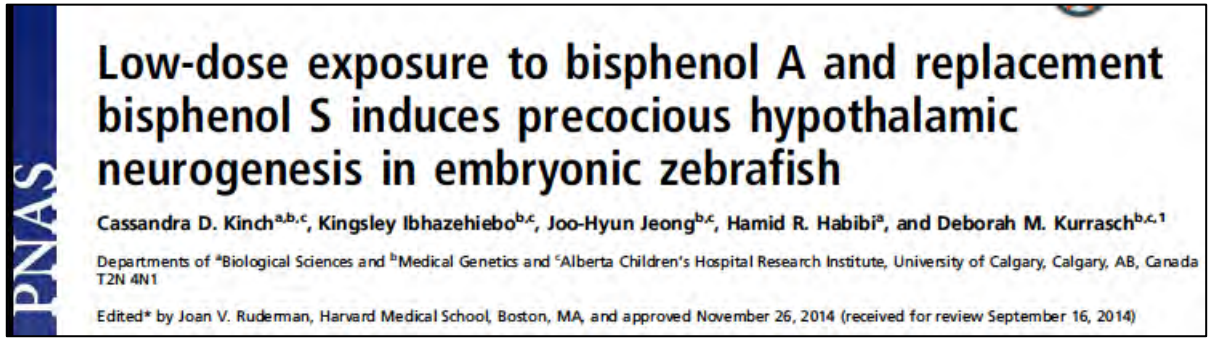
Zota A.R., et al. 2013 ES&T

Green Chemistry developed to replace hazardous chemicals, processes and make products with safer alternatives

Safer Alternatives to BPA and other EDCs?

DES → BPA → BPS and BPF

More Hormone Disruption!



PNAS

Low-dose exposure to bisphenol A and replacement bisphenol S induces precocious hypothalamic neurogenesis in embryonic zebrafish

Cassandra D. Kinch[a,b,c], Kingsley Ibhazehiebo[b,c], Joo-Hyun Jeong[b,c], Hamid R. Habibi[a], and Deborah M. Kurrasch[b,c,1]

Departments of [a]Biological Sciences and [b]Medical Genetics and [c]Alberta Children's Hospital Research Institute, University of Calgary, Calgary, AB, Canada T2N 4N1

Edited* by Joan V. Ruderman, Harvard Medical School, Boston, MA, and approved November 26, 2014 (received for review September 16, 2014)

PNAS Dec 2014

A new chapter in the bisphenol A story: bisphenol S and bisphenol F are not safe alternatives to this compound

Soria Eladak, M.Sc.,[a,b,c] Tiphany Grisin, M.Sc.,[a,b,c] Delphine Moison, M.Sc.,[a,b,c] Marie-Justine Guerquin, Ph.D.,[a,b,c] Thierry N'Tumba-Byn, Ph.D.,[a,b,c] Stéphanie Pozzi-Gaudin, M.D.,[d] Alexandra Benachi, M.D., Ph.D.,[d] Gabriel Livera, Ph.D.,[a,b,c] Virginie Rouiller-Fabre, Ph.D.,[a,b,c] and René Habert, Ph.D.[a,b,c]

[a] Unit of Genetic Stability, Stem Cells, and Radiation, Laboratory of Development of the Gonads, Université Paris Diderot, Sorbonne Paris Cité, Fontenay-aux-Roses; [b] Commissariat à l'Energie Atomique, Fontenay-aux-Roses; [c] Institut National de la Santé et de la Recherche Médicale, Unité 967, Fontenay-aux-Roses; and [d] Service de Gynécologie-Obstétrique et Médecine de la Reproduction, Hôpital A. Béclère, Université Paris Sud, Clamart, France

Fertil Steril 2015;103:11-21

How do we identify those at risk of harm from EDCs and counsel them to mitigate/minimize their risks?

Do HCPs Do An Environmental History?

American Congress of Obstetricians and Gynecologists Survey (ACOG) (N=2514)

78%

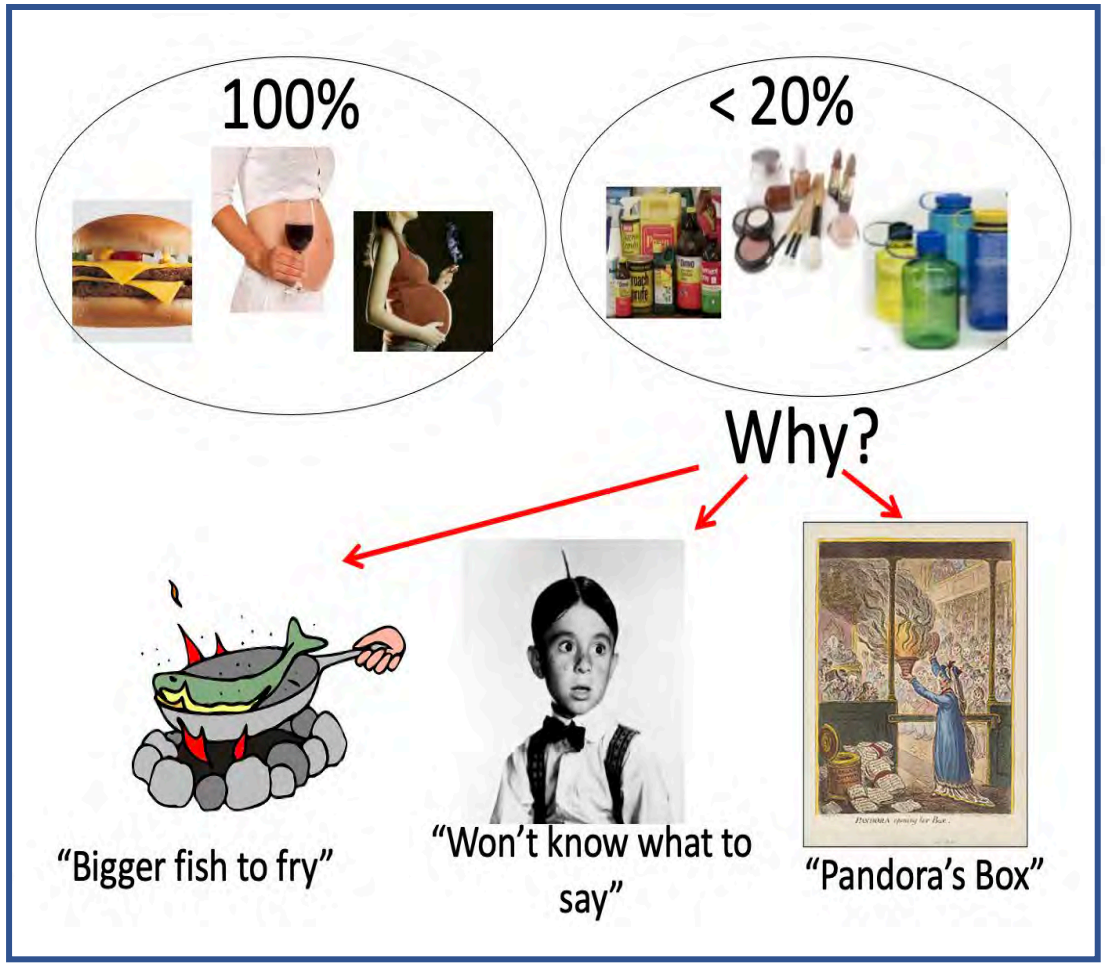
of obstetricians surveyed feel they can reduce patient exposure

Yet…..

<25% report they take an environmental health history

Stotland NE, Sutton P, Trowbridge J, Atchley DS, Conry J, et al. Counseling Patients on Preventing Prenatal Environmental Exposures - A Mixed-Methods Study of Obstetricians. PLoS ONE 2014;9(6): e98771. doi:10.1371/journal.pone.0098771

What Do Obstetricians Ask About and Interventions at Point of Care



Interventions:

(1) brochures to patients on PNC entry or making available in waiting or exam rooms

(2) staff providing patients with information on nutritional counseling or other germane health education regarding avoidance of toxic chemicals

(3) Taking an environmental health history – smart sets in EHR

Role of the HealthCare Team to Promote Successful Intervention Strategies

Taking an Exposure History

Examples are available at
http://prhe.ucsf.edu/clinical-practice-resources;
https://www.atsdr.cdc.gov/hec/csem/exphistory/docs/exposure_history.pdf

When counseling patients about their exposures, HCPs need to:

- **Understand patient risk is a function of** toxicity, dose, frequency, duration, and timing of exposures (especially vulnerable developmental windows, and individual patient vulnerability – e.g., underlying health conditions, SDS) and exposure routes.

- **Identify patients with hazardous occupations or hobbies**. Persons with occupational/recreational toxic exposures are at high risk of adverse reproductive outcomes.
  - Legal workplace limits are not created to protect pregnant persons.
  - Persons exposed to chemicals via hobbies have lower exposures vs working in similar industries (e.g., jewelry making), but may have less safety training.

Giudice et al. Environmental factors in reproduction, In: Reproductive Endocrinology, Yen, Jaffe, Barbieri, Williams, Strauss, Elsevier, Boston, 2023

What Do Individuals Know About EDCs?

Qualitative studies show knowledge and awareness of EDCs among lay public is low.

Male infertility: Maxim *J. Risk Res.* **2013**, *16*, 677–695
- Perceptions about controversial link between exposure to EDCs and a decline in human male fertility was well received, contradicting assumptions that transparency about scientific uncertainty of EDCs elicits negative psychological effects

Pregnant persons: *Rouillon Int. J. Environ. Res. Public Health **2017**;14:1021. **2018**;15:2231.*
- Did not believe they were particularly susceptible to exposures but believed exposures to EDCs were extremely dangerous.

General public*: Kelley, Int J Environ Res Public Health. **2020**;17:7778*
- 19-65 yo in focus groups (n=34) in Belfast.
- Generally, little knowledge of and awareness about EDCs, their sources and associated health effects.
- While unaware of possible individual mitigation strategies, the majority expressed government responsibility to mitigate effects.

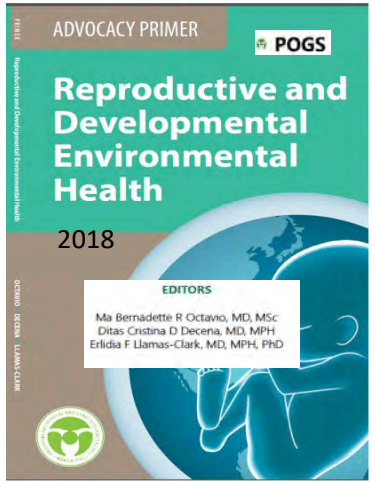
How Can HCPs Promote Successful Intervention Strategies?

- HCPs should take an exposure history and provide patients with resources and referrals.
- Need to get information to patients about known effects and reducing/eliminating exposures to EDCs with extrapolation to preventing adverse health impacts.
- HCPs can work with community leaders and policy officials to expand the network of information, without being topic experts themselves.
- Government and academic resources and referrals re specific environmental exposures and reproduction are available.

Giudice et al. Environmental factors in reproduction, In: Reproductive Endocrinology, editors Yen, Jaffe, Barbieri, Williams, Strauss, Elsevier, Boston, 2023

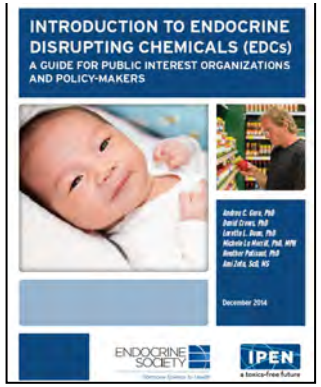
Some Resources to Reduce Toxic EDC Exposures

Educate and Advocate



FIGO
International Federation of Gynecology and Obstetrics
the Global Voice for Women's Health

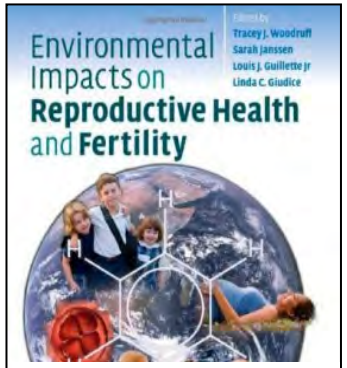
EDC-2: 2015
Gore et al



ACOG 2022 Updated Committee Opinion on Environment and Climate Impacts on Women's Health.

ACOG
The American College of Obstetricians and Gynecologists

Policy Priorities Environmental Health



Woodruff T, Jansen S, Guillette, L, Giudice LC 2008

asrm
American Society for Reproductive Medicine

Environment & Reproduction Special Interest Group

Project TENDR

ACOG
The American College of Obstetricians and Gynecologists

IFFS

Avoiding Toxic Chemicals *BEFORE*, *DURING* and *AFTER* Pregnancy

Some specifics

10 Tips for a Healthier Pregnancy

1. Avoid eating, drinking or storing food in plastic
2. Don't microwave in plastic
3. Cook with cast iron or stainless steel not non-stick pans
4. Avoid eating fish high in Hg or PCBs
5. Eat fresh, organic foods, or clean off pesticides
6. Limit cosmetics
7. Avoid dry cleaning or stain treating clothing
8. Use a wet mop when cleaning
9. Avoid consumer products with flame retardants
10. Remove shoes before entering your home.

FIGO Committee on Climate Change and Toxic Environmental Exposures

FIGO.ORG
English, Spanish, French

POLICY EFFORTS

- Need:
  - transparency of data
  - population educated in risks associated with specific exposures
  - informed governing body and industry partners with the common will to change policy in the interest of the public health.

- Disparities in exposure risks among vulnerable populations mandate inclusion of environmental justice in policies to improve the public health.

- Chemical regulations differ widely across the globe.
  - The **Reach** (Registration, Evaluation, Authorisation and Restriction of Chemicals) policy addresses production and use of chemicals and impacts on human health and the environment, with the onus on the manufacturer to demonstrate safety to keep their chemicals in the marketplace.
  - In the **US chemicals** released into the marketplace fall short of the scrutiny is suspected or demonstrated

We have some work to do……

Kassotis CD, Vandenberg LN, Demeneix BA, Porta M, Slama R, Trasande L. Endocrine-disrupting chemicals: economic, regulatory, and policy implications. Lancet Diabetes Endocrinol. 2020;8:719; . Giudice LC. Environmental impact on reproductive health and risk mitigating strategies. Current Opinion Obstet Gynecol. 2021 08(01); 33:343-349

CONCLUSIONS

www.prhe.ucsf.edu

- Scientific and epidemiologic data reveal mechanisms and associations of preconception, prenatal and adult exposures to EDCs negatively impacting women's health and developmental processes and outcomes.
- While strategies to control EDC exposures may show lower body burdens, whether there is ***direct improvement*** of epidemiologically associated disorders is largely unproven but should not derail preventive strategies.
- While EDCs are ubiquitous, highest risk is among vulnerable populations, who should be included in all intervention mitigation strategies.
- We need to incorporate environmental and occupational health in professional education.
- Health care professionals, scientists, citizens can play a major role in raising awareness among colleagues, trainees, patients, the general public, and government leaders - key to improving human health.

Giudice et al. Environmental factors in reproduction, In: Reproductive Endocrinology, editors: Yen, Jaffe, Barbieri, Williams, Strauss, Elsevier, Boston, 2023

Environmental Toxicants Are Tilting the Risk Balance Unfavorably for Women's Health Outcomes

This is an **environmental issue**, a **public health issue**, an **occupational health issue**, a **social justice issue**, a **human rights issue**, an **economic issue**, a **political issue**, and a **gender issue**.

Thank you

Advancing Health Equity

Tamarra M. James-Todd, MPH, Ph.D., Tonya Sharmaine Lane, M.S.

Moderated by LT Abayomi Walker

Advancing Health Equity

Tamarra James-Todd, PhD, MPH

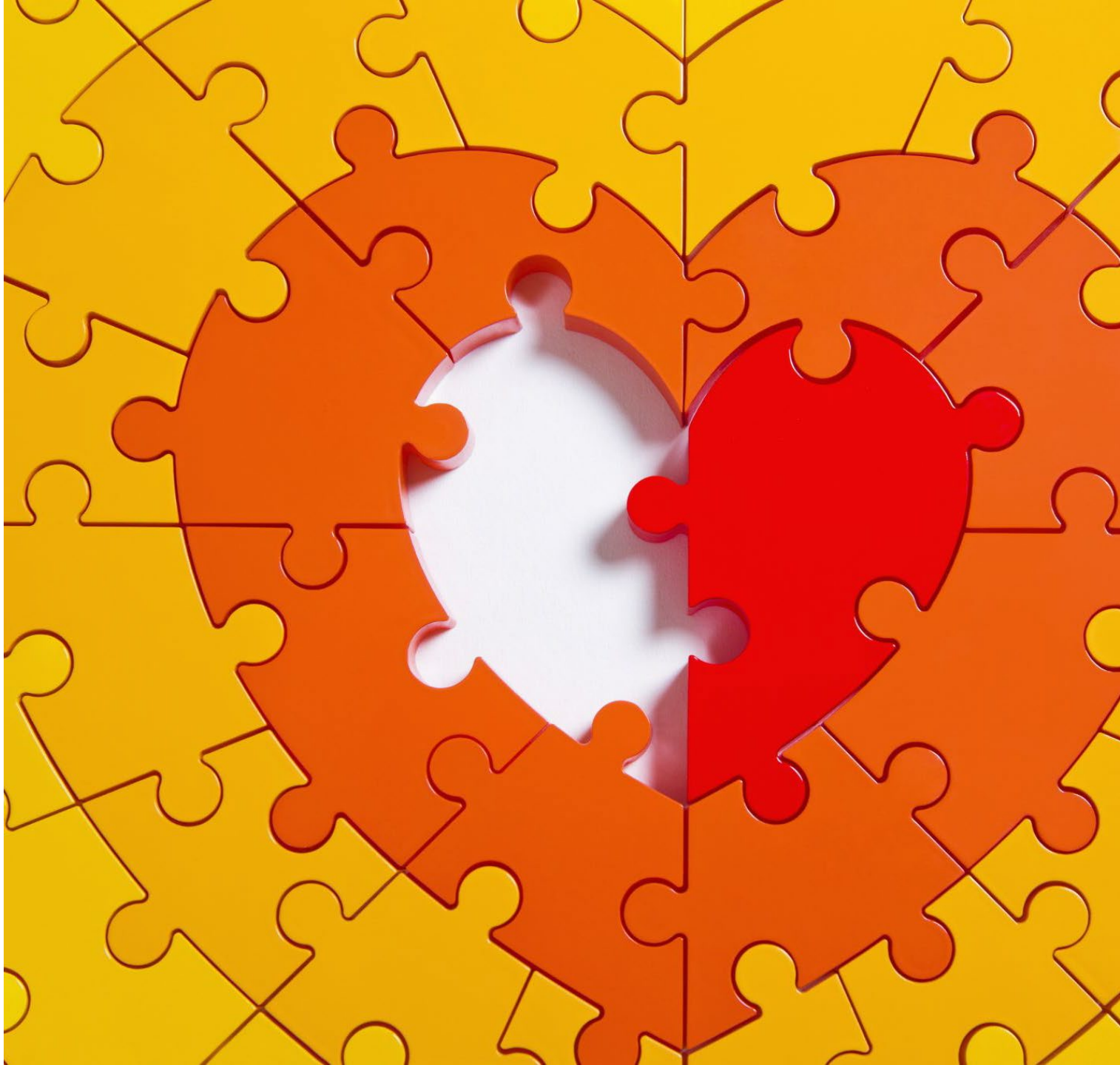
Associate Professor of Environmental Reproductive Epidemiology, Director, Environmental Reproductive Justice Lab

Harvard T.H. Chan School of Public Health

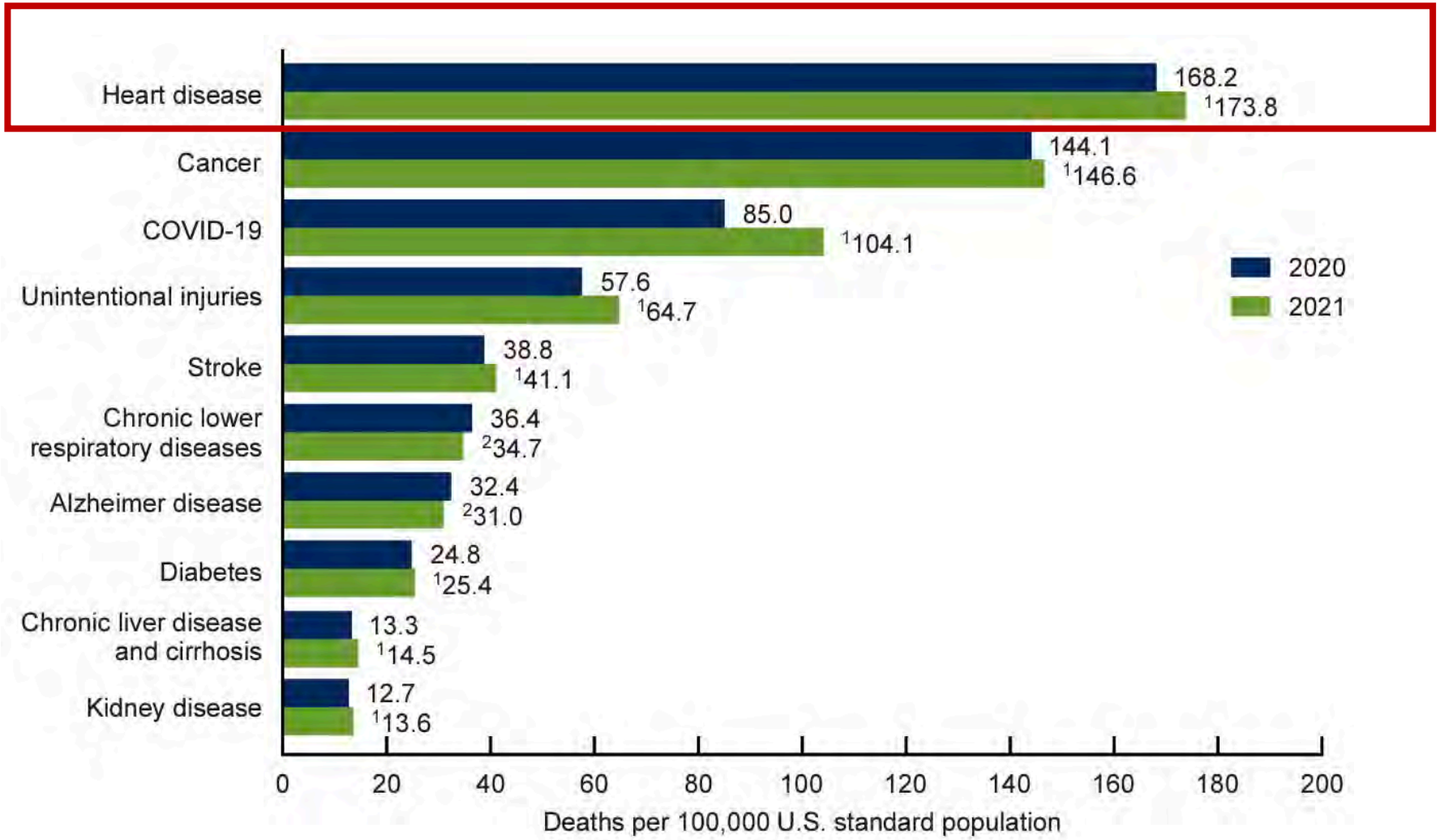
Racial/ethnic disparities in endocrine disrupting chemical exposures and disparities in chronic disease risk

Tamarra James-Todd, PhD, MPH
Mark and Catherine Winkler Associate Professor of Environmental Reproductive Epidemiology
Harvard T.H. Chan School of Public Health
Director, Environmental Reproductive Justice Lab

July 19, 2023



Age-adjusted mortality rate for 10 leading causes of death in U.S., 2020 and 2021



National Center for Health Statistics, National Vital Statistics System, Mortality

Health across the life course: examples of cardiovascular disease risk factors

Prenatal | Infancy | Childhood | Adolescence/ Young Adulthood | Reproductive years | Postmenopausal/ Older age

-Intrauterine growth restriction
-GDM or preeclampsia

-Rapid catch-up growth
-LGA

-Early menarche
-Obesity

-Pregnancy loss
-Pregnancy complications

-Early menopause
-Hot flash severity

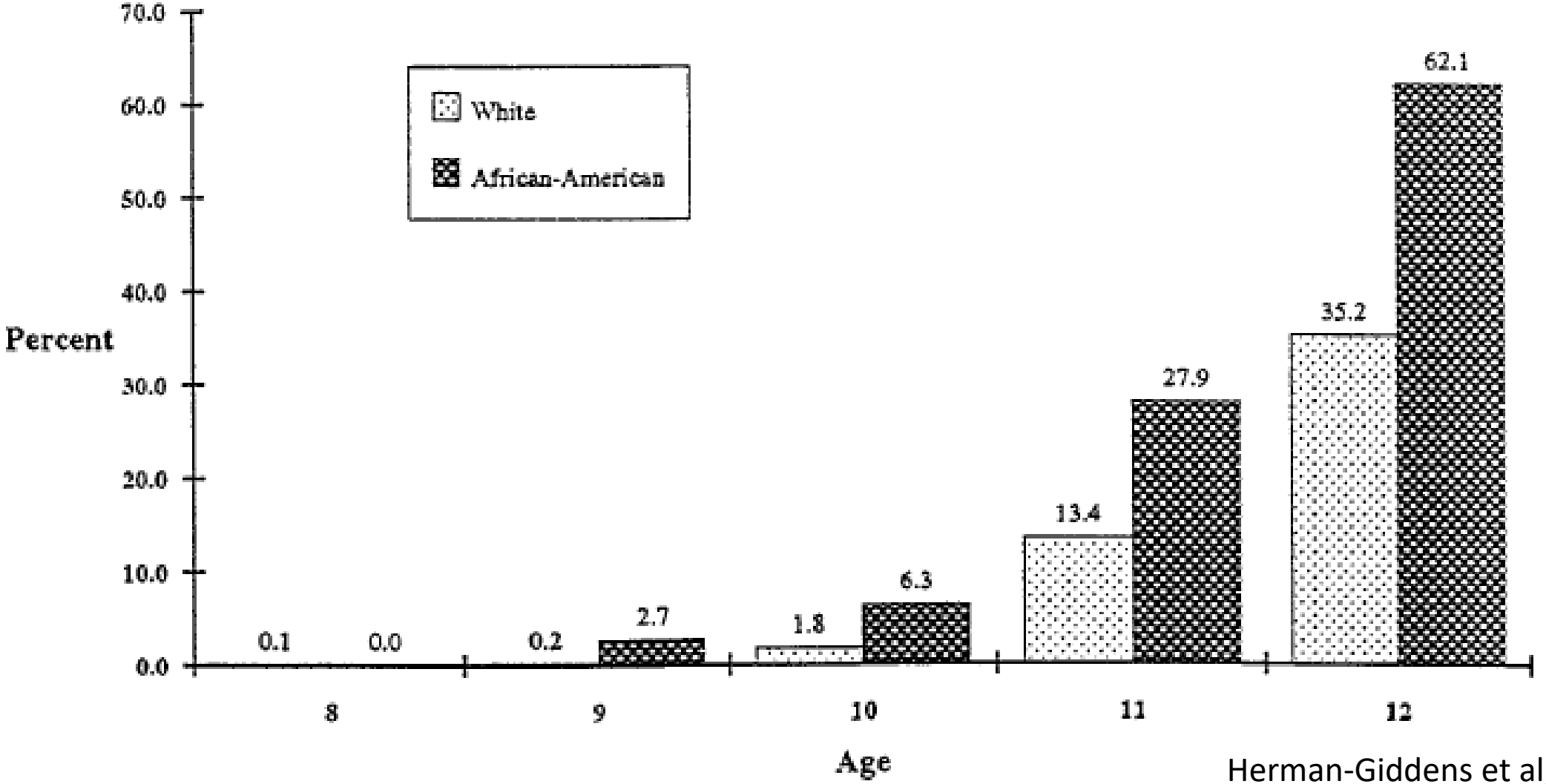
-Hypertension, dyslipidemia, diabetes, obesity, PCOS

FIGURE 1

Hypertension Prevalence by Sex and Race/Ethnicity

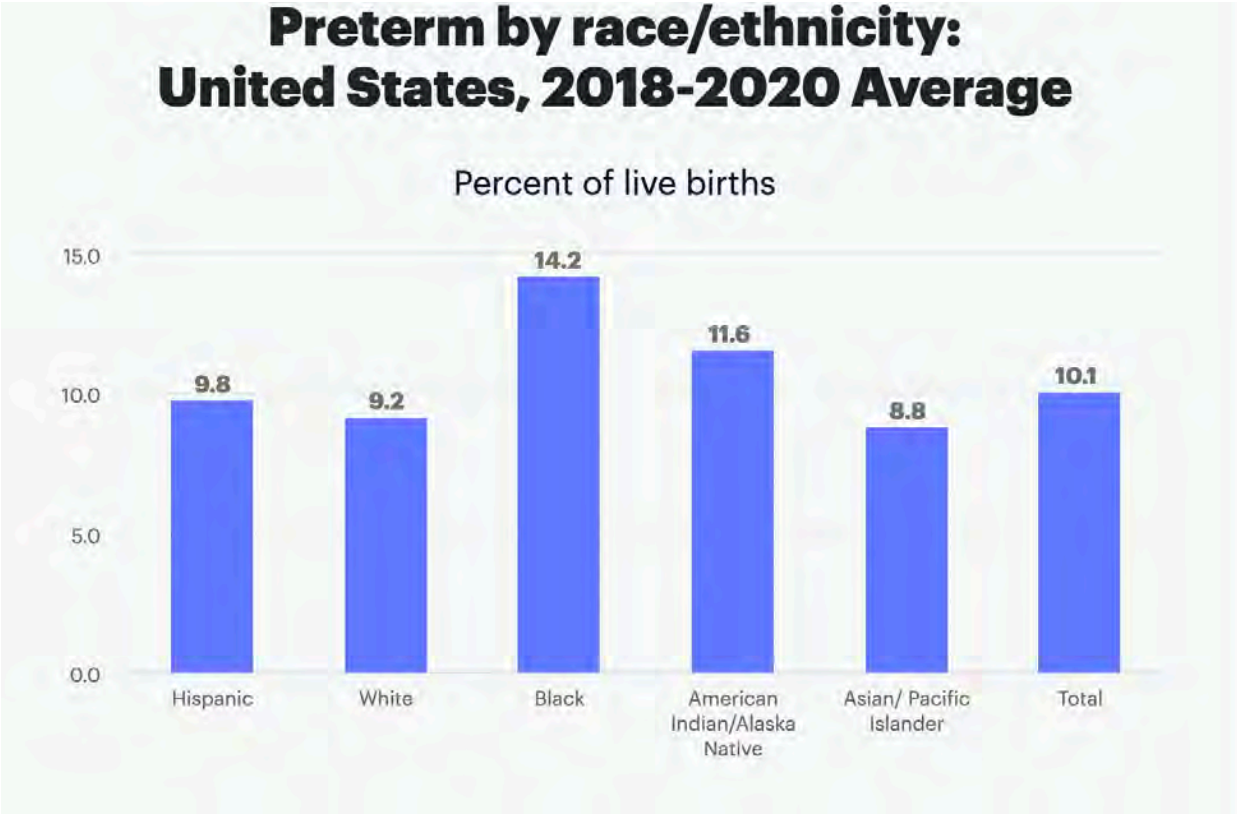
Source: Yoon SS, Fryar CD, Carroll MD. Hypertension prevalence and control among adults: United States, 2011–2014. NCHS data brief, no 220. Hyattsville, MD: National Center for Health Statistics. 2015.

Racial disparities in cardiovascular disease risk factors across the life course: early menarche

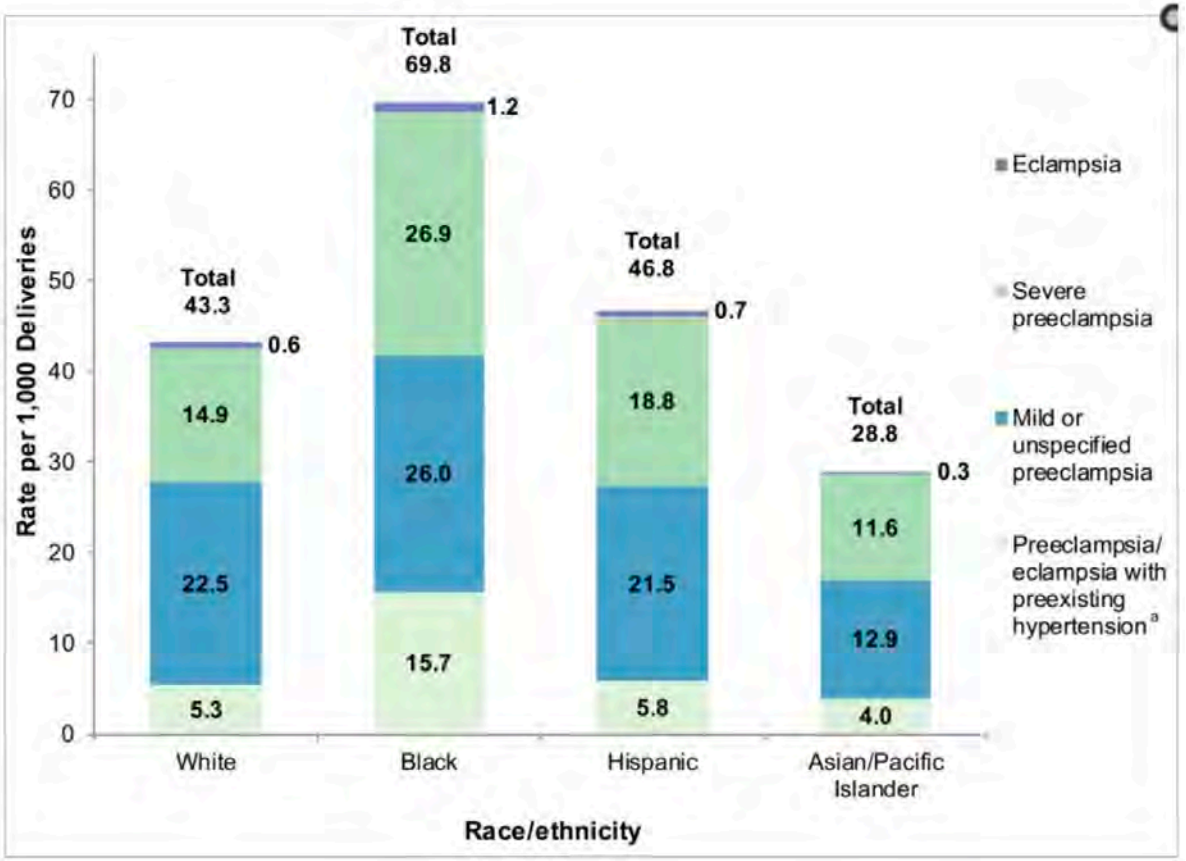


Herman-Giddens et al, Pediatrics 1997

Racial disparities in cardiovascular disease risk factors across the life course: pregnancy complications



March of Dimes 2022



Fingar KR et al, HCUP Stat Brief 2017

Racial disparities in cardiovascular disease risk factors across the life course: menopause

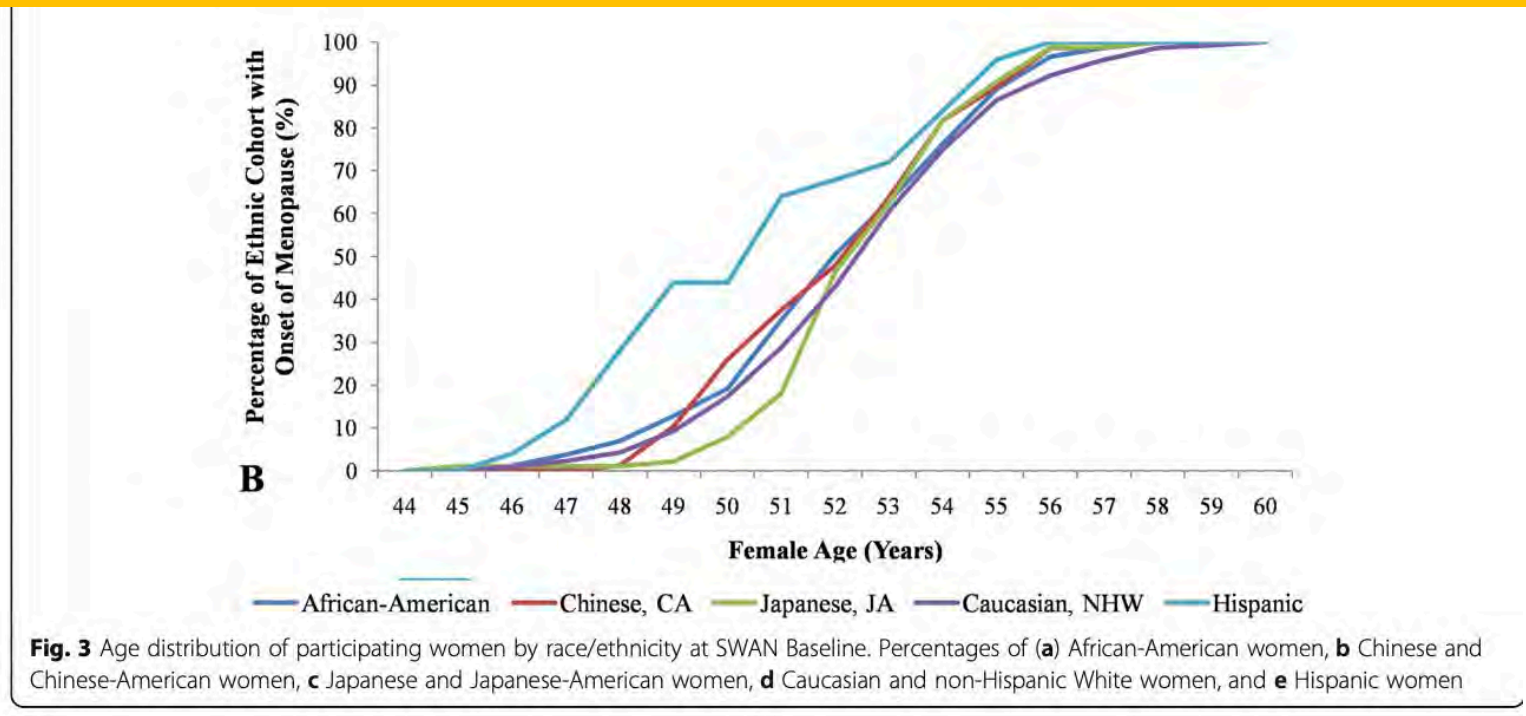
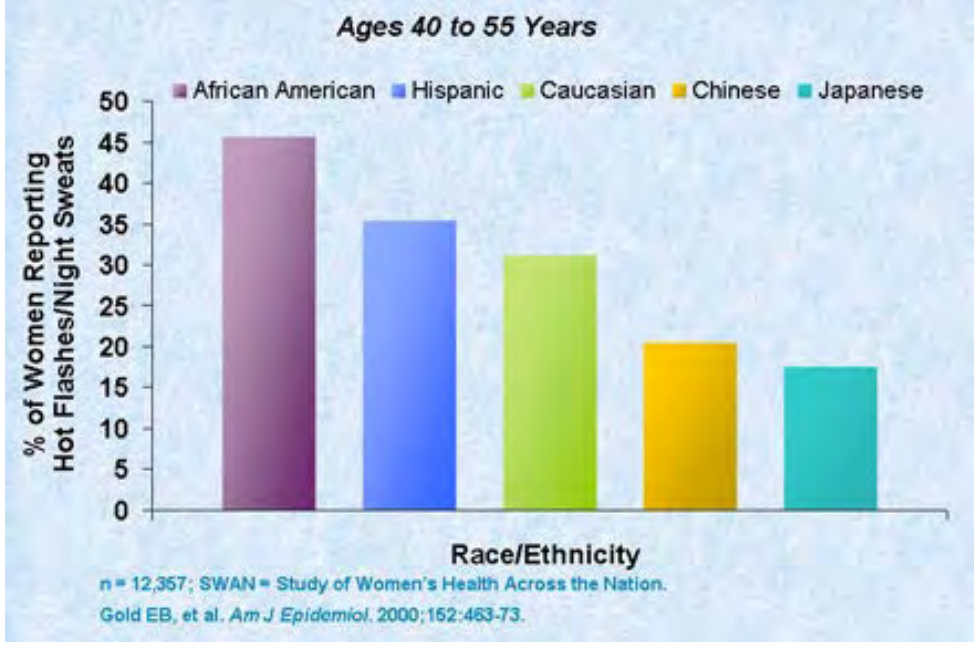


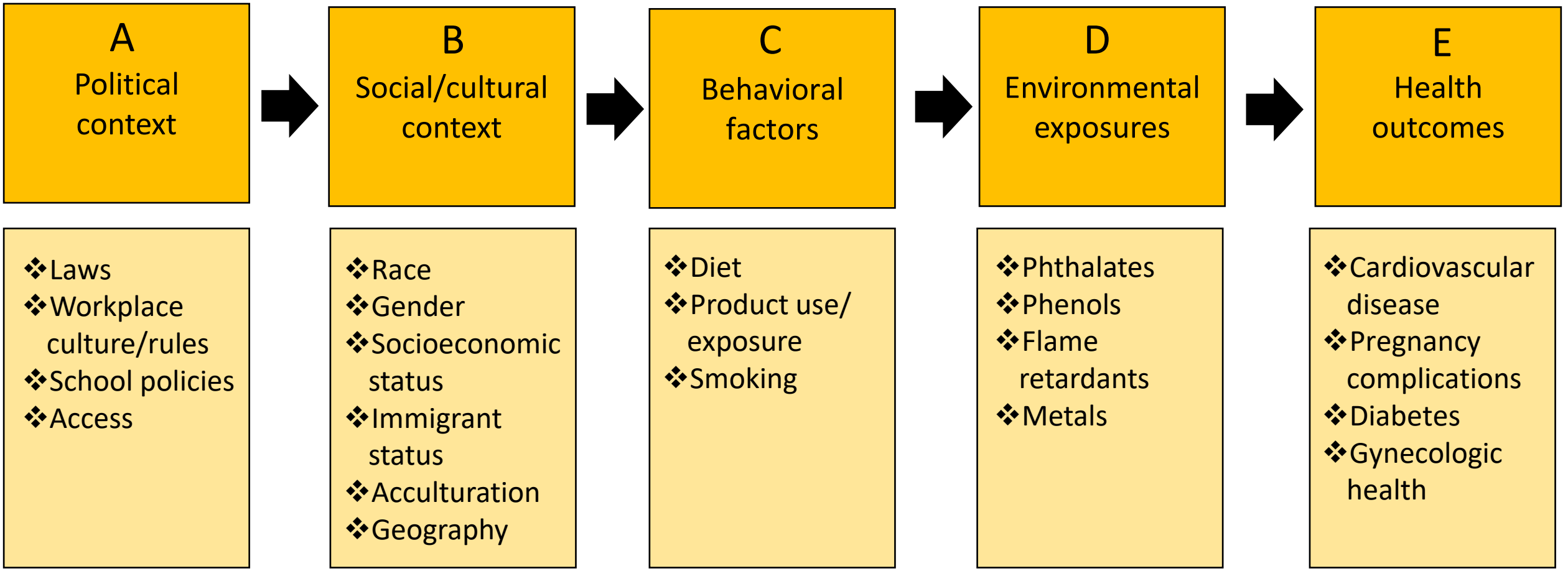
Fig. 3 Age distribution of participating women by race/ethnicity at SWAN Baseline. Percentages of (**a**) African-American women, **b** Chinese and Chinese-American women, **c** Japanese and Japanese-American women, **d** Caucasian and non-Hispanic White women, and **e** Hispanic women

Chan et al, BMC Women's Health 2020



Gold EB et al, Am J Epi, 2000

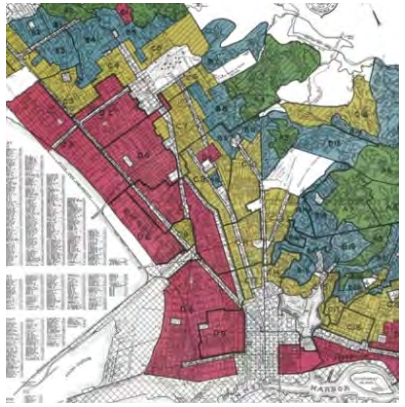
Translational Epidemiologic Approach to Health Disparities



Bellavia et al, Environ Epidemiol, 2018

Translational Epidemiologic Approach to Health Disparities

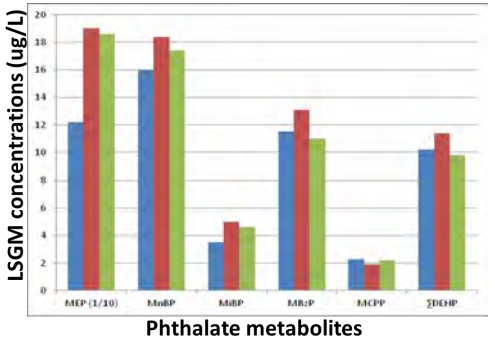
A Political context → **B** Social/cultural context → **C** Behavioral factors → **D** Environmental exposures → **E** Health outcomes



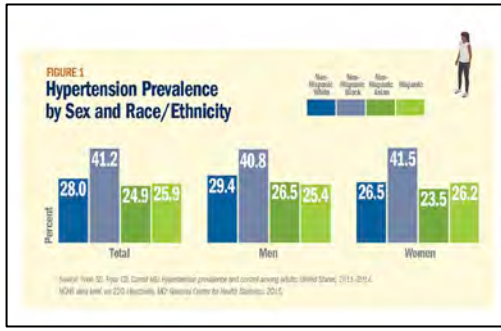
Historic redlining

Racial differences in wealth

Safer product and food apartheid

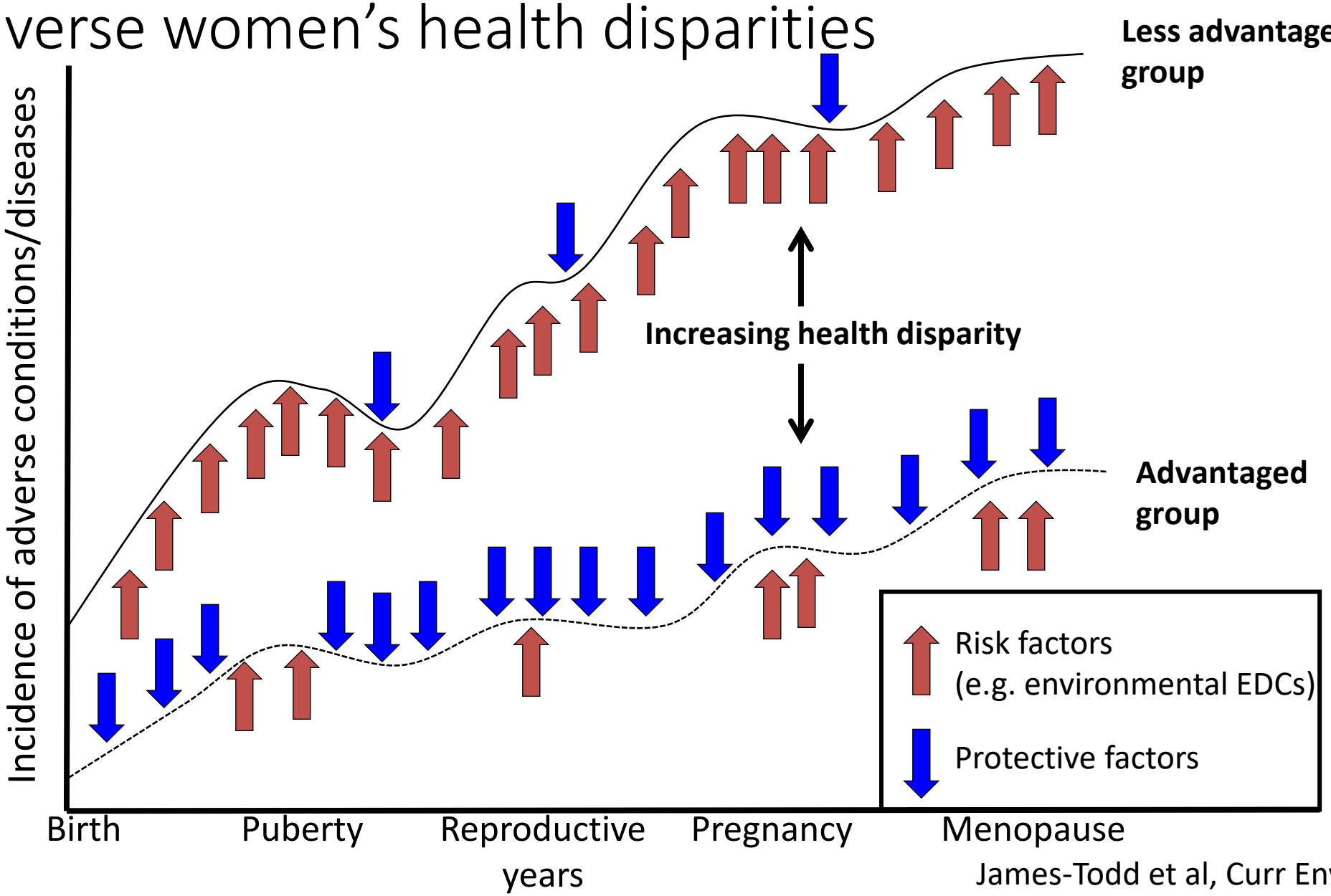


Disparities in EDCs



Health disparities

Contribution of unequal environmental exposures to increasing risk of adverse women's health disparities



James-Todd et al, Curr Env Hlth Rep 2016

Endocrine Disrupting Chemicals in Consumer Products

Pesticides

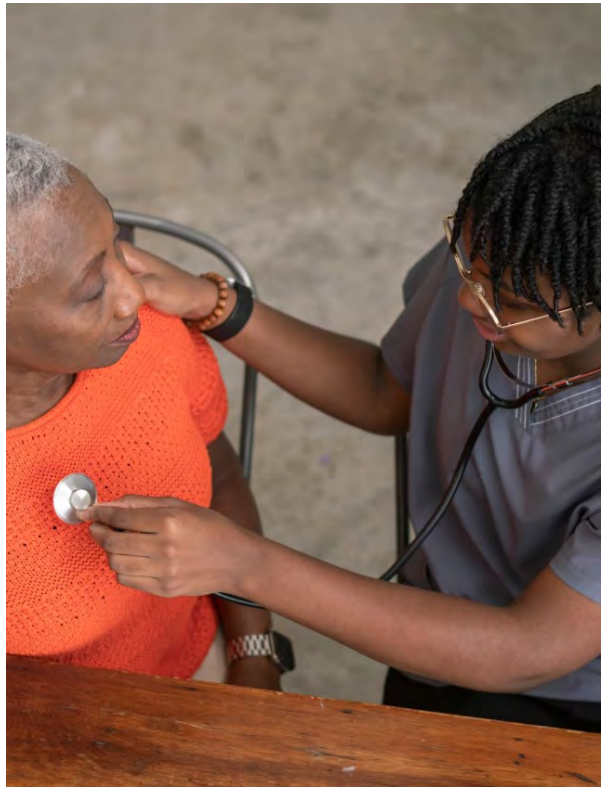
Plasticizers

Surfactants

Phenols

Flame retardants



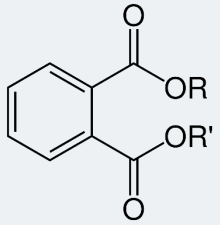



Two examples:

1. Phthalates and cardiovascular disease risk

2. PFAS and cardiovascular disease risk

Examples of Disparities in Environmental Chemical Exposures

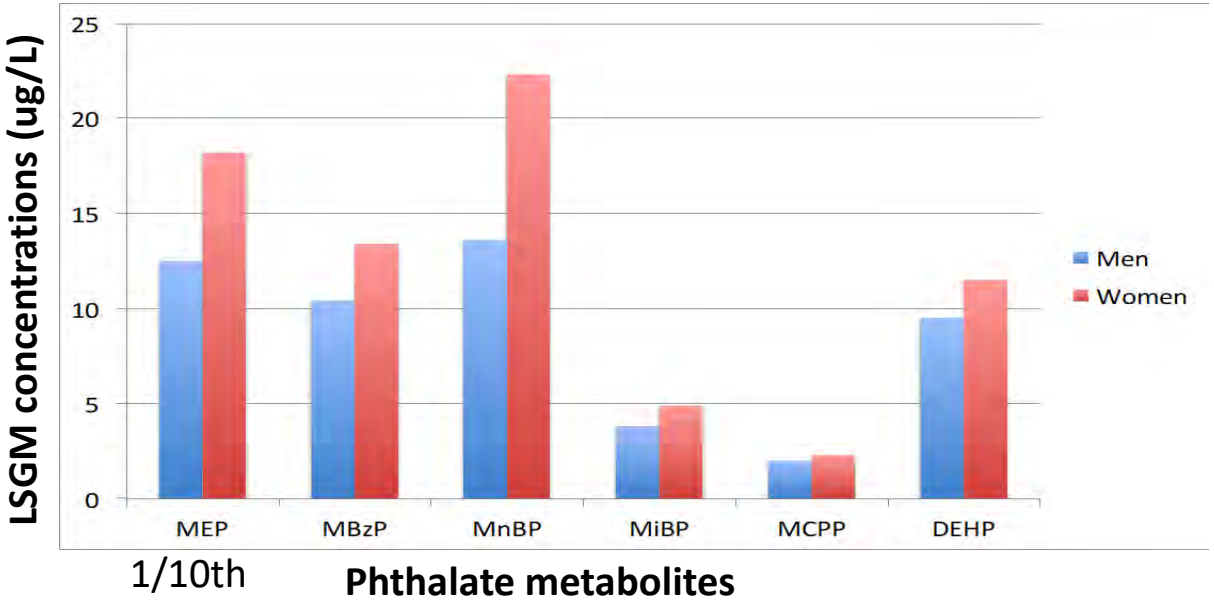


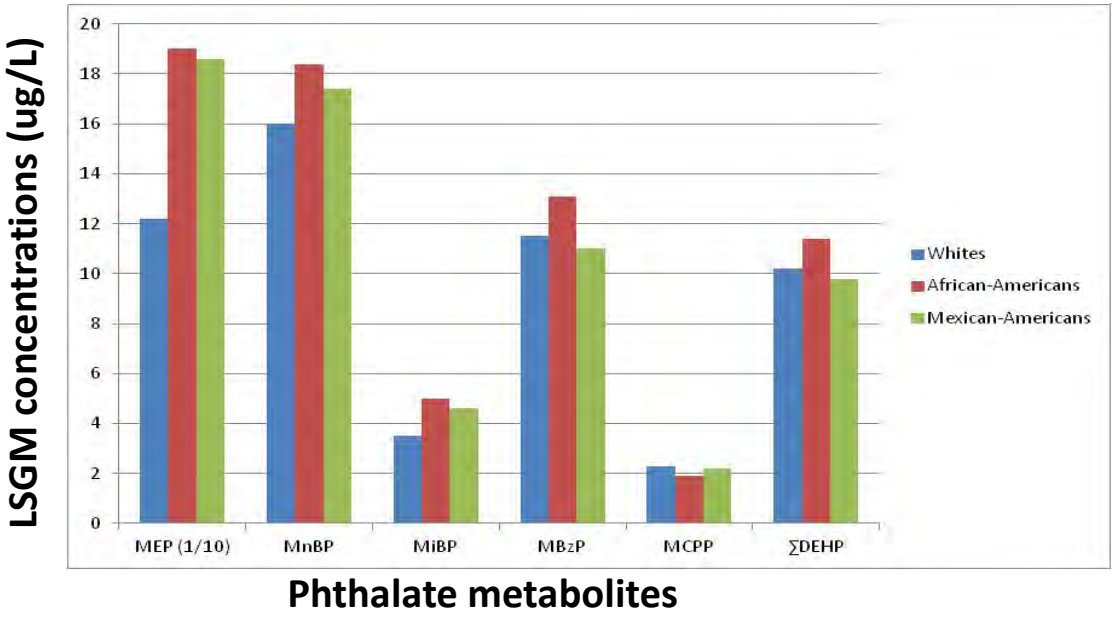
Phthalates

Examples:

- ❖ Personal care products
- ❖ Diet/food packaging
- ❖ Medical tubing/medication/plastics

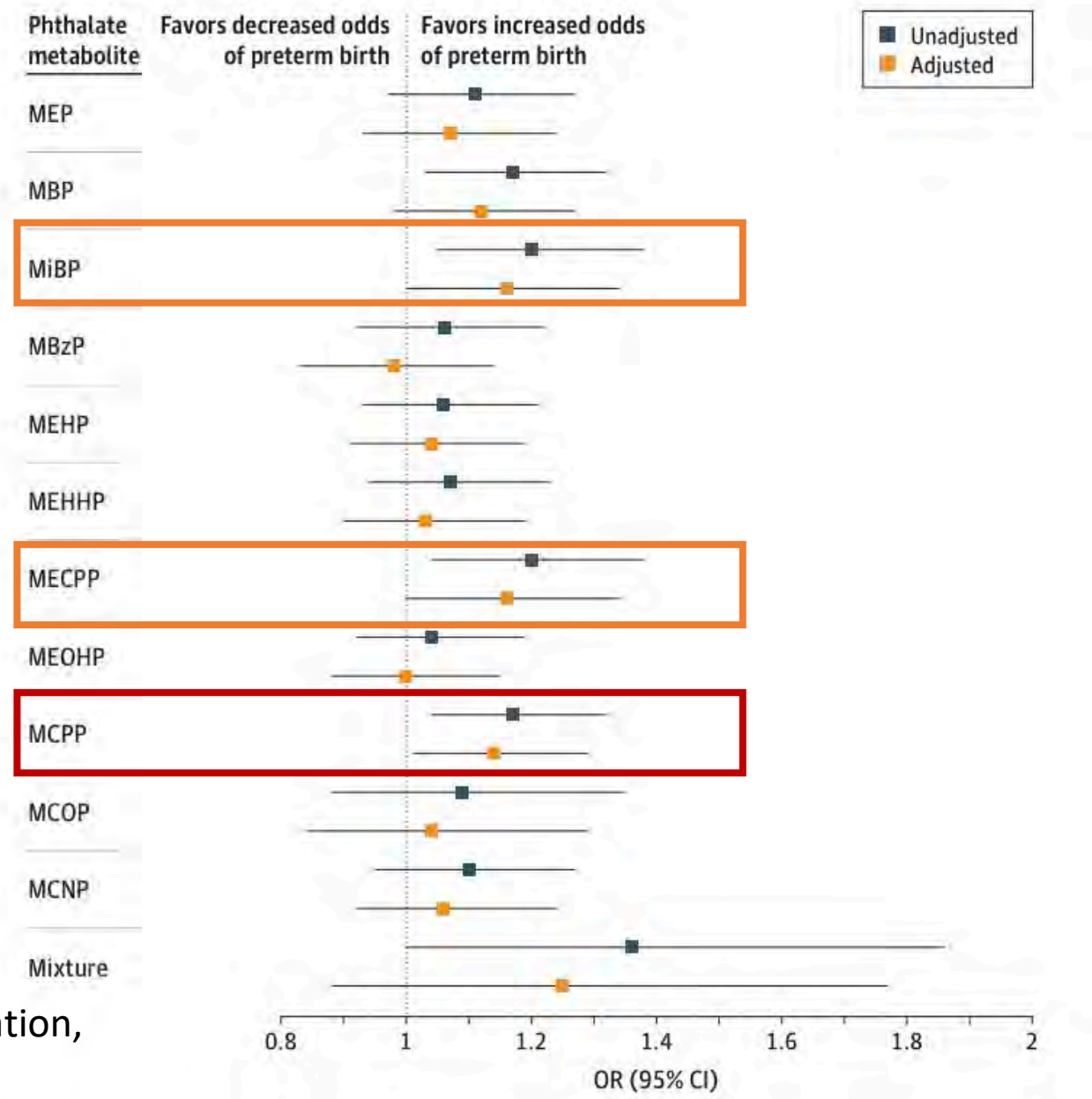
NHANES 2001-2008





James-Todd et al, Environ Health, 2014

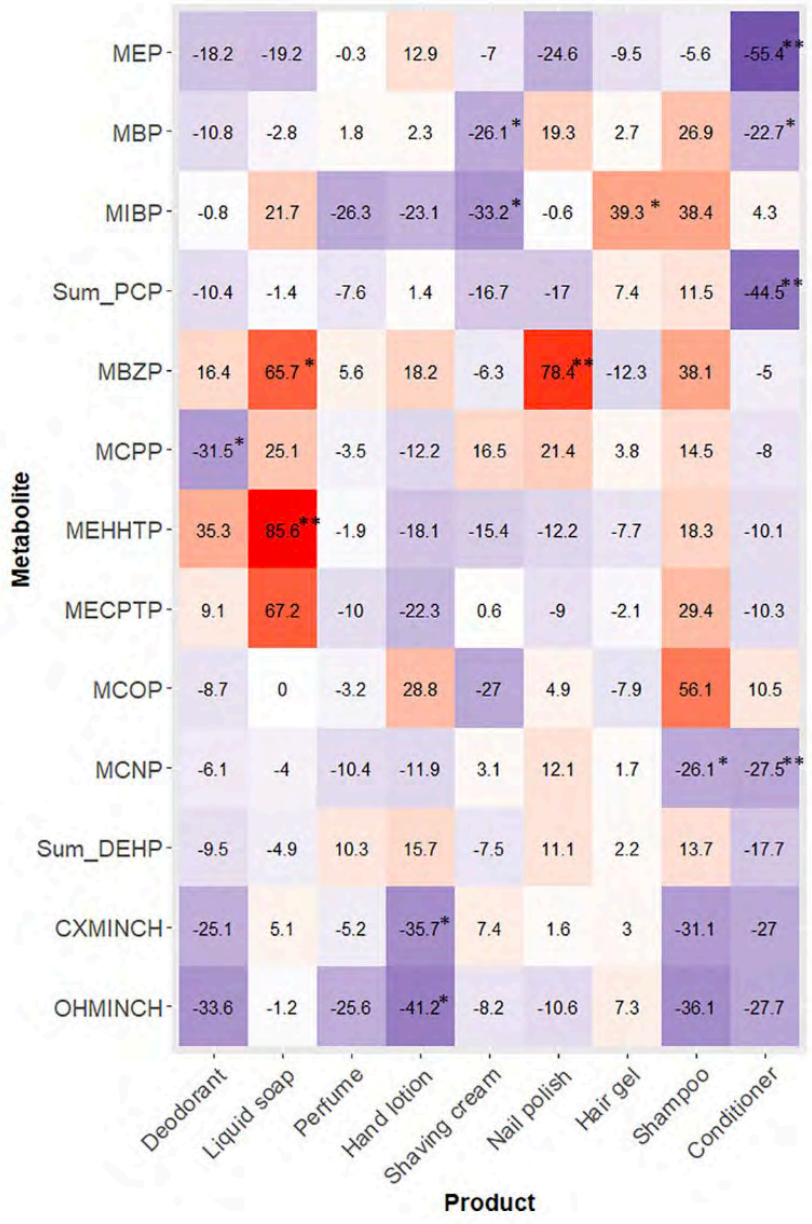
Phthalates and preterm birth

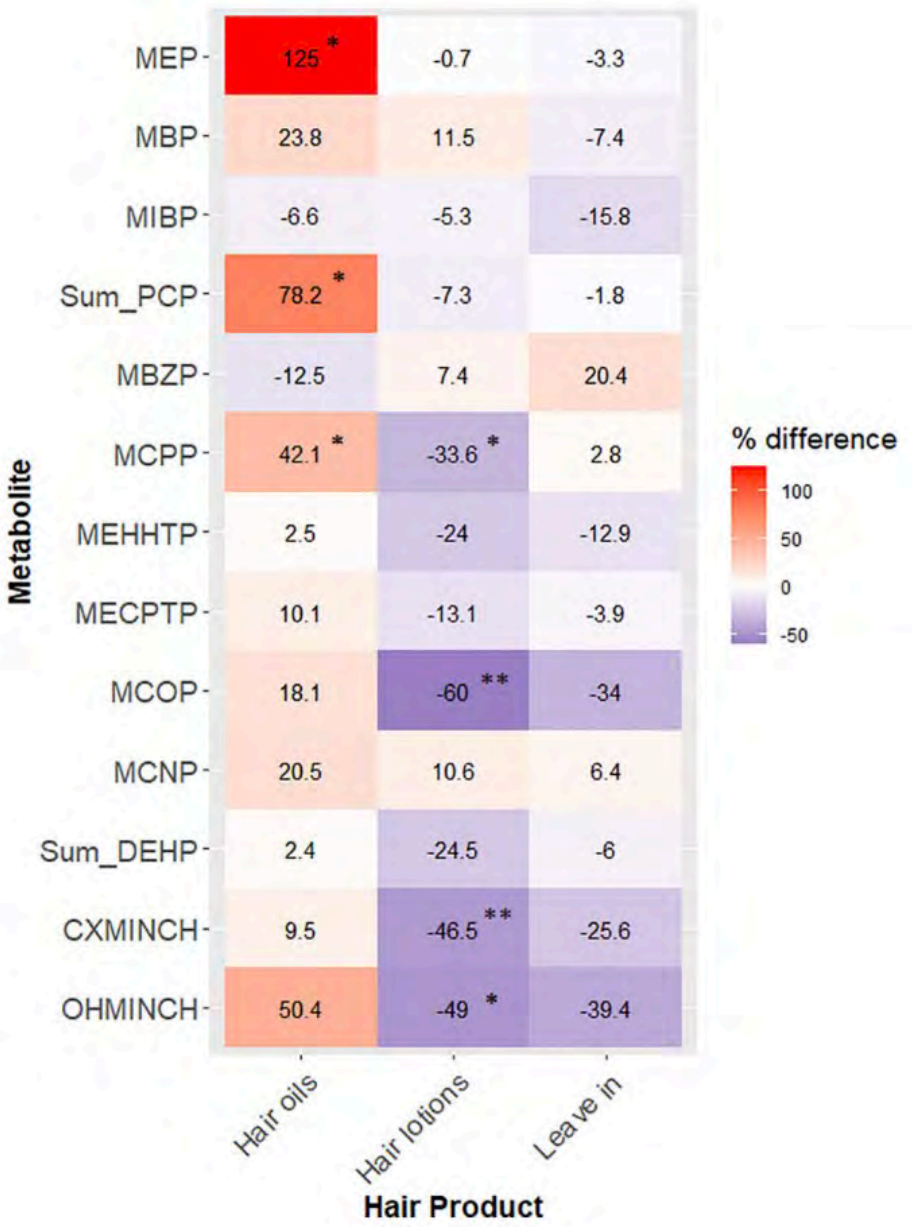


Adjusted for maternal age, race/ethnicity, education, and pre-pregnancy body mass index

Welch et al, JAMA Pediatr 2022

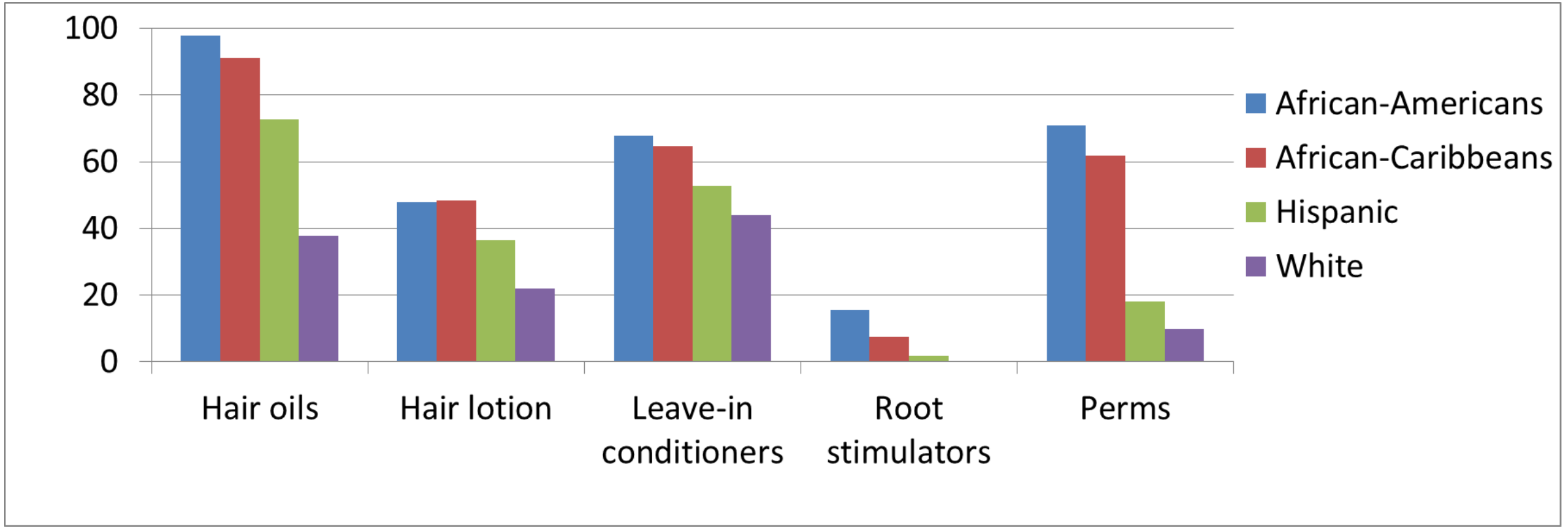
Product use and phthalate metabolite concentrations





Fruh et al, STOTEN 2022

Association between Race/Ethnicity and Hair Product Use



James-Todd, J Immigr Minor Health. 2012

Association between Hair Product Use and Preterm Birth:

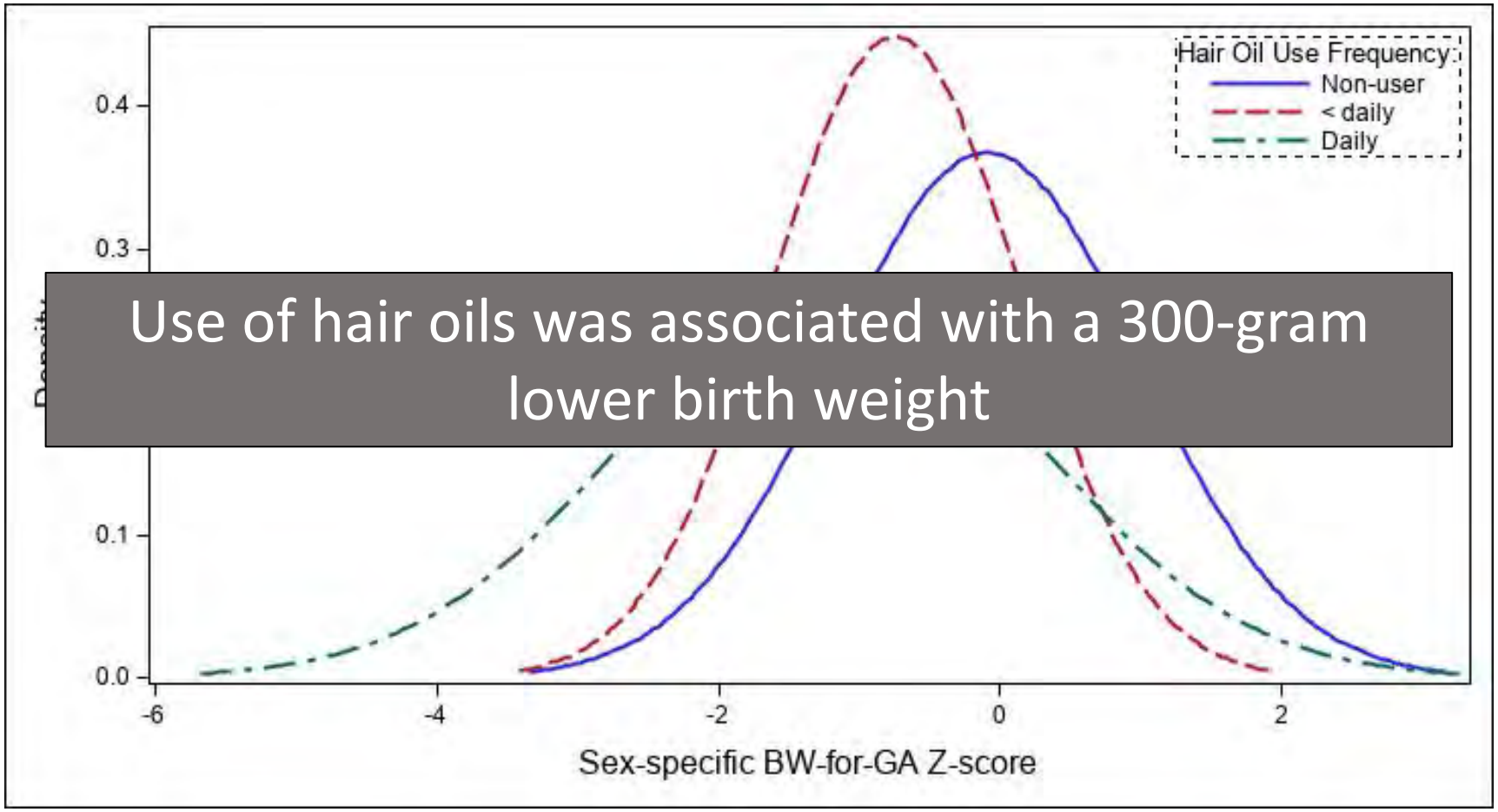
Visit Time Point	Hair oil use	Hair lotion use	Leave-in conditioner use
Visit 1			
Daily	-5.8 (-16.3, 4.7)	3.1 (-10.7, 16.9)	5.1 (-5.3, 15.6)
<Daily	0.5 (-6.7, 7.7)	-3.8 (-10.7, 3.2)	1.7 (-4.8, 8.2)
Never	Ref.	Ref.	Ref.
Visit 2			
Visit 3			
Daily	-1.0 (-6.7 4.6)	1.7 (-5.4, 8.7)	-2.5 (-11.5, 6.5)
<Daily	-1.3 (-7.0, 4.5)	-2.3 (-8.0, 3.5)	-2.5 (-7.1, 2.2)
Never	Ref.	Ref.	Ref.
Visit 4			
Daily	-8.3 (-14.9, -1.6)	-1.8 (-12.6, 9.0)	-2.1 (-9.6, 5.4)
<Daily	0.9 (-3.8, 5.7)	-3.0 (-9.0, 3.0)	-0.4 (-5.0, 4.3)
Never	Ref.	Ref.	Ref.

Daily use of hair oils in late pregnancy associated with an 8-day earlier delivery

ERGO

Preston and Fruh et al, Environ Res, 2021

Association between Hair Product Use and Birth Weight



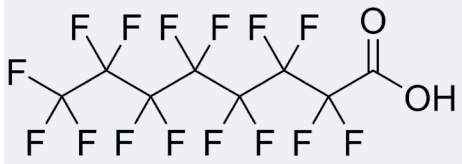
Use of hair oils was associated with a 300-gram lower birth weight

Chan et al, Env Res 2023

Two examples:

1. Phthalates and cardiovascular disease risk
2. **PFAS and cardiovascular disease risk**

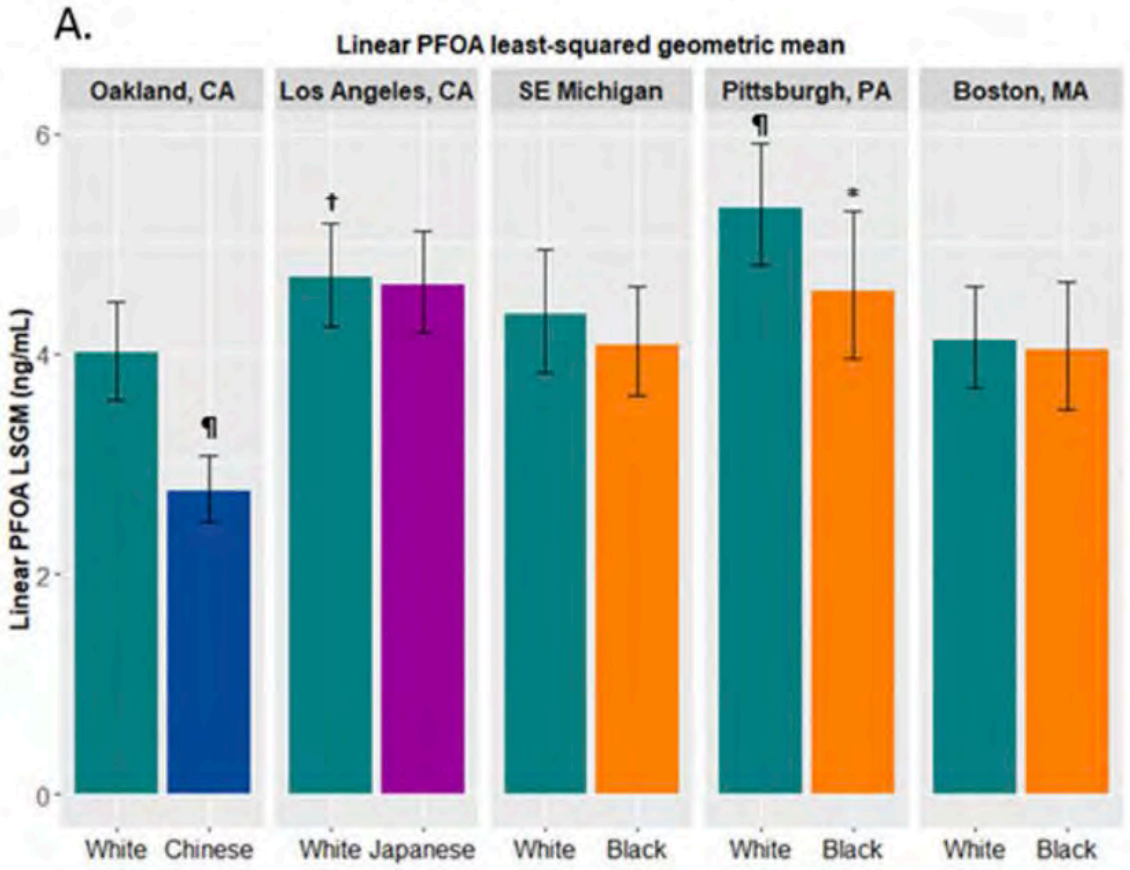
Examples of disparities in environmental chemical exposures

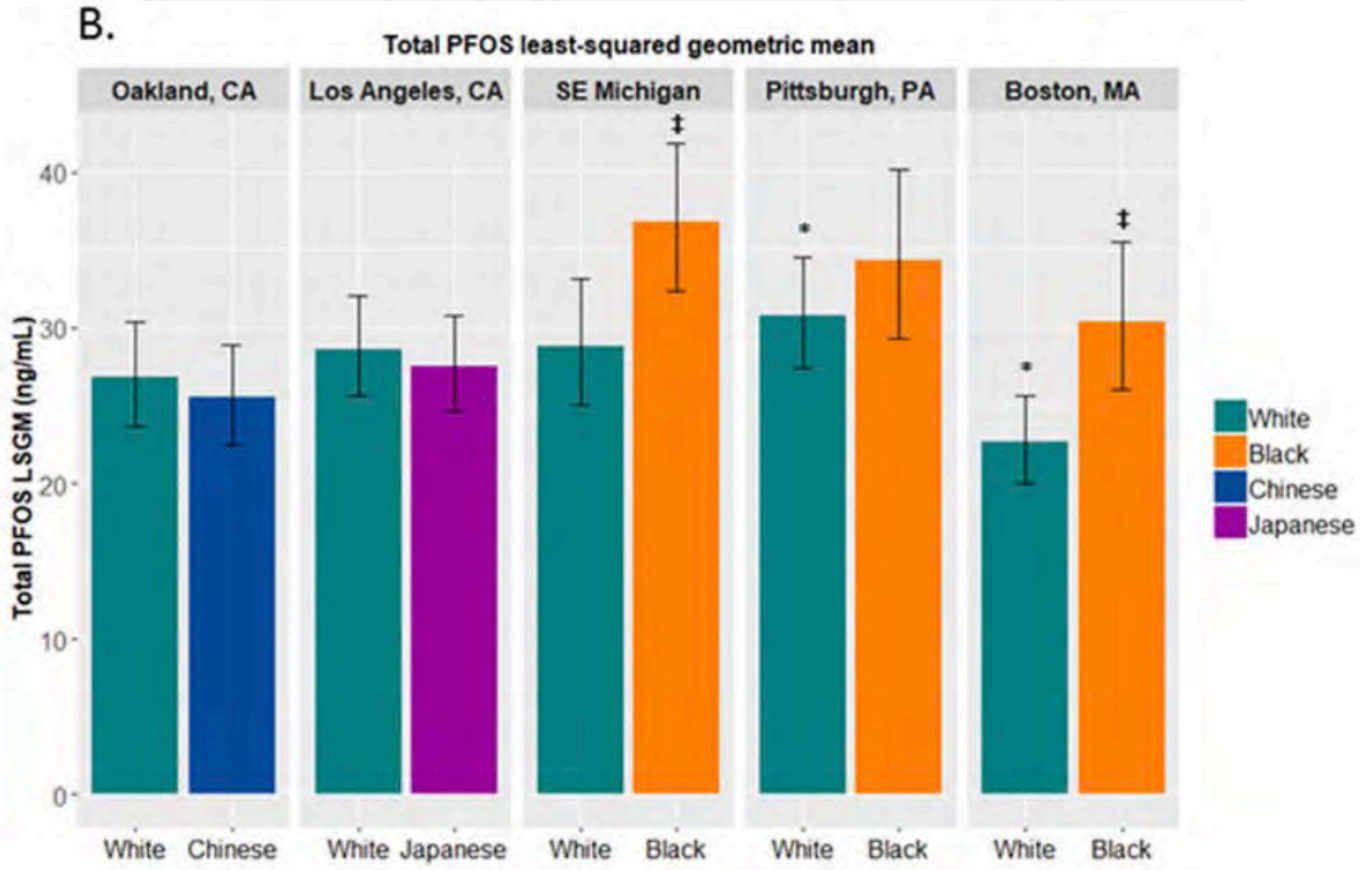


PFAS

Examples:

- ❖ Contaminated water
- ❖ Consumer products
- ❖ Occupational exposure





Park et al, Env Res, 2019

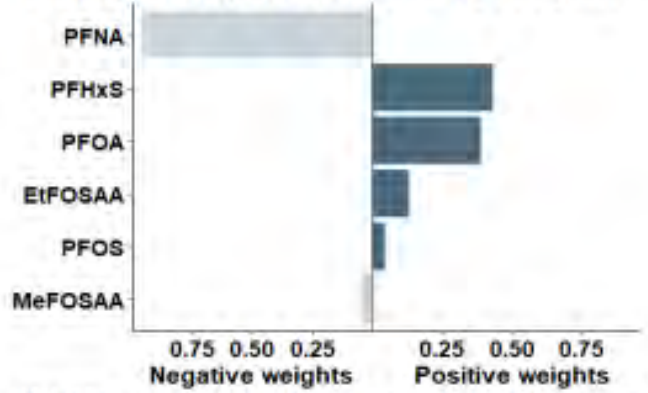
PFAS mixtures and hypertensive disorders of pregnancy

PFAS Mixture

Quantile g-computation results: effect of the PFAS mixture on the odds of GH & PE

- Each quartile increase in the PFAS mixture was associated with **1.40 (95% CI: 1.04, 1.87) greater odds of GH vs. Norm**

Figure 2. Quantile g-computation estimated PFAS weights for GH vs. Norm



Weights correspond to the proportion of the overall mixture effect in either the (+) or (-) direction for each individual PFAS

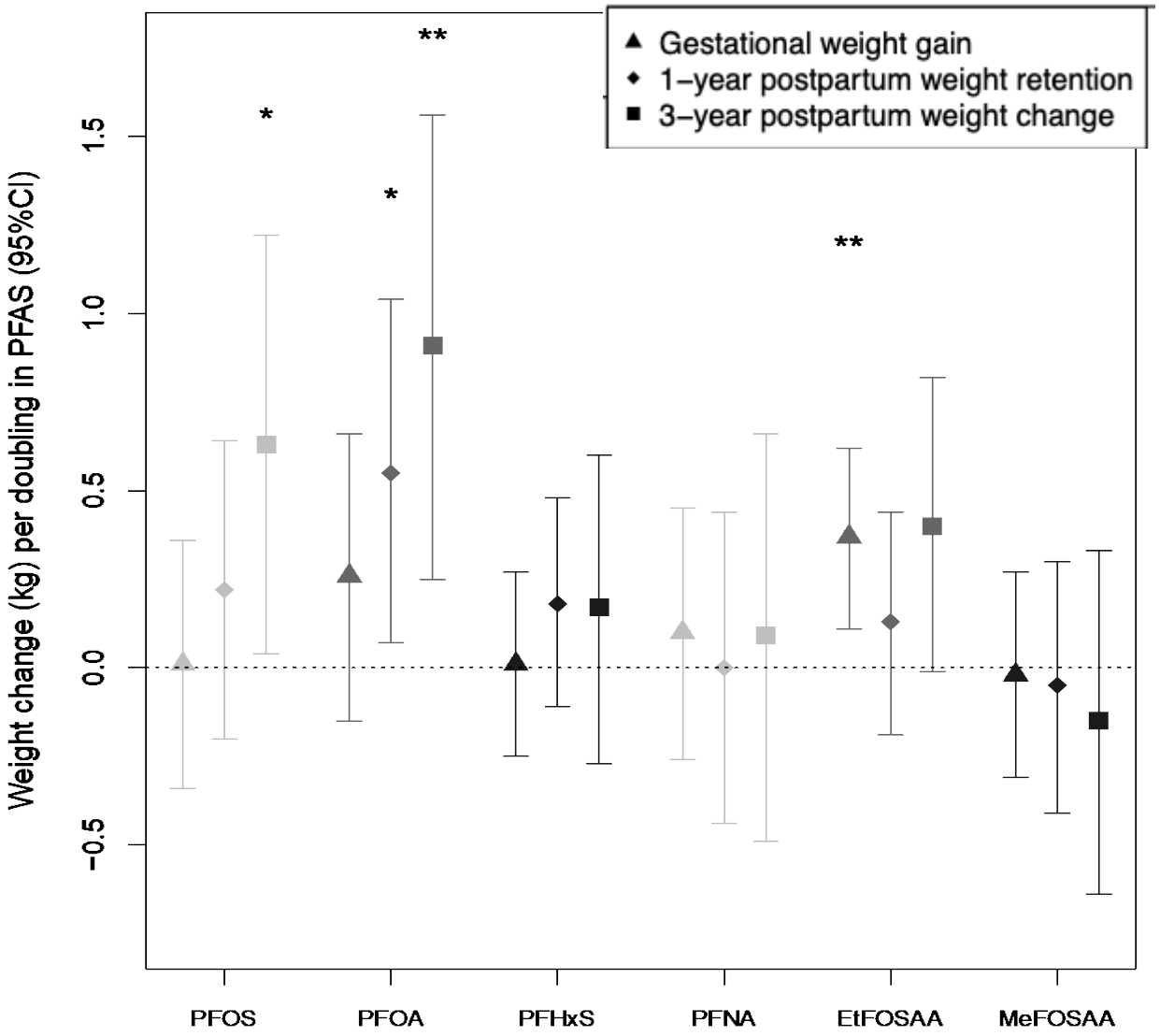
- The PFAS mixture was not associated with PE

- PFAS mixtures are associated with 40% increased odds of gestational hypertension
- PFHxS, PFOA, EtFOSAA, and PFOS contribute positively to the association between PFAS mixture and gestational hypertension
- No association between PFAS mixture and preeclampsia

All estimates adjusted for age, marital status, race/ethnicity, education, smoking

Preston et al, Env Int 2022

PFAS and Maternal Weight from Pregnancy to 3 years Postpartum



- Women gained 0.37 kg (95% CI: 0.11, 0.62) more **gestational weight** per doubling of EtFOSAA
- Women retained 0.55 kg (95% CI: 0.07, 1.04) more **at 1-year postpartum** per doubling of PFOA
- **3-year postpartum** : women gained
  - 0.63 kg (95% CI: 0.04, 1.22) more per doubling in PFOS,
  - 0.91 kg (95% CI: 0.25, 1.56) more per doubling in PFOA, and
  - 0.40 kg (95% CI: -0.01, 0.82) more per doubling in EtFOSAA

All estimates adjusted for age, pre-pregnancy BMI, marital status, race/ethnicity, education, household income, smoking, and parity

Mitro et al, Obesity 2019

From Documenting to Doing—Action Steps for Environmental Justice Epidemiologic Research

Identified a potentially modifiable risk factor!

Race/ ethnicity → *Environmental racism*
- *Structural/ place-based factors*
- *Cultural/ Behavioral*
- *Accessibility*
- *Availability*

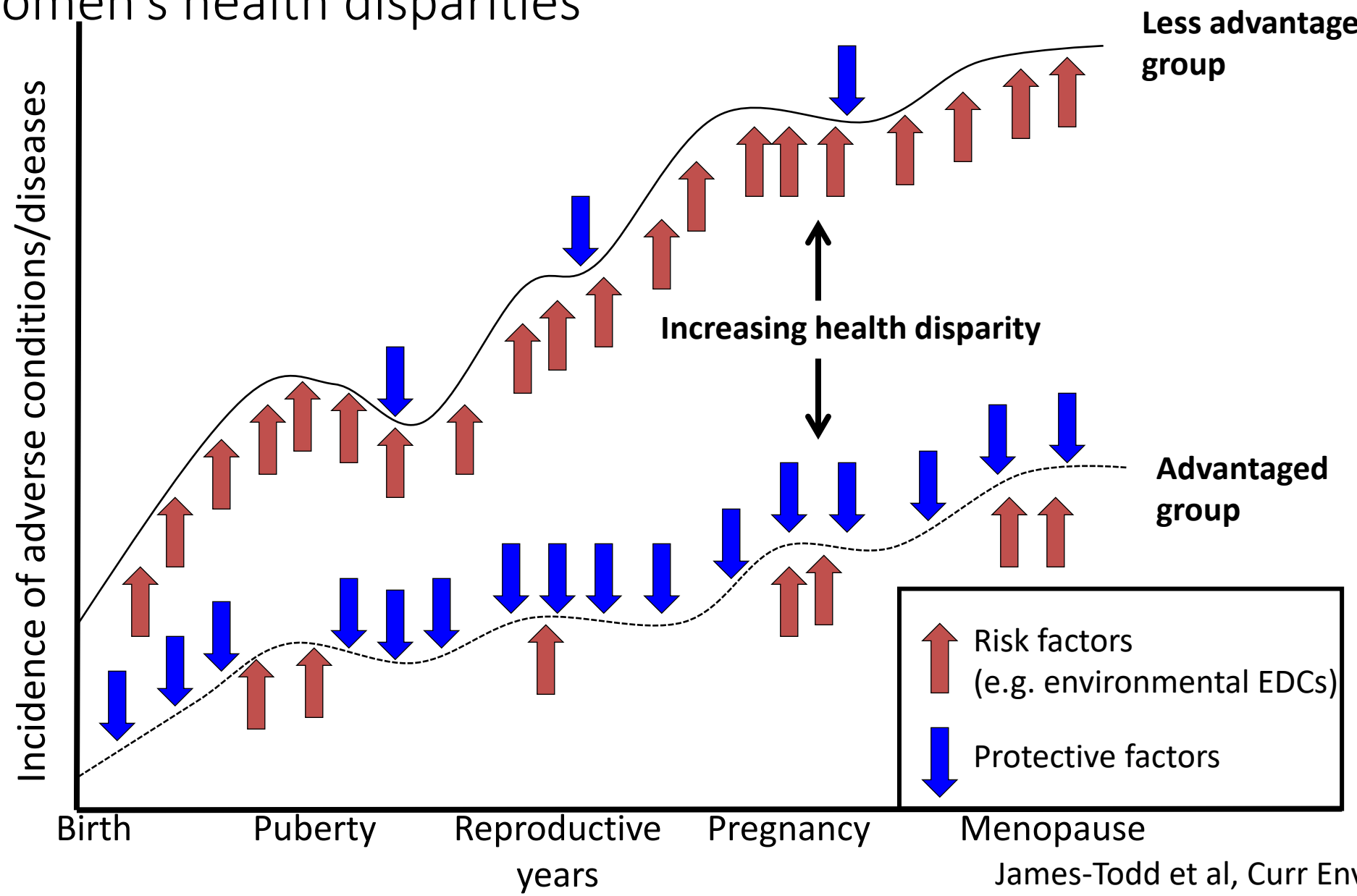
→ *Endocrine disrupting chemicals* →
- *Preterm birth*
- *Low birth weight*
- *Postpartum weight retention*

→ *CVD risk*

Considerations for improving research methods for addressing EDC-associated health disparities

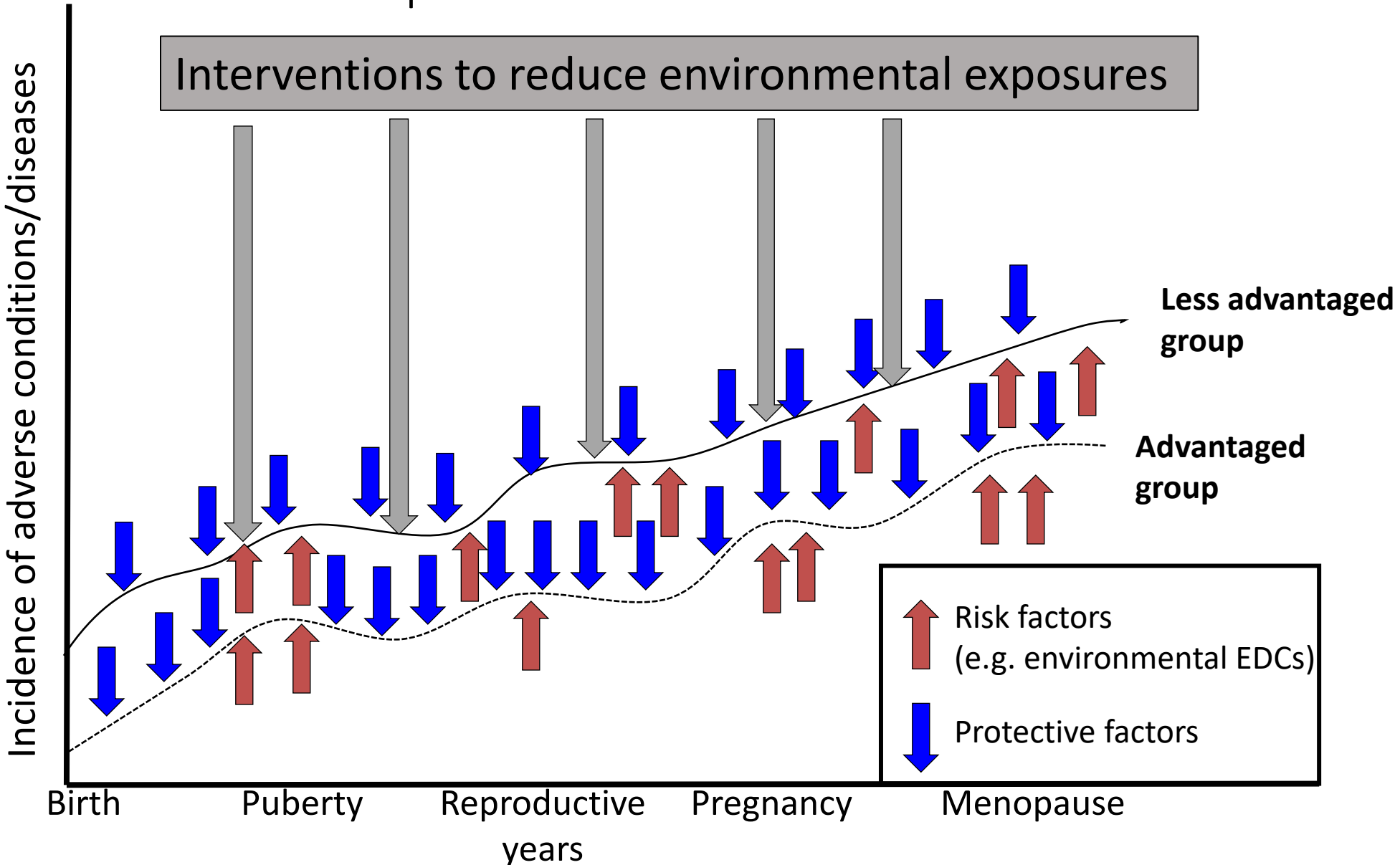
- Improve exposure assessment
- Expand toolkit of statistical methods
- Include mixed methods research – qualitative methods are equally important
- When enough information is available, consider intervention development
- Implementation science and effectiveness research
- Partner with communities and investigators in other fields

Contribution of unequal environmental exposures to increasing risk of adverse women's health disparities



James-Todd et al, Curr Env Hlth Rep 2016

Contribution of unequal environmental exposures to increasing risk of adverse women's health disparities



Acknowledgements

Environmental Reproductive Justice Lab: Marlee Quinn, MPH; Emma Preston, PhD; Kathryn Tomsho, PhD; Zifan Wang, MS; Marissa Chan, MS; Jordan Arvayo, MS; Azariah Boyd, BA; Gerardo Rodriguez, BA

ERGO/LIFECODES Study Team: Michele Hacker, ScD, Blair Wylie, MD; Thomas McElrath, MD, PhD; Ellen Seely, MD; Florence Brown, MD; Russ Hauser, MD, ScD; Paige Williams, PhD; Andrea Bellavia, PhD; David Cantonwine, PhD; Camille Powe, MD; Shruthi Mahalingaiah, MD; Karen O'Brien, MD; Marlee Quinn, MPH; Zifan Wang, MS; Emma Preston, PhD; Victoria Fruh, PhD, Antonia Calafat, PhD; Xiaoyun (Sherry) Ye, MS

Review article and conceptual model: Andrea Bellavia, PhD; Yu-Han Chiu, MD, ScD; Linda Valeri, PhD; Ami Zota, ScD

NHANES Study: Tianyi Huang, ScD; Richard Stahlhut, MD; Russ Hauser, MD, PhD; Sheena-Gail Powell, BS; Janet Rich-Edwards, ScD, Susanna Mitro, PhD; MyDzung Chu, PhD; Robin Dodson, ScD; Gary Adamkiewicz, PhD; Lucy Chie, MD; Florence Brown, MD

Project Viva PFAS: Emma Preston, PhD; Marie-France Hivert, MD; Abby Fleisch, MD; Sharon Sagiv, PhD; Wei Perng, PhD; Sheryl Rifas-Shiman, MS; Jorge Chavarro, MD, PhD; Emily Oken, MD; Ami Zota, ScD; Susanna Mitro, PhD

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Questions?

Contact: tjtodd@hsph.harvard.edu

For more information, visit the
Environmental Reproductive Justice Lab at:
https://projects.iq.harvard.edu/james-toddlab

Advancing Health Equity

Tonya Sharmaine Lane, M.S.

Cosmetic Chemist

Curly Chemistry

VIDEO RECORDING


Break
We will resume in Gather.Town at 11:15AM

Virtual Poster Session

Gather.Town

11:15AM – 12:30PM

Join us in Gather.Town for the Virtual Poster Session

How to Join Gather.Town

- Please join our sessions **currently in progress** in Gather.Town
- **The Gather.Town link is available in the chat box as well as on the website.**
- Detailed Gather.Town instructions can also be found on the website.
- Abstracts and posters are viewable on the symposium website and in Gather.Town.
- For assistance, please send a direct message or email to the contracting team:
  - Damon (RLA), damon.kane@roseliassociates.com
  - Sofia (RLA), sofia.jones@roseliassociates.com

Symposium Website

Upcoming Agenda

11:15 – 12:30 PM Virtual Poster Session in Gather.Town

12:30 – 1:00 PM Lunch


Lunch
We will resume at 1PM

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Alexandra Destler

SafetyNEST

Robin Dodson

Silent Spring Institute

Emily Hilz

Individual

Tiffany St. Bernard, Ph.D.

My Hair Days

Dr. Greg Hall, M.D.

National Institute for African American Health (NIAAH)

Erin Speiser

Hackensack University Medical Center

Jacqueline Brown

Empowerment Resource Center, Inc.

Moderated by Margaret Snyder

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Alexandra Destler

SafetyNEST

SafetyNEST®

Alexandra Destler, Founder & CEO: Alexandra@mysafetynest.com

WOMEN OWNED

Mission

Our mission is to dramatically reduce the incidence of preventable diseases linked to toxic chemicals and safeguard the future generations so they can grow and thrive.

AGENDA

- Why I Started SafetyNEST
- What I've Learned
- How We're Reaching Women to Safeguard Future Generations

Daily Exposure to Dangerous Toxic Chemicals

85,000 chemicals surround us daily
from flame retardants in bed mattresses to lead in lipstick.

Less than 1% of these chemicals
are tested by the EPA for safety or toxicity.

No enforcement in the US
that new chemicals be tested for safety
before chemicals go to market.

Early Exposure to Toxics is Directly Linked to Diseases

Early life toxic exposures can have **harmful effects across the full life span.**

Since the 70s…

- Rates of **childhood cancers are up 40%**
- **Learning disabilities now affect 1 out of 6 children** born in the US
- **Childhood asthma & obesity have tripled.**

Diseases linked to toxic chemicals:

- **Preterm birth**
- **Birth defects**
- **Diabetes**
- **Obesity**
- **Asthma**
- **Childhood cancers**
- **ADHD and other behavioral and cognitive problems.**

Childhood obesity has more than **doubled in last 30 years.**

***Sources**: UCSF Program on Reproductive Health and the Environment Icahn School of Medicine at Mount Sinai, Children's Environmental Health Center.*

Existing Health Care Gap
Safeguarding the Next Generation

Moms-to-be and New Families

are **unaware of risks or frustrated** & **lack credible guidance** on what's safe and what's not safe in their home.

Reproductive Health Professionals

Lack training, tools and expertise to counsel patients when women are motivated to make behavior change.

UCSF Health: https://obgyn.ucsf.edu/news/fewobcounseltoxins

All Women Want a Trusted, Easy & Reliable Solution.

What We Learned

Top Changes for a Healthier Pregnancy and Baby

How We're Reaching Women

Trusted Content

BetterNest ™ Score

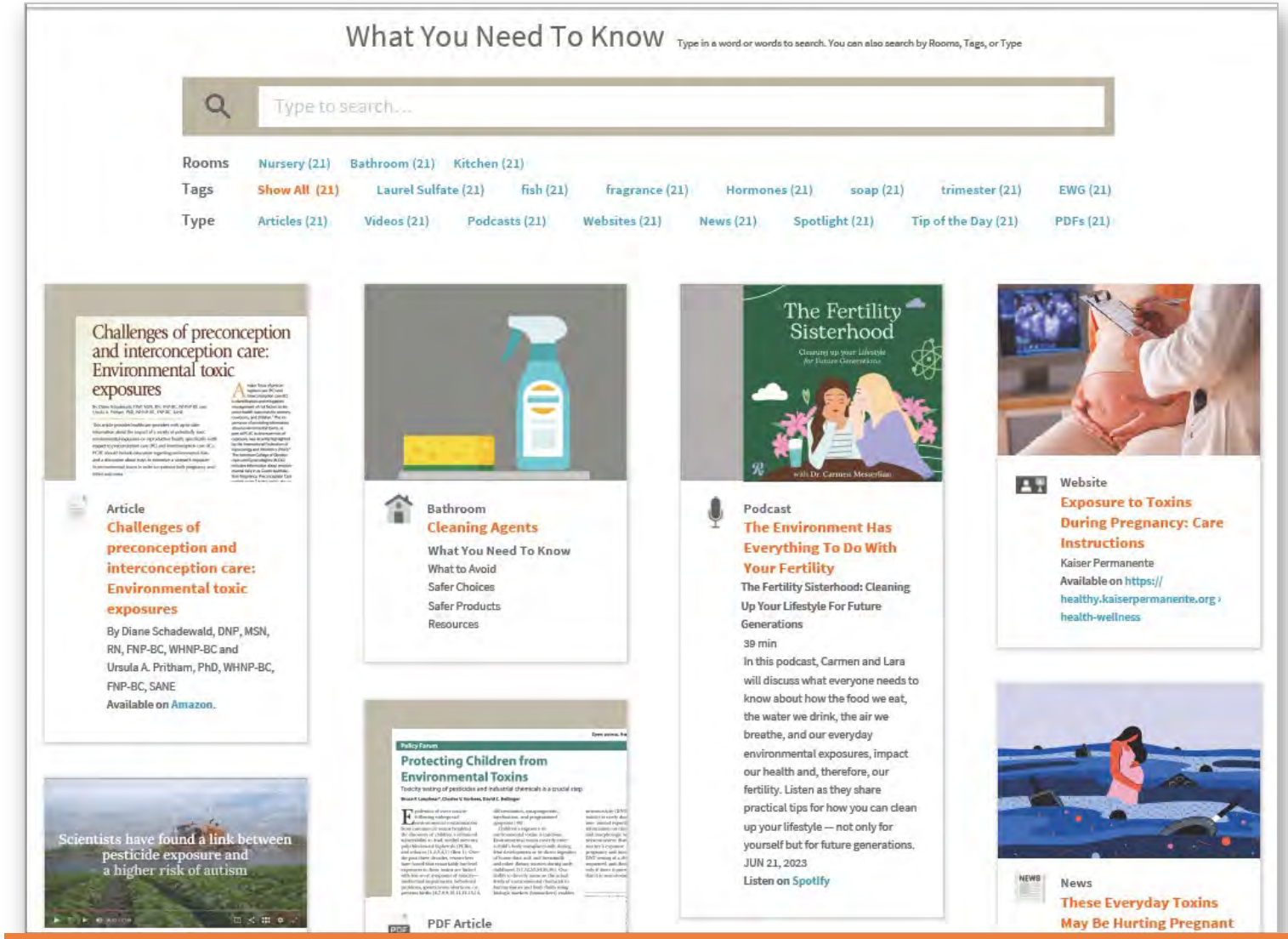
Health Professional Resources

Wellness Market

Social Media

Be the Change!

Trusted Content



CDC
Centers for Disease Control and Prevention

PEHSU
Pediatric Environmental Health Specialty Units

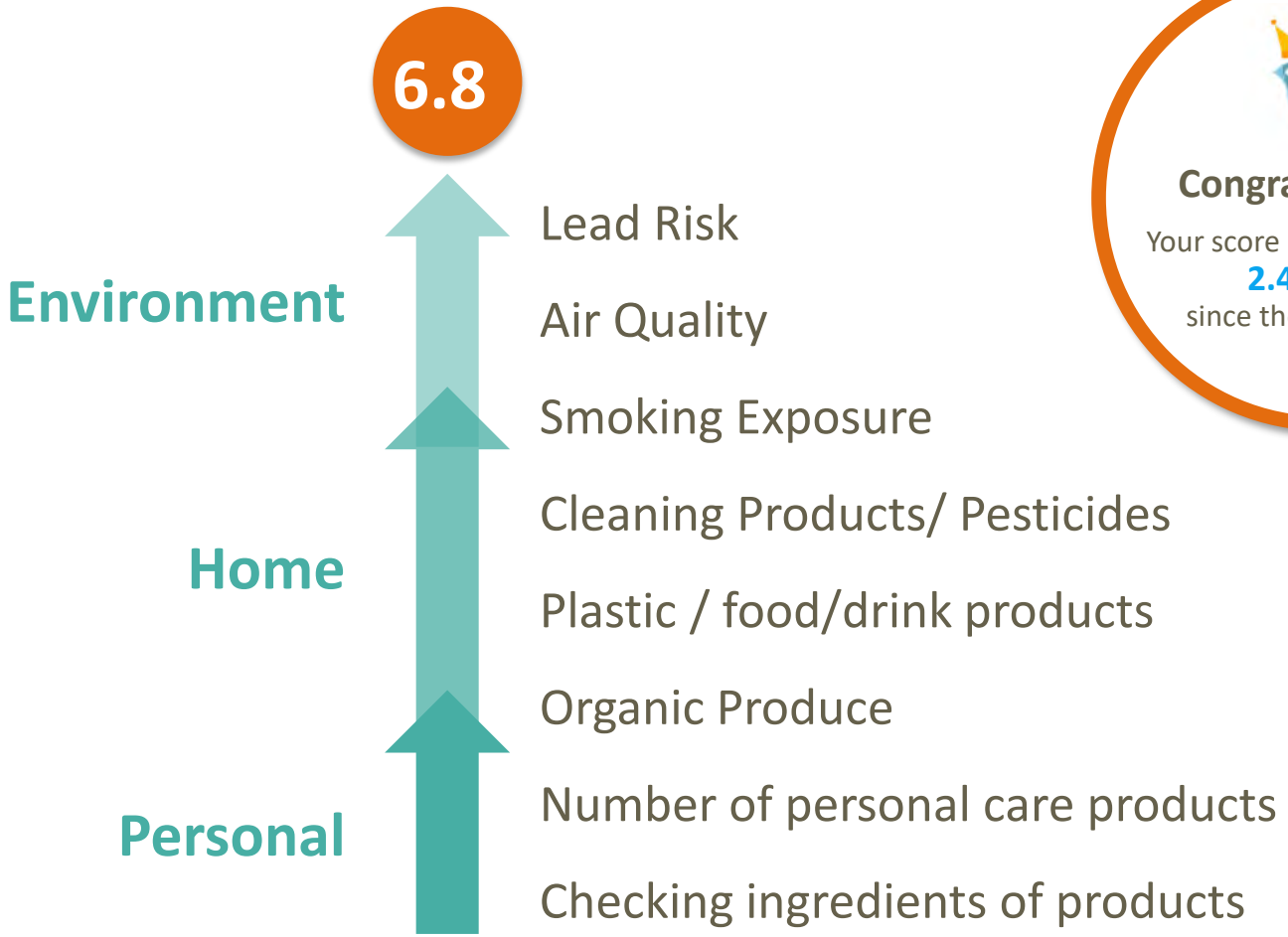
NIH
National Institute of Environmental Health Sciences

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

EPA

Accurate, Actionable and Affordable Guidance

BetterNest™ Score



Congratulations!

Your score has increased by
2.4 points
since the last update.

Accurate, Actionable and Affordable Guidance

Wellness Market

Your Location

95549

Desired Distance

Within 25 miles

Select a Category

- Fertility
- Lactation
- Doulas and Midwives
- Mental Health
- Acupuncture
- Home Green Audit

Tender Gifts Midwifery & Birth Center

Midwifery Circle City Women's Health Services Inc

East County Midwives

Fruitful Vine Midwives

Birth in Color Midwifery, LLC

Artemis

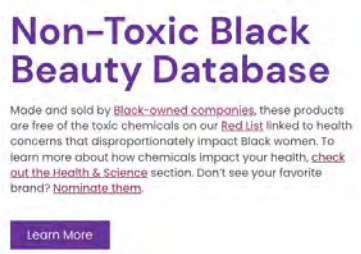
SafetyNEST on Social

YouTube

TikTok

Accurate, Actionable and Affordable Guidance

Safer Products – How to Find



Be the Change!

Engage in action to drive change locally and domestically by advocating for fair environmental health JUSTICE and protection policies.

SafetyNEST®

Re-Launching Fall 2023:
www.mysafetynest.com

Contact:
Alexandra@mysafetynest.com

Thank you.

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Robin Dodson
Silent Spring Institute

Product Options in Women-Engaged Research (POWER) Project

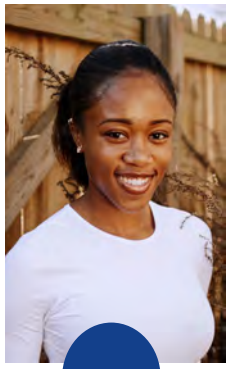
Dr. Elissia Franklin, Aleyana Momplaisir, Lilly Marcelin, Dr. Robin Dodson

SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

Resilient Sisterhood Project
A Window into Women's Reproductive Health and Wellness

Silent Spring Institute

Silent Spring Institute is a leading scientific research organization dedicated to understanding the links between environmental chemicals and women's health.



SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

Resilient Sisterhood Project

RSP is a non-profit organization raising awareness and empowering women and young adults of African descent affected by diseases of the reproductive system.

Resilient Sisterhood Project
A Window into Women's Reproductive Health and Wellness

Putting together a team for social media influence

1. Identified 50 social media content creators across multiple niches
2. Pitched over 30 creators to be a part of the POWER team
3. Onboarded a team of 10 social media influencers

Influencer Deliverables

- Attend interactive and informational workshop
- Create and post 1-2 content pieces for social media
- Share a survey with their audience
- Report post analytics and audience feedback

SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

Resilient Sisterhood Project
A Window into Women's Reproductive Health and Wellness

Instagram Post

Metrics

25,000+
Views

1800+
Likes

80+
Saves

60+
Shares

A wide range of content is being created

N'Dea

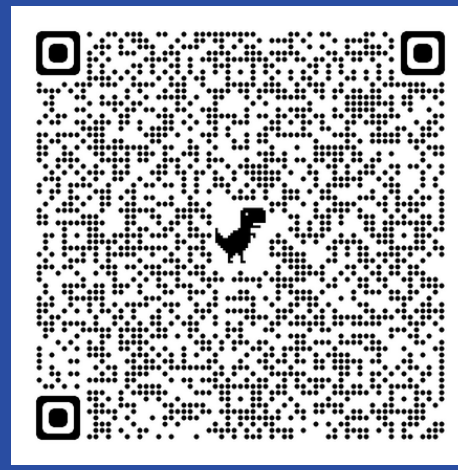
@bmekween

TikTok

Beverly

@curlybeviie

Instagram



Korie

@teamkorie

LinkedIn

Robyn

@robynmneal

Instagram Reel

Audience feedback

74%

Increased their concern about how chemicals in products may affect their health

83%

Previously heard about chemicals in products affecting health

43%

May start avoiding chemicals of health concern in the products that they purchase

Based on 187 survey participants

> So true and very personal for me since I have also had similar struggles! Thanks for sharing and working towards educating more black women about how we can take more informed care of our bodies. 🙌♡

> Thanks, [...] for this Call to Action! [...] This beautiful reminder recharges us to take ownership.

> I really love this! I'm really critical about what I put in and put on my body but I still have so much to learn about the different chemicals that go into these everyday products..

From LinkedIn and Instagram viewer comments

Our impact

Metrics

114,000+

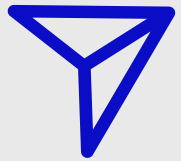
Views

8700+

Likes

900+

Saves



1400+

Shares

Is social media an effective way to reach Black women with information about EDCs in products?

Connect with us

SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

www.silentspring.org
@SilentSpringIns
@silentspringinstitute
@silentspringinsitute

Resilient Sisterhood Project
A Window into Women's Reproductive Health and Wellness

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Robyn

@robynmneal

Food | Lifestyle

Lisa

@fitlisag

Fitness | Health

Korie

@teamkorie

Science | Lifestyle

Camille

@iamcamillesmith

Beauty | STEM

Beverly

@curlybeviie

Beauty | Lifestyle

N'Dea

@bmekween

Sustainability | Lifestyle

Ijeoma

@ijeomakola

Lifestyle | Empowerment

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

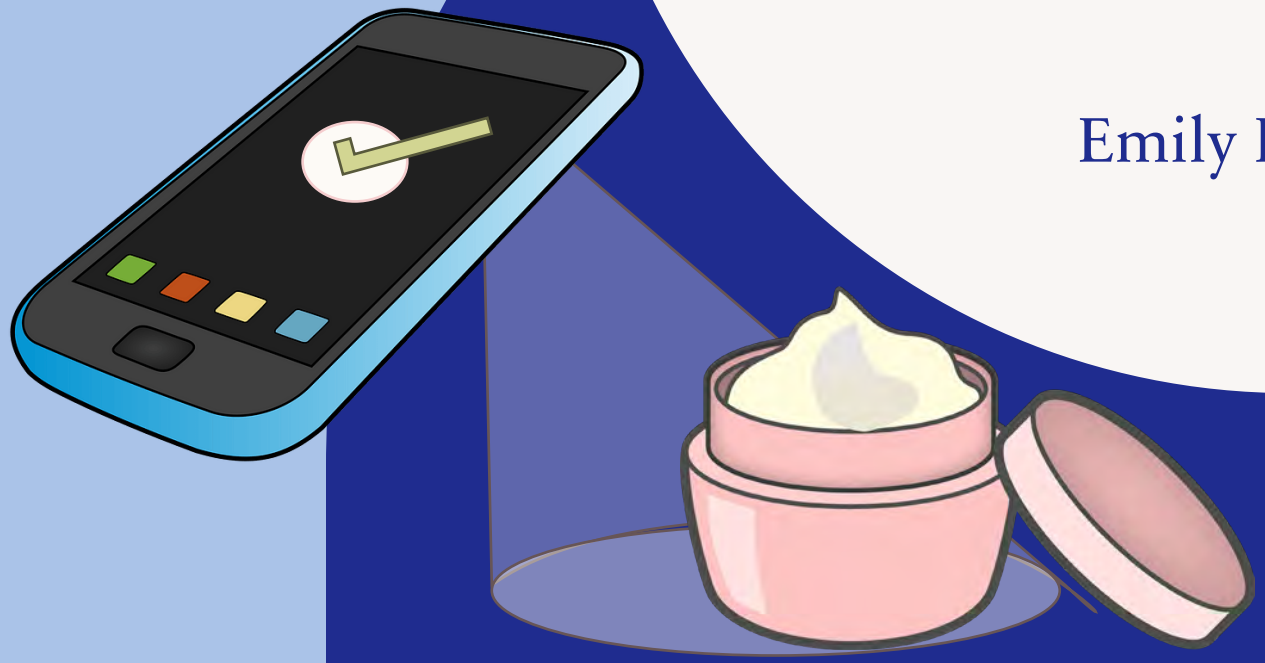
Emily Hilz

Individual

ENDOSCREEN:

AN APP FOR INCREASING BLACK WOMEN'S AWARENESS OF EDCS IN PERSONAL CARE PRODUCTS

Emily Hilz, PhD



Public perception of the risk associated with the use of EDC-containing products is low.

- low awareness of personal routes of exposure such as in consumer products.

BLACK WOMEN ARE DISPARATELY EXPOSED TO EDCS VIA TARGETED CARE PRODUCTS

Black women are exposed to EDCs because of socioenvironmental factors:

- natural hair discrimination
- colorism
- stigma surrounding feminine hygiene

Modest reductions in exposure meaningfully improve health.

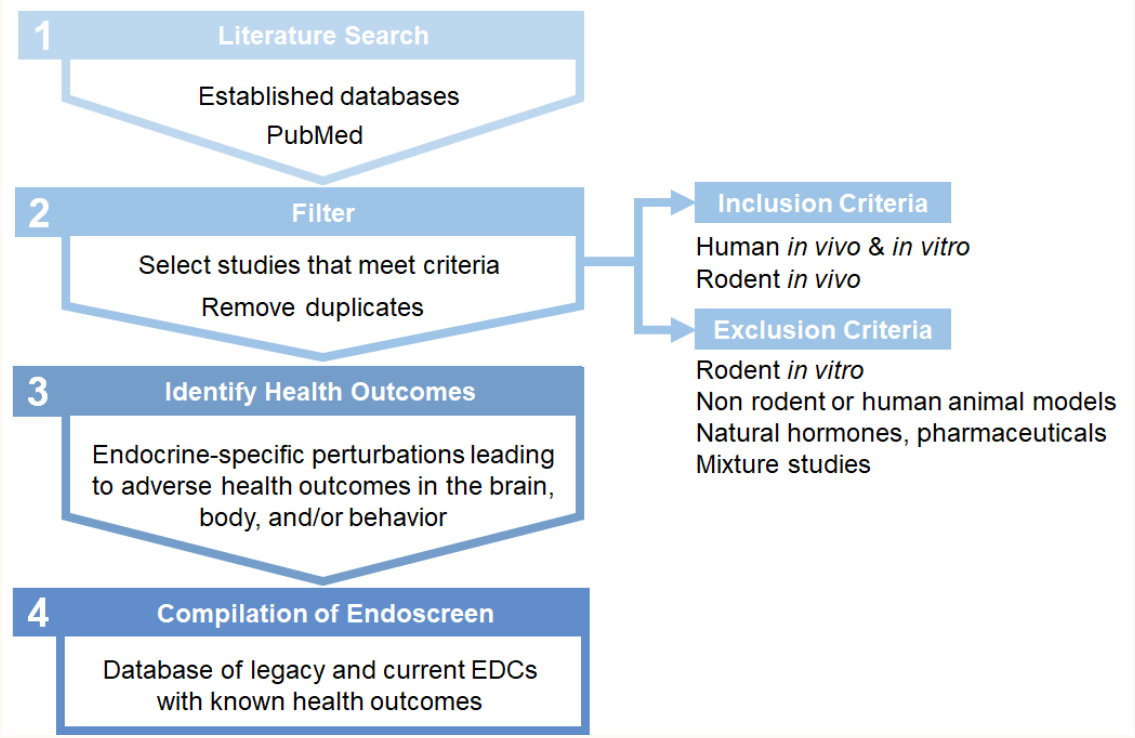
Dodson et al., 2021; James-Todd et al., 2012;
Bethea et al., 2020; Branch et al., 2015; Welch et al., 2022

ENDOSCREEN

Mobile app development to
increase awareness of / reduce exposure to EDCs

EDC DATABASE	OCR	REPORT BACK	OUTREACH	USER FEEDBACK
Built on a database of known and/or suspected EDCs + their adverse health effects.	Scans product ingredients list to recognize EDCs.	Reports information regarding detected EDCs and their associated health outcomes.	Designed with education in mind. Partner with black brand ambassadors, business owners, and community leaders.	Collection of non-identifying demographic information; patterns-of-use, demographics, and report back data.

THE DATABASE



Used systematic review to identify EDCs with known health impacts.

- Mix of automated (PubMed api) and manual scanning (specific chemical and outcome).
- Used frequency analysis to assess relevance.

Modeled after DEDuCT; updated methods and criteria, removed duplicates.

- Added ~1300 papers not included in DEDuCT 2.0 for a total of ~14,000 entries and 861 unique EDCs.

Karthikeyan et al., 2019, 2022

USER EXPERIENCE

SCAN A LABEL

"Optical Character Recognition" converts text from a picture to machine-readable format.

- Singles out letters and categorizes those as words that can be referenced to the database.

REPORT BACK

Provides a report to users about EDCs in their product(s)

- Health outcomes
- Number of peer-reviewed articles

Report back increases understanding and feelings of empowerment.

EDUCATION

Educational features include:

- What are EDCs?
- Health Impacts.
- Tips for avoiding EDCs.

Later releases:

- Personal exposure tracker.

(1) image acquisition (2) conversion to readable characters (3) Comparison to database & report back

REACHING THE BLACK COMMUNITY

"Endoscreen is designed to be used by any person in any circumstance… but we are working specifically to reach black women and members of their and other disproportionately exposed communities."

ENDOSCREEN IS UNIQUE

Works independently in real-time.
No manual databasing of individual products / backend screening staff.

EVIDENCE-BASED

Uses established accessible commination techniques.
Addresses uncertainty without undermining confidence.
Provides empowering action to choose between products.
Works to achieve these goals within a community context.

AND LIVE!

Visit **endoscreen.org** or scan the OR code to view our beta.
Our outreach campaign begins in earnest August 2023!

SCAN ME

ENDOSCREEN.ORG
Know what you're using

THANK YOU

HHS OFFICE ON WOMEN'S HEALTH

THE ENDOSCREEN TEAM:

EMILY HILZ
Project lead and research specialist

ROBERT PERCE
Full Stack Engineer;
SysAdmin & implementation

FORREST MCDONALD
Software engineer;
prototype & DB wrangling

ehilz@utexas.edu
emilyendocrine
Emily N. Hilz

SCAN ME

ENDOSCREEN.ORG
Know what you're using

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Tiffany St. Bernard, Ph.D.

My Hair Days

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Dr. Greg Hall

National Institute for African American Health (NIAAH)

NATIONAL INSTITUTE FOR AFRICAN AMERICAN HEALTH

& EDC Education

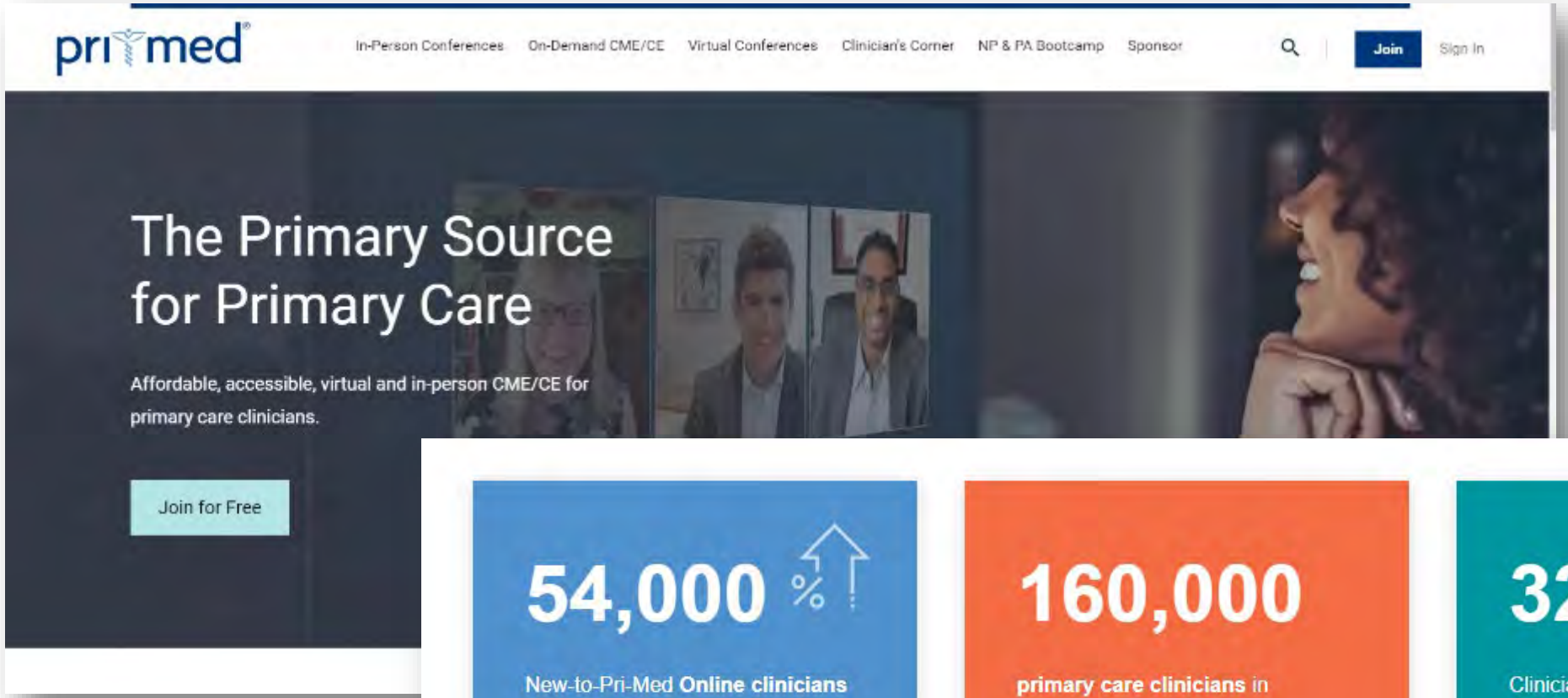
Gregory L. Hall, MD

Founder & Board Chair, National Institute for African American Health

Medical Director, Cutler Center for Men, University Hospitals of Cleveland
Associate Professor of Integrative Medical Sciences, Northeast Ohio Medical Univ.
Associate Professor of Internal Medicine, Northeast Ohio Medical Univ.
Assistant Clinical Professor in Medicine, Case Western Reserve University School of Medicine

Multipronged Approach to Education

- Physician Education
- On-line Resource
- Video Education with Social Media
- Podcast Interviews
- Community Partnerships



54,000

New-to-Pri-Med **Online clinicians** since 2020

160,000

primary care clinicians in Pri-Med's national database

32,590

Clinicians **registered** for *PrimaryCareNOW* in 2022

pri med

Bridging the Gap

Endocrine Disrupting Chemicals (EDCs) and their Impact on the Health of Women of Color

primed

Gregory L. Hall, MD

Medical Director, Cutler Center for Men, University Hospitals of Cleveland
Associate Professor of Integrative Medical Sciences, Northeast Ohio Medical Univ.
Associate Professor of Internal Medicine, Northeast Ohio Medical Univ.
Assistant Clinical Professor in Medicine, Case Western Reserve University School of Medicine
Founder & Board Chair, National Institute for African American Health

On-Line Access

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Hormone Disrupting Chemicals (EDCs) are Throwing Black Women's Systems Off

by NIAAH Editors | Apr 23, 2023 | EDC & Black Women

By Essence Maston, PhD & Greg Hall, MDA lot has been written in the news about endocrine disrupting chemicals, or EDCs. Many of these chemicals are found in shampoo, lotions, conditioners, lipstick, makeup, moisturizers, sunscreens, creams,

NIAAH NATIONAL INSTITUTE FOR AFRICAN AMERICAN HEALTH

Is Plastic Damaging Black Women's Health?

by NIAAH Editors | Apr 23, 2023 | EDC & Black Women, Medical Experts & Research, Our Health | 0 comments

By Essence Maston, PhD & Greg Hall, MD

Many of the plastics that we use could be damaging to our health. Do you store food in plastic containers or even wrap food in plastic wraps? Science has shown that small amounts of dangerous chemicals are absorbed by the food while they are in direct contact. These chemicals could change the level of hormones in your body. Some believe the higher occurrence of infant and mother mortality, diabetes, and obesity may be related to these chemical exposures . . . particularly in African American women.

The overall safety of plastics has been the topic of many debates. Should plastic be banned? Should containers be re-used – if so, how many times is too many? What precautions should be taken? What is "BPA"?

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Apr 23, 2023

Is Plastic Damaging Black Women's Health?

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Minority patients benefit from having minority doctors, but that's a hard match to make

February 6, 2023

Not all calories are equal – a dietitian explains the different ways the kinds of...

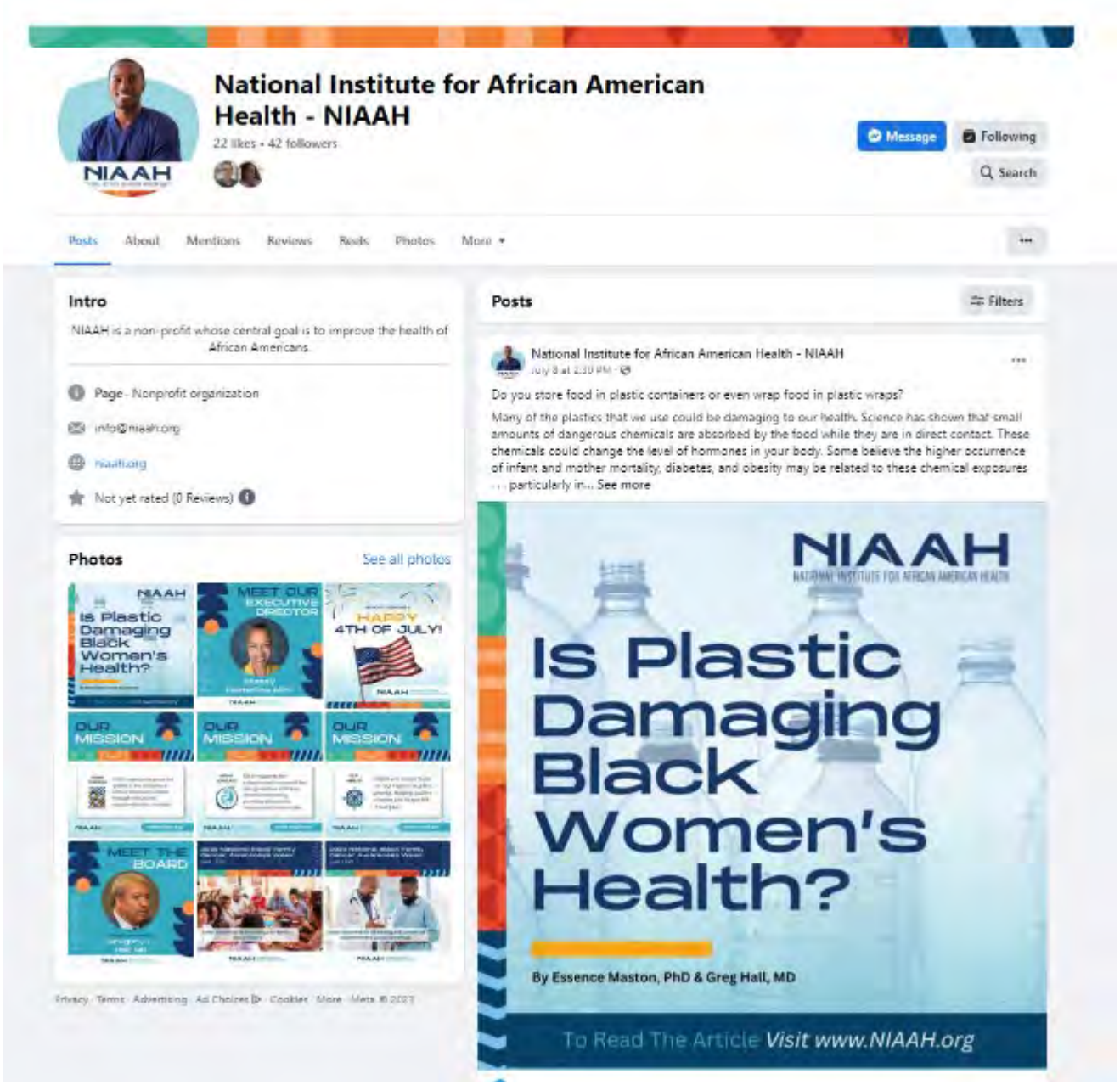
January 2, 2023

Blacks are at higher risk for Alzheimer's, but why?

November 23, 2022

Next »

SOCIAL MEDIA



Instagram

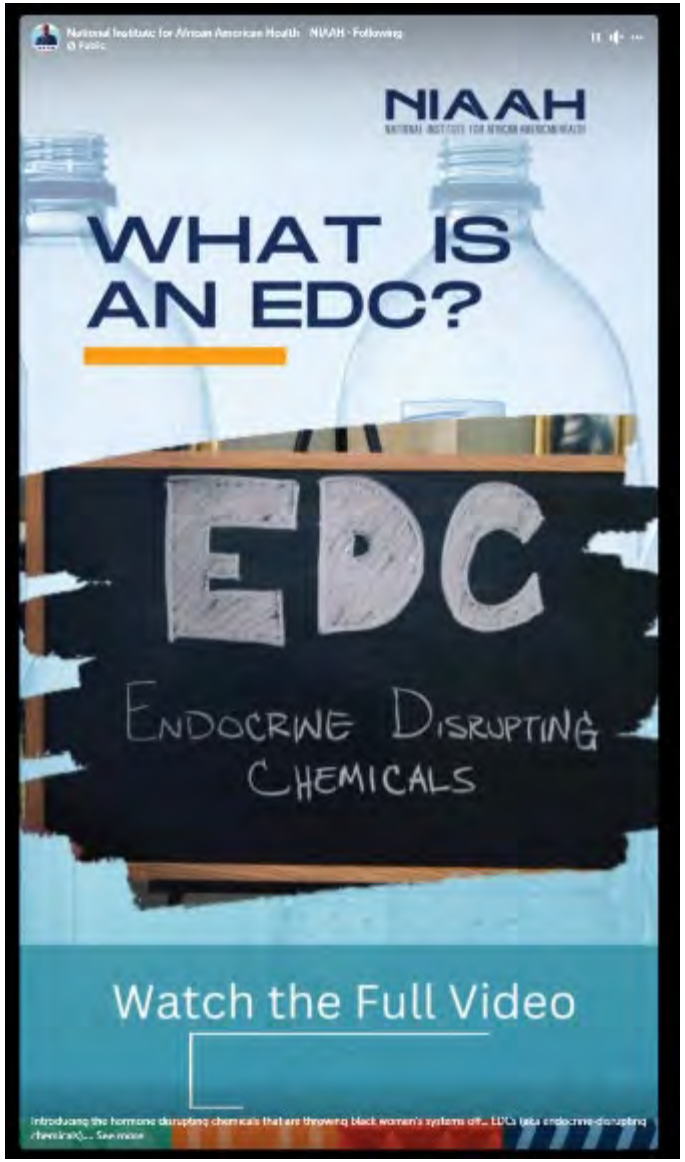

PLASTIC
VS
GLASS
BPA chemicals can leach into food and liquids
Non-toxic
May break down from overuse at high temperatures over time
Capable of withstanding high temperatures
Chemicals can change the level of hormones in your body (EDCs)
Free from EDCs
To Learn More: Visit www.NIAAH.org

Three Videos Produced for Our Campaign

Beyond the Surface: Examining EDC Exposure (FULL VIDEO)| EDC...

EDC Awareness "Two Women-Split Screen" Full Frame | NIAAH.org

"It's Just Hairspray" (Full Frame) | EDC Awareness Video | NIAAH.org

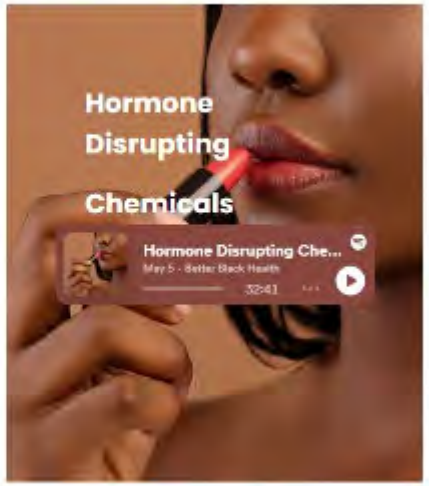

NIAAH
WHAT IS AN EDC?
EDC
ENDOCRINE DISRUPTING CHEMICALS
Watch the Full Video


IT'S JUST HAIRSPRAY
0:01 / 2:58

PODCAST

BETTER BLACK HEALTH with Dr. Greg Hall

Get the latest health information and hear the most interesting people in the country talk about ways to improve your health



Community Partnerships

The she Foundation, Incorporated

The Philanthropic Arm of Swing Phi Swing Social Fellowship, Inc.®
Supporting Health and Education Initiatives

Richmond Hts.
Health Consortium

NATIONAL CONGRESS OF BLACK WOMEN

FOUNDED IN 1984

Beyond the Surface: Examining EDC Exposure (FULL VIDEO)| EDC...

The She Foundation, Incorporated
The Philanthropic Arm of Swing Phi Swing Social Fellowship, Inc.®
Supporting Health and Education Initiatives

NIAAH
NATIONAL INSTITUTE FOR AFRICAN AMERICAN HEALTH

& EDC Education

primed

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Erin Speiser

Hackensack University Medical Center

New Jersey Healthy Salon Workers Training to Reduce Endocrine Disrupting Chemical Exposure Risk among Black Women

Reaching the next generation of cosmetologists

Erin Speiser, PhD, MA, CCRP – Principal Research Associate, Center for Cancer Health Equity, Cancer Institute of NJ, Rutgers University (previously at Hackensack Univ. Medical Center)

Traci N. Bethea, PhD, MPA – Assistant Professor, Office of Minority Health and Health Disparities Research, Georgetown Lombardi Comprehensive Cancer Center

Derek G. Shendell, D.Env, MPH – Professor, Department of Environmental & Occupational Health & Justice; Director, New Jersey Safe Schools Program (NJ SS), Rutgers School of Public Health

Background

- Hairdressers and stylists, barbers, nail technicians, aestheticians and other salon professionals work daily with a wide variety of chemicals, many of which have hazardous properties.

- Research to date has documented that chronic exposure to chemical toxicants currently found in hair and nail preparations can cause adverse health effects such as contact dermatitis, asthma and allergies, and may increase risk of cancer and negative reproductive outcomes.

https://thenounproject.com/

Background (cont.)

- Hair care and styling products are particularly important as they include chemical relaxers, bonding glues for hair extensions, and other products containing chemical mixtures - a potential “toxic soup” of ingredients not tested for long-term health and safety.

- To date, there is no known cosmetology training program for Black/African American (AA) salon workers including both content on the health hazards of endocrine disrupting chemicals (EDCs) and how to protect oneself from exposure in the salon setting.

Our HHS Challenge Study

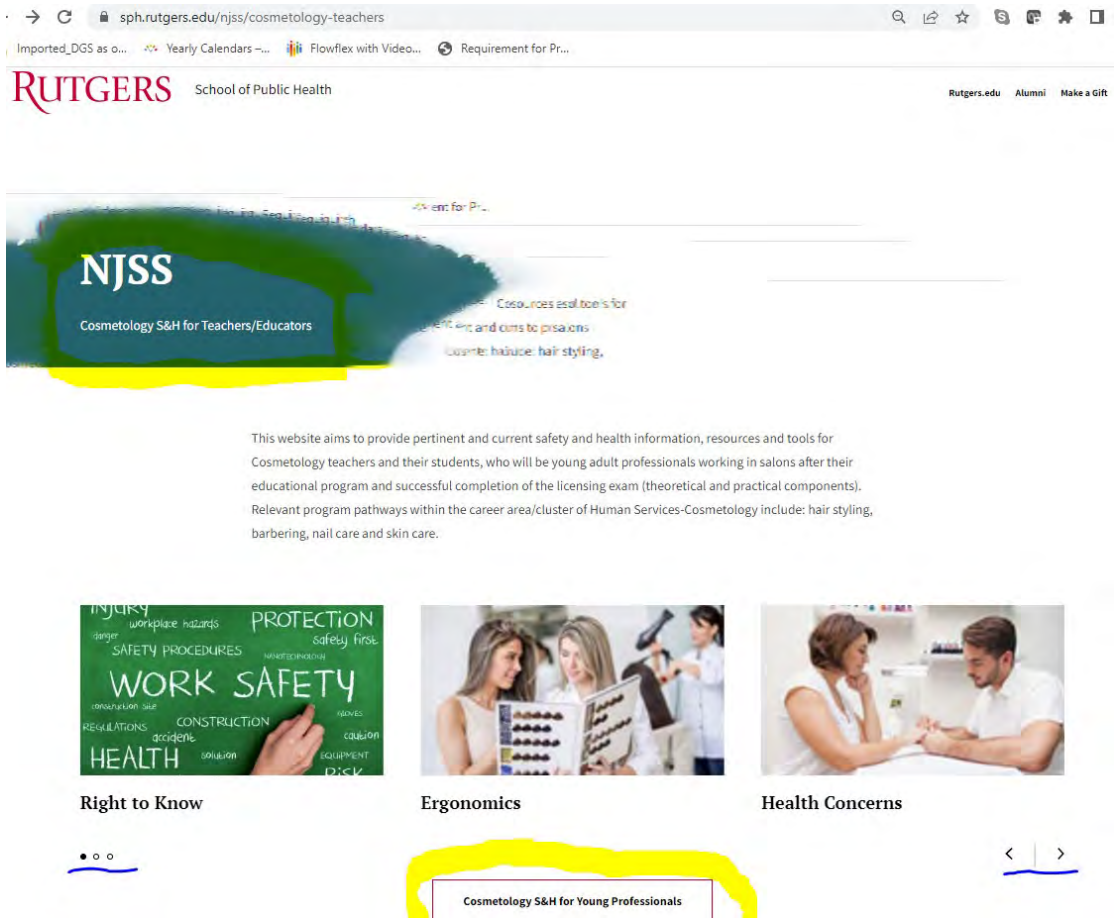
- To help protect the safety and health of these future cosmetology workers (and their clients), we created 2 educational modules on EDCs that have been added to and will be assessed as part of an existing training through the NJ Safe Schools Program from Rutgers School of Public Health:
  - Unit #1: Introduces the racial/ethnic disparities related to salon products and practices that lead to disproportionate EDC exposure among Black/AA women.
  - Unit #2: Focuses on steps that Black/AA students can take to protect themselves from EDCs at work (including alternatives to common EDCs containing products) and how to educate future owners/supervisors and clients.

NJ Safe Schools Program (NJSS)

https://sph.rutgers.edu/njss/home

NJSS home page links to:

- Cosmetology S&H for Teachers/ Educators
- Cosmetology S&H for Young Professionals



Launch of the Educational Intervention

- Our team developed content pages – information, photos and other visuals with sources, and links to websites or PDF files – that were integrated into the Rutgers Canvas Learning Management System, an asynchronous online learning platform

- Five teachers completed a preview pilot in Spring/Summer 2023:
  - 3 in Somerset County, NJ
  - 2 in Essex County, NJ

- The full rollout with students will occur in Fall 2023, followed by data analysis of the assessment measures

Lesson objectives (example from new modules)

View All Pages

Objectives Topic 4 Part II

Objectives for lesson 4 Part II

We spend up to 90% of time indoors, where the air is often 2-5 times more polluted than outdoors.[1]

In this presentation, you'll learn about:

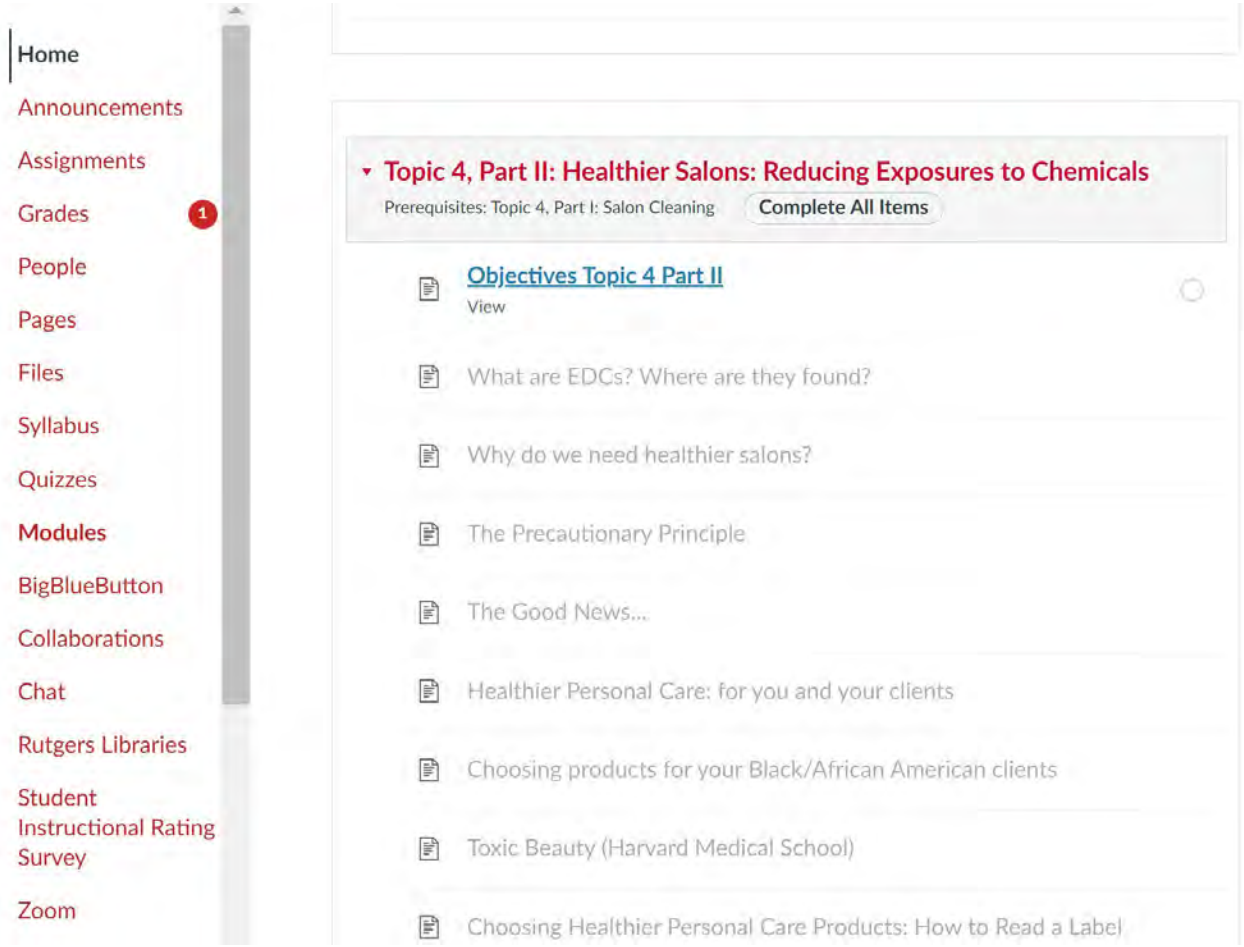
1. Identifying everyday exposures to chemicals in salons.
2. Simple changes can reduce exposures to positively impact salon worker safety and health and the health of clients.
3. Racial/ethnic disparities in salon products & practices.

References

1. US Environmental Protection Agency, Report on the Environment/Indoor Air Quality.

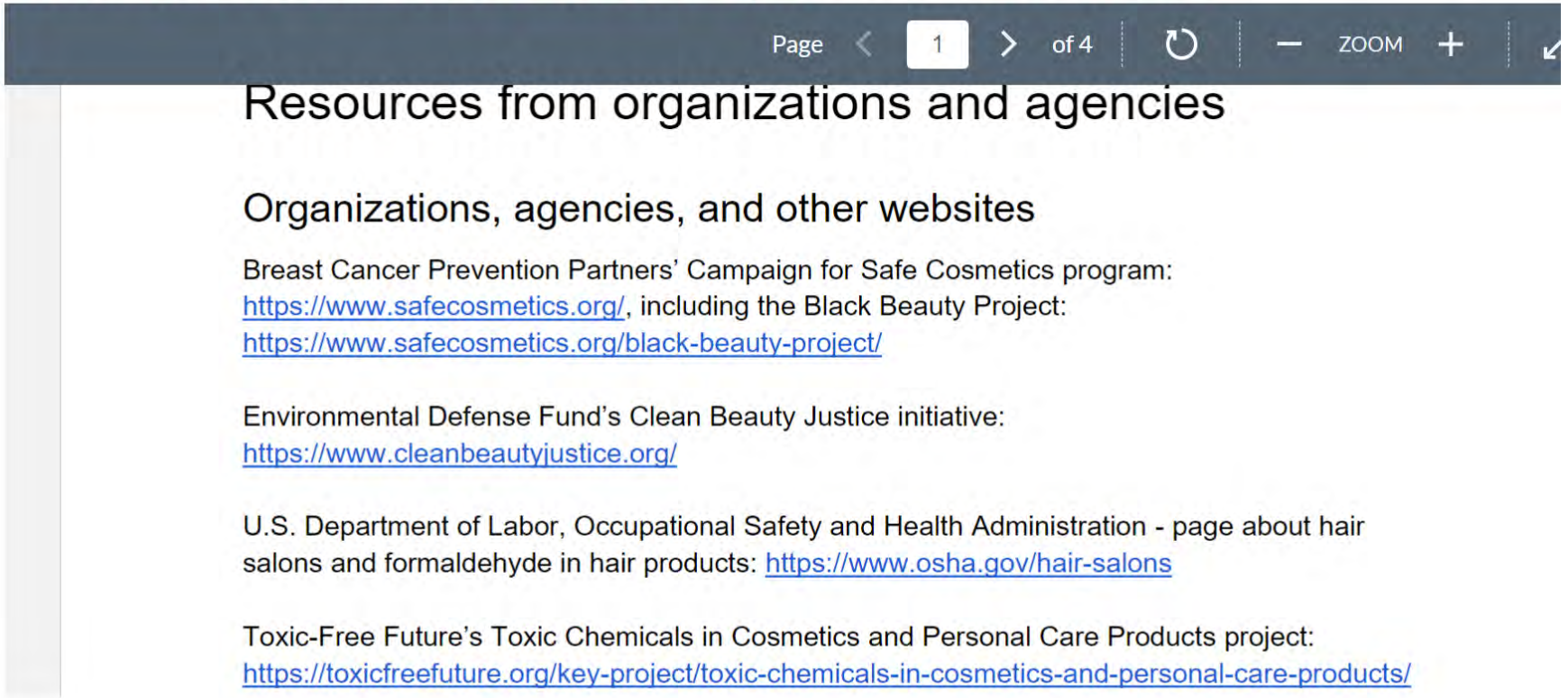
Previous

Organization of content in Canvas (partial list)



Additional resources for students (partial list)

Download Additional Resources for EDCs Module .pdf (108 KB) | Alternative formats



Case study for knowledge assessment (partial view)

View All Pages

Reducing Exposures to Chemicals Case Study

GiGi made an appointment at her neighborhood salon. She wanted the new keratin treatment for straightening hair that her best friend had tried.

GiGi had heard confusing news about this keratin treatment, including that someone said it used chemicals that could actually damage hair. Her mother said the chemicals could also harm her health.

Thank you!

Acknowledgements

- Midhat Rehman, MPH
- New Jersey Safe Schools Program, Rutgers School of Public Health
- HHS Office on Women's Health

HHS Endocrine-Disrupting Chemicals Innovator Award Competition Awardees

Jacqueline Brown

Empowerment Resource Center, Inc.

Endocrine Disrupting Chemicals & Women's Health Symposium

July 18th - 19th, 2023

Jacqueline Brown, MSPH MBA BS

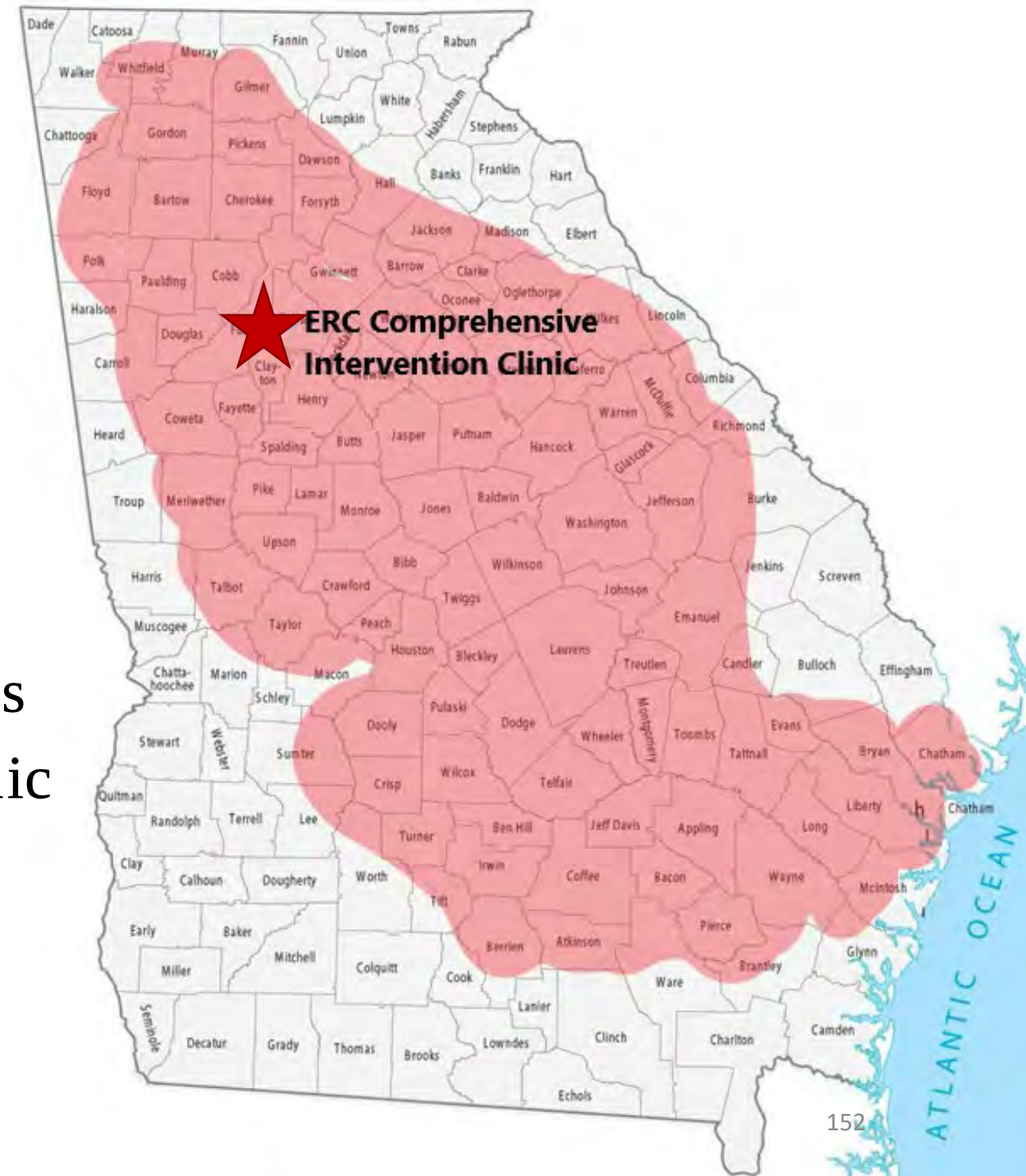
Chief Executive Officer

ERC Overview

- Established in 2003 and incorporated in 2006
- 20 Years of Operation
- A Non-Profit with 501(C)(3) Status
  - Community-Based Organization
  - Comprehensive Continuum of Care
- ERC Comprehensive Intervention Clinic
  - Georgia Composite Medical Board
  - Georgia Volunteer Health Care Program
  - Georgia DBHDD Provider and Community BH Clinic
- 3-Year Accreditation for Behavioral Health Services by CARF

ERC Overview

- Located in Atlanta, Georgia
- HHS HRSA 340B Covered Entity
  - STD
  - Ryan White
  - Family Planning Clinic
- Three HRSA 340B Eligible Facilities
  - Comprehensive Intervention Clinic
  - Clayton County BOH
  - ERC on the M.O.V.E.



ERC Overview

- Three Access Points for Services
  - Walk-in
  - ERC Telemedicine
  - Multiple Satellite Locations
- Multiple Contract Pharmacy
- Healthcare Accessibility
  - New to the Medicaid Arena
  - Accept Most Major Private Insurance
  - Sliding Fee Scale
  - Grant-Funded Services
  - Pursuing FQHC LAL Designation

Mission

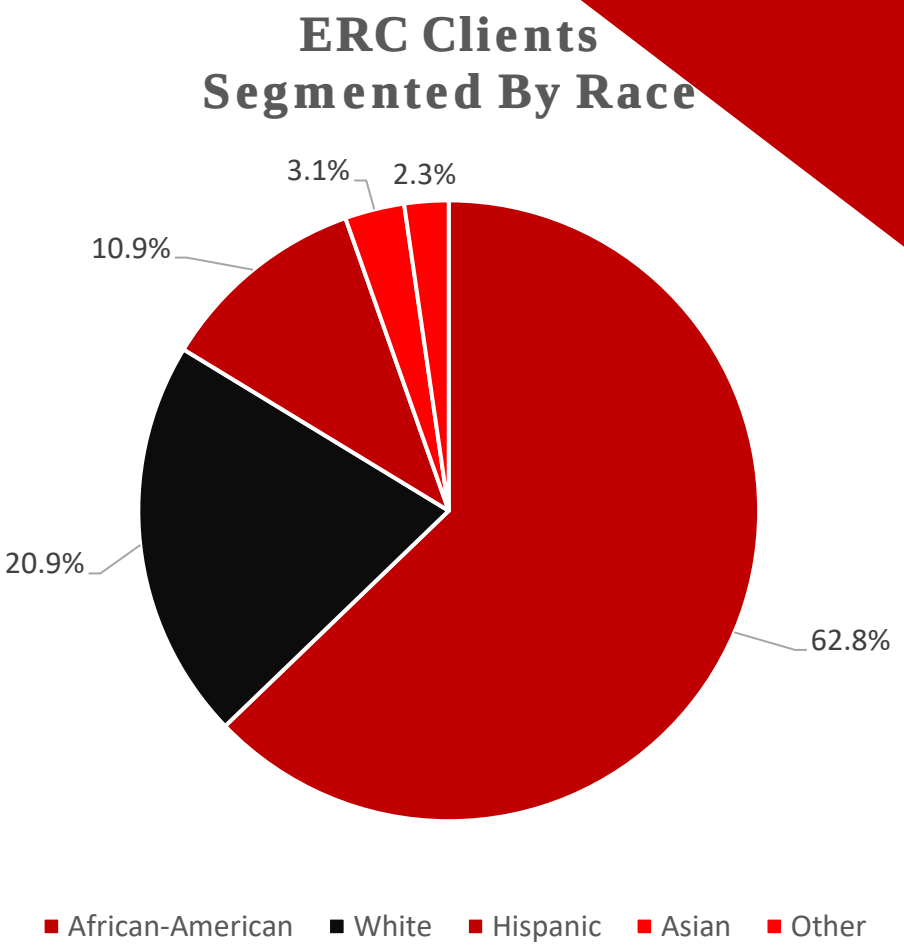
To Provide Programs, Services, and Community-level **Solutions** That **Improve** The **Health-related Quality of Life** for the Communities We Are **Privileged** to Serve.

Vision

Achieving Healthier Outcomes
One Client At A Time

ERC Client Pool Characteristics

- 39.0% Were Under the Age of 29
- 44% Uninsured
- 2.0% HIV Seropositive Rate
- 81.2% Linkage to Care Rate
- 15% Were Repeat Visitors for STI Services
- Gender Segmentation:
  - Male (66.0%)
  - Females (30.5%)
  - Gender non-conforming (2.0%)
  - Self-identified transgender (1.0%)



Endocrine Disrupting Chemicals

ERC Website Dedicated to Educate Black & African-American Women

- Inform on the Risk of EDC Use
- Educate about EDC Links to Cancers & Reproductive Health Issues
- List EDC Used in Household Products
- Share Strategies That Help to Reduce EDC Exposure

39% Likelihood of Black Women Dying from Breast Cancer Than White Women

Community Outreach Events

Additional Questions?

Jacqueline Brown, MSPH, MBA, BS
Chief Executive Officer
Empowerment Resource Center, Inc.
(404) 526-1145
www.ERC-Inc.org

Simple Ways Patients can Limit Exposure to EDCs

Leonardo Trasande, MPP, M.D.

Moderated by Margaret Snyder

Simple Ways Patients can Limit Exposures to EDCs

Leonardo Trasande, MPP, M.D.

Professor of Pediatrics

NYU Grossman School of Medicine

Break

We will resume at 2:45PM

Work Across the Government

Catherine Aubee, Sue Fenton, Tucker Patterson

Moderated by Margaret Snyder

Work Across the Government

Catherine Aubee

Senior Advisor for Endocrine Disruptor Screening Program

US Environmental Protection Agency, Office of Pesticide Programs

US EPA Endocrine Disruptor Screening Program

An Update for

HHS Office on Women's Health
Endocrine Disrupting Chemicals and Women's Health Symposium
Work Across the Government

July 19, 2023

Overview of U.S. EPA's Endocrine Disruptor Screening Program (EDSP)

Statutes & Organization

Congress passed the Food Quality Protection Act in 1996, which required EPA to screen pesticide chemicals for endocrine activity. In 2020, EDSP was integrated into the pesticide program.

Tiered Testing

EDSP uses a tiered approach to screen chemical. Tier 1 involves *in vitro* and *in vivo* screens for potential activity. Chemicals that move to Tier 2 are screened for adverse endocrine effects.

Chemical Lists

List of substances covered by the program and status on screening lists.

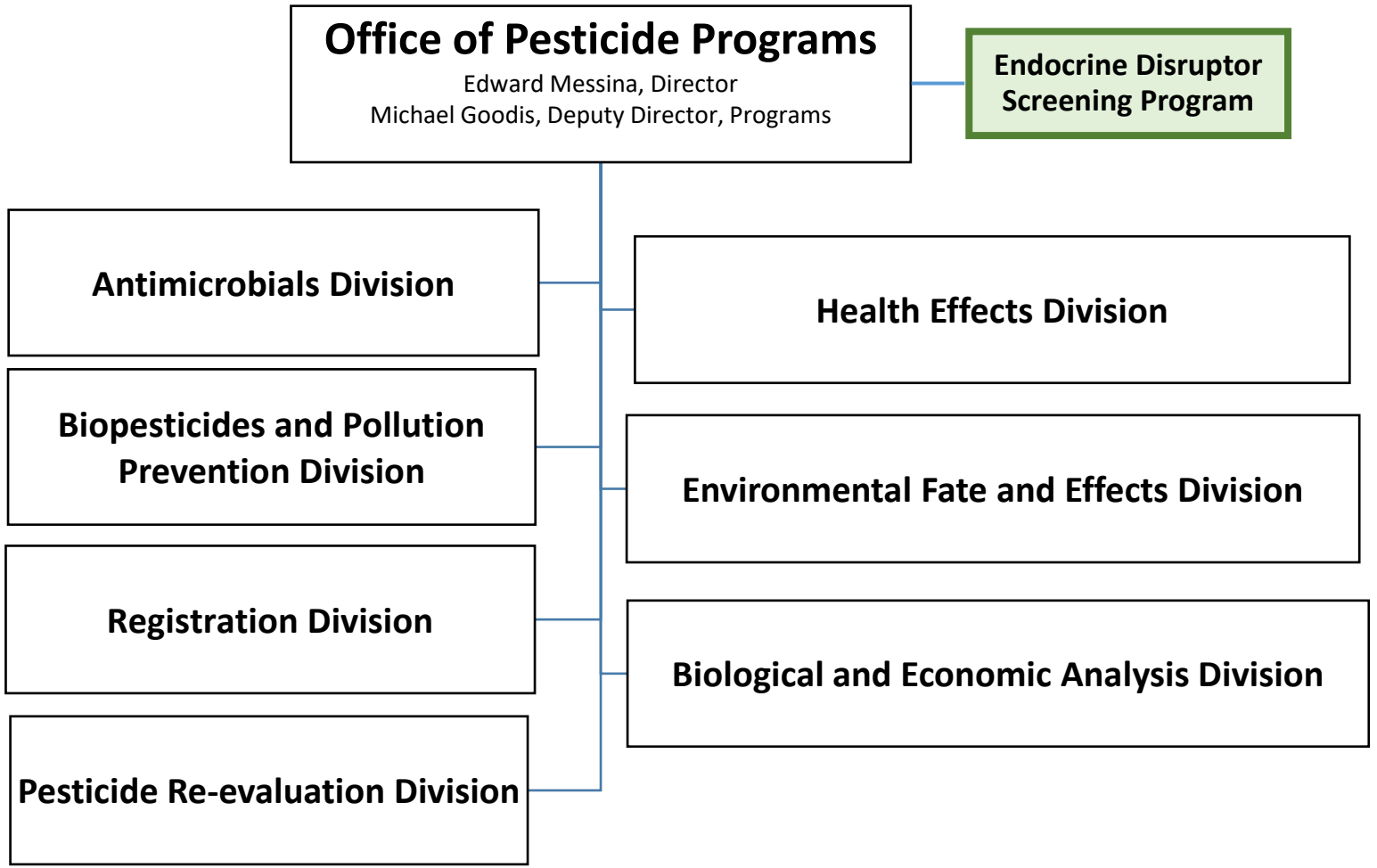
Alternative Methods

Cutting-edge technologies are used to prioritize chemicals and reduce, refine, or replace vertebrate animal testing. These are needed to increase the pace of chemical screening and testing.

Enhancing Efficiencies

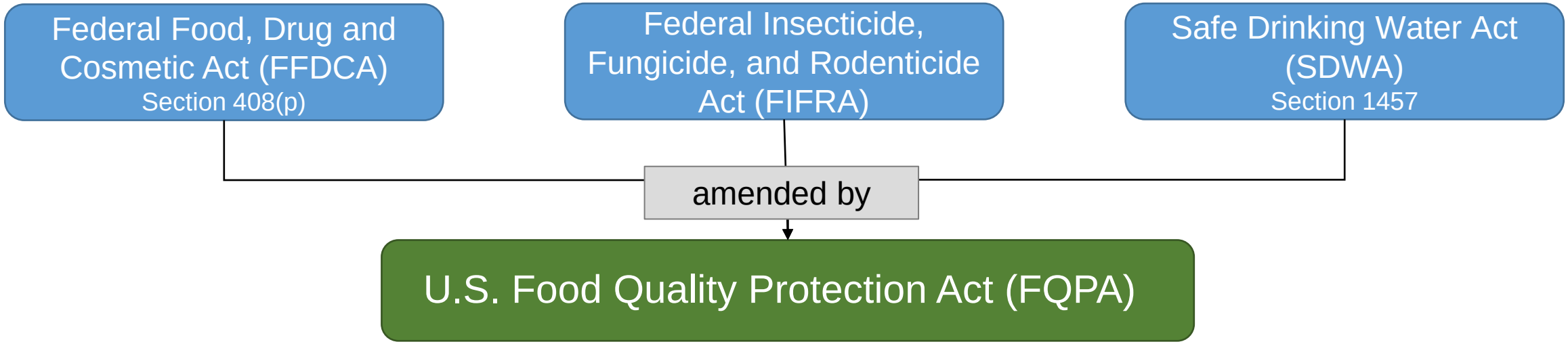
EDSP is enhancing efficiencies through use of artificial intelligence, machine learning, natural language processing.

Organization



OPP Organizational Structure

Statutes



Legislative Mandate (Priority):

- **Requires** EPA to screen pesticide chemicals for their potential for estrogenic effects in humans

Discretionary Authority:

- Authorizes EPA to include other endocrine effects similar to an estrogen effect (expanded to androgen and thyroid)
- Addresses human health (expanded to include aquatic and terrestrial vertebrate wildlife)
- Authorizes EPA to screen any other substances similar to a pesticide chemical

Endocrine Disruptor Definition

2002 World Health Organization (WHO)
definition of “endocrine disruptor”

An endocrine disruptor is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations.

http://www.who.int/ipcs/publications/new_issues/endocrine_disruptors/en/

Tiered Testing

EDSP's tiered approach to screen chemicals includes a Tier 1 battery of assays and Tier 2 tests.

Tier 1:

- 5 *In vitro* and 6 *in vivo* screens
- Detect **potential to interact** with endocrine system

Tier 2:

- May be called in after Weight of Evidence (WoE) review of Tier 1 data
- Multi-life stage/generational studies covering a broad range of taxa
- Determine **adverse apical outcomes** associated with endocrine effects

EDSP Tier 1 Battery	Type	Tier 1 Test Guideline
Estrogen Receptor (ER) Binding	In vitro	OCSPP 890.1250
Estrogen Receptor Transactivation (ERTA)	In vitro	OCSPP 890.1300
Uterotrophic (UT)	In vivo	OCSPP 890.1600
Androgen Receptor (AR) Binding	In vitro	OCSPP 890.1150
Aromatase	In vitro	OCSPP 890.1200
Steroidogenesis (STR)	In vitro	OCSPP 890.1550
Hershberger	In vivo	OCSPP 890.1400
Female Rat Pubertal	In vivo	OCSPP 890.1450
Male Rat Pubertal	In vivo	OCSPP 890.1500
Fish Short Term Reproduction (FSTRA)	In vivo	OCSPP 890.1350
Amphibian Metamorphosis (AMA)	In vivo	OCSPP 890.1100

EDSP Tier 2 Tests	Type	Tier 2 Test Guideline
Rat 2-generation Reproduction	In vivo	OCSPP 870.3800
Rat Extended 1-Gen Reproduction	In vivo	OECD TG 443
Medaka Extended 1-Gen Reproduction	In vivo	OCSPP 890.2200
Larval Amphibian Growth & Development	In vivo	OCSPP 890.2300
Avian Multi-Generation Reproduction	In vivo	OCSPP 890.2100

https://www.epa.gov/test-guidelines-pesticides-and-toxic-substances/series-890-endocrine-disruptor-screening-program

Lists of Chemicals

EDSP screens pesticides, chemicals, and environmental contaminants for their potential effect on estrogen, androgen, and thyroid hormone systems. Designation on List 1 or List 2 does **not** mean a chemical will affect the endocrine system.

First List of Chemicals for Tier 1 Screening (List 1) announced in 2009

- High exposure potential
  - Pesticide active ingredients
  - High Production Volume (HPV) chemicals used as pesticidal inert ingredients
- 67 chemicals on original list
- 15 chemicals were not supported by industry
- 52 chemicals were tested in Tier 1 battery

Second List of Chemicals for Tier 1 Screening (List 2) announced in 2013

- Identified via EPA's drinking water and pesticide programs
  - Excluded biologic agents, naturally-occurring chemicals, and hormones
- 107 chemicals
- Approximately 60 chemicals are not pesticide chemicals

Universe of Chemicals

EDSP published a Universe of Chemicals list in 2012.

The updated list of chemical substances covered by the EDSP include:

~ 1,200 pesticide active ingredients,

~ 2,500 pesticide inert ingredients,

} Statutorily Required: FFDCA§408(p)(3)(A)

~ 6,000 drinking water contaminants,

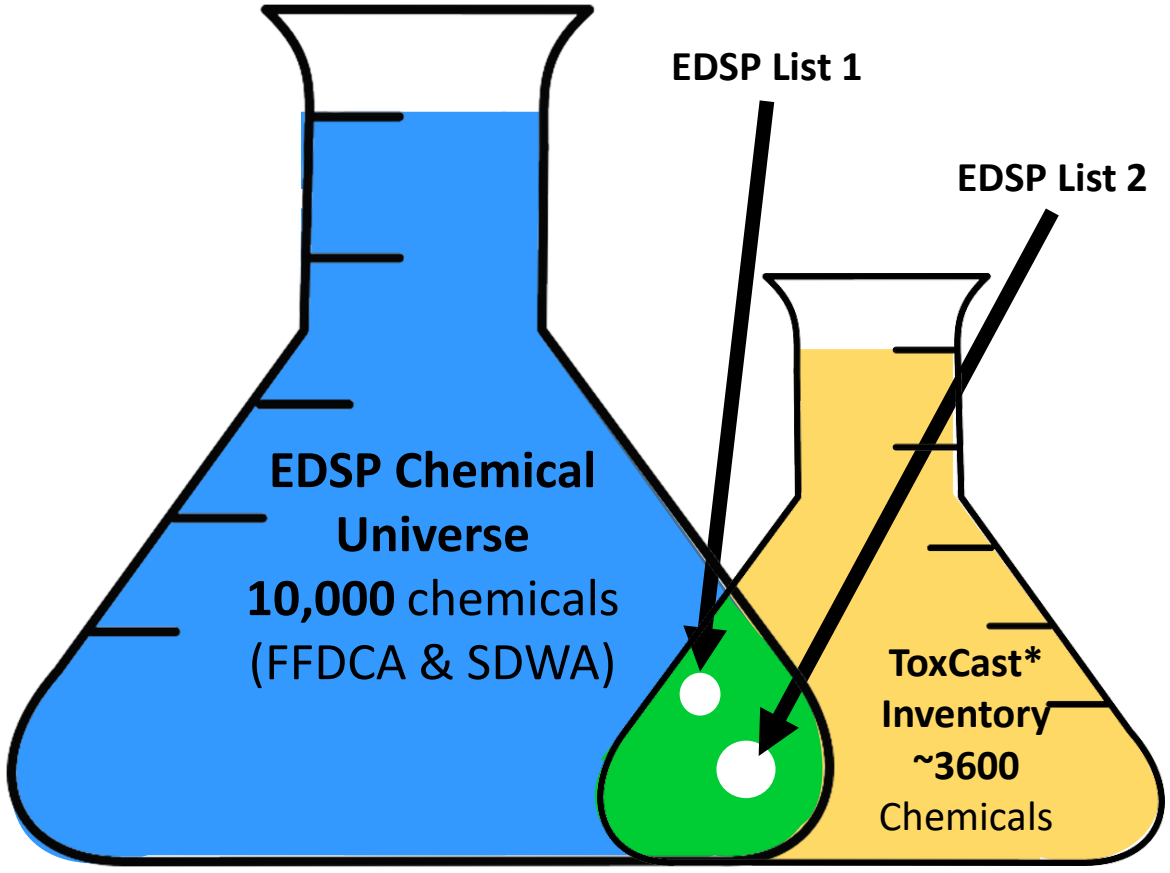
} Discretionary Authority: SDWA§1457

with some overlap between these lists.

https://www.epa.gov/endocrine-disruption/universe-chemicals-potential-endocrine-disruptor-screening-and-testing

EDSP's Evolution: New Approach Methods (NAMs)

- Rapidly **screen** chemicals in the EDSP Universe for endocrine bioactivity
- Provide **alternative data** for specific endpoints in the EDSP Tier 1 battery of assays
- Contribute to the **weight of evidence** screening level determination of a chemical's potential bioactivity



* ToxCast is the Toxicity Forecaster developed by US EPA

Need for Alternative Methods

Goal: Thousands of chemicals to be screened as quickly and accurately as possible.

New Approach Methods (NAMs) are being developed for enhancing efficiencies.

High-Throughput (HTP) Assays for

- Estrogen Receptor, Androgen Receptor, Steroidogenesis, Thyroid Pathway

Other tools and approaches

- SeqAPASS, Systematic Reviews, In Vitro to In Vivo Extrapolation (IVIVE), and Bioactivity Exposure Ratio (BER)

In January 2023, EPA published a draft paper on the availability of NAMs for EDSP.

https://www.regulations.gov/document/EPA-HQ-OPP-2021-0756-0002

Validated Alternatives
ER and AR Full Pathway Models

Estrogen Receptor (ER) pathway model may be used as an alternative to performing three current EDSP Tier 1 screening assays:

- ER binding *in vitro* assay (OCSPP 890.1250)
- ER transcriptional activation (ERTA) *in vitro* assay (OCSPP 890.1300)
- *In vivo* Uterotrophic assay (rat) (OCSPP 890.1600)

Androgen Receptor (AR) pathway model may be used as an alternative for one current EDSP Tier 1 screening assay:

- AR binding *in vitro* assay (OCSPP 890.1150)

EDSP Tier 1 Battery	Type	Tier 1 Battery Alternatives
Estrogen Receptor (ER) Binding	In vitro	ER Model (Alternative)
Estrogen Receptor Transactivation (ERTA)	In vitro	ER Model (Alternative)
Uterotrophic (UT)	In vivo	ER Model (Alternative)
Androgen Receptor (AR) Binding	In vitro	AR Model (Alternative)
Aromatase	In vitro	STR Model (Future)
Steroidogenesis (STR)	In vitro	STR Model (Future)
Hershberger	In vivo	AR/STR Model (Future)
Female Rat Pubertal	In vivo	ER, STR, THY Models (Future)
Male Rat Pubertal	In vivo	AR, STR, THY Models (Future)
Fish Short Term Reproduction (FSTRA)	In vivo	ER, AR, STR Models (Future)
Amphibian Metamorphosis (AMA)	In vivo	THY Model (Future)
EDSP Tier 2 Tests	**Type**	**Tier 2 Test Alternatives**
Rat 2-generation Reproduction	In vivo	ER, AR, STR, THY (Future)
Rat Extended 1-Gen Reproduction	In vivo	ER, AR, STR, THY (Future)
Medaka Extended 1-Gen Reproduction	In vivo	ER, AR, STR (Future)
Larval Amphibian Growth & Development	In vivo	THY (Future)
Avian Multi-Generation Reproduction	In vivo	ER, AR, STR, THY (Future)

High Throughput and Computational Methods

ER Full Pathway Model

Use multiple assays (18) for pathway coverage

- Different technologies
- Different points in pathway

No assay is perfect

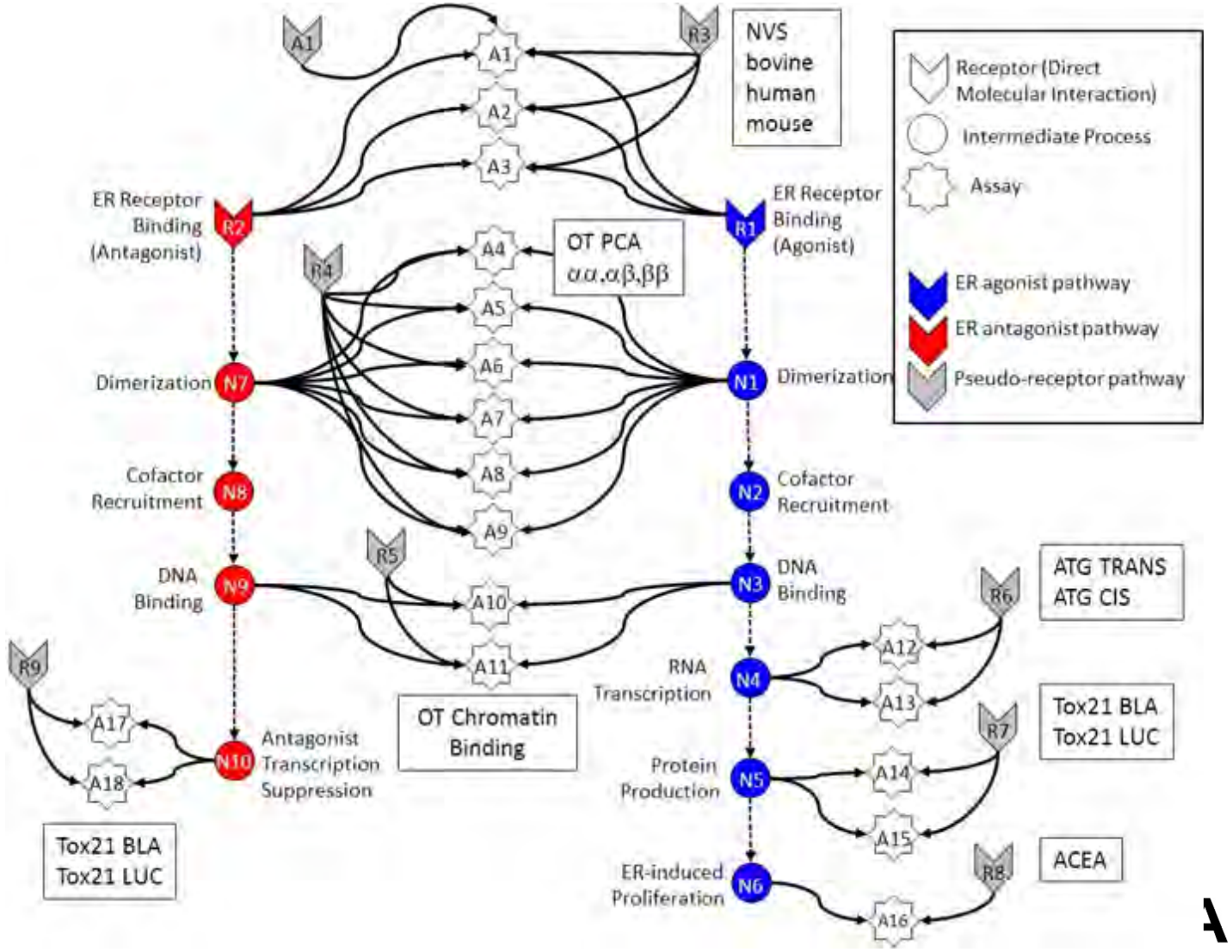
- Assay Interference
- Noise

Use model to integrate assays

Evaluate model against reference chemicals

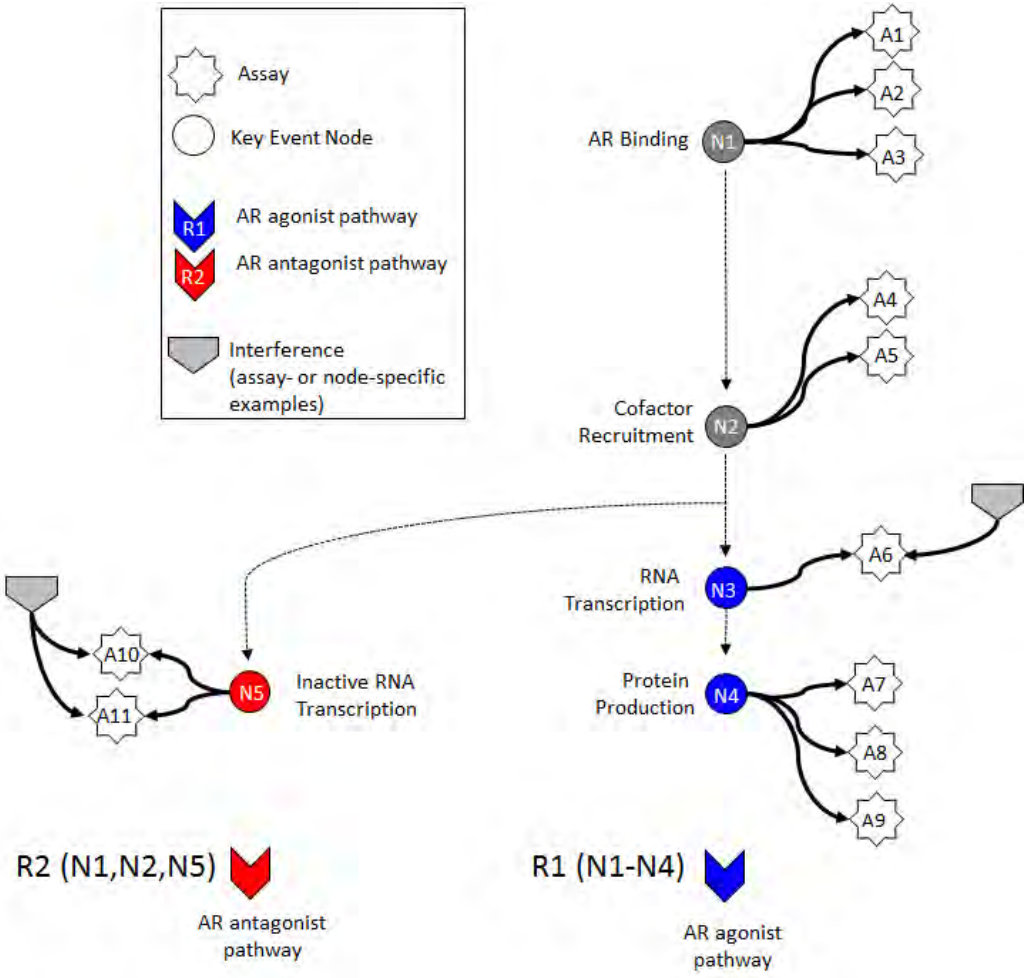
Methodology being applied to other pathways

US EPA. 2014. FIFRA SAP "Integrated Endocrine Bioactivity and Exposure-Based Prioritization and Screening"

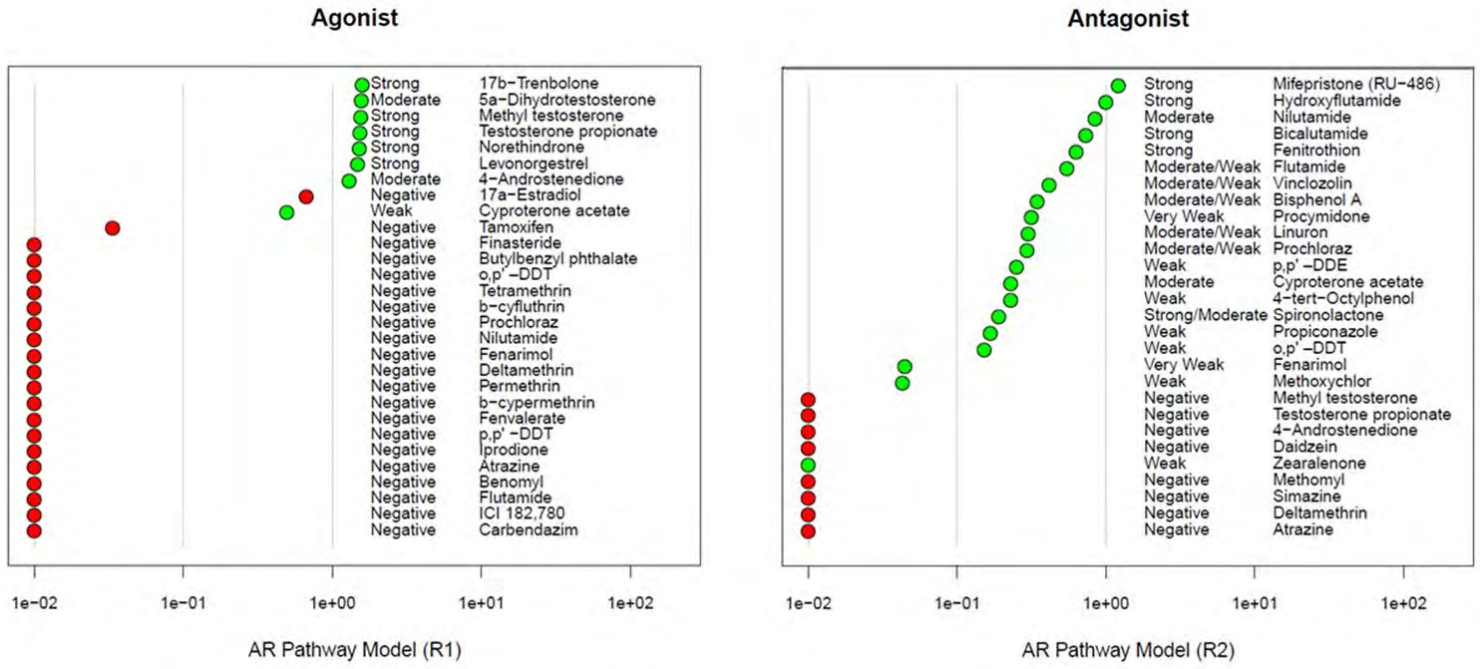


High Throughput and Computational Methods

AR Full Pathway Model



AR Reference Chemical Performance



US EPA. 2017. FIFRA SAP "Continuing Development of Alternative High-Throughput Screens to Determine Endocrine Bioactivity, Focusing on Androgen Receptor, Steroidogenesis, and Thyroid Pathways"

Other NAMs

The following NAMs are proposed for use in **priority setting** or as **Other Scientifically Relevant Information (OSRI)** in WoE evaluations:

- Reduced assay subset (4-7 assays) ER & AR pathway models
- QSAR models for ER and AR
- SeqAPASS – Sequence Alignment to Predict Across Species Susceptibility tool
- IVIVE – In Vitro to In Vivo Extrapolation
- iBER – integrated Bioactivity and Exposure Ratio

Tools for Future Development

- Steroidogenesis HT assay
- Thyroid Adverse Outcome Pathway Network

ER and AR Subset Models

The full ToxCast ER and AR pathway models are proposed as **alternatives** to Tier 1 assays

- BUT expensive, and some component assays no longer commercially available

Can we simplify?

- Assay subsets were assessed, and 4 to 7 assays provided equivalent performance (*e.g.*, balanced accuracy) to the full pathway models

Next steps

- V**alidate assay subsets** (4 - 5 assays per pathway) using reference chemicals and a set of 'validation' chemicals
- Once validated, screening of pesticide chemicals will begin using these subsets

ER Subset Models

Assay #	ER Assay type	Species
1	receptor binding	bovine
2	receptor binding	human
3	receptor binding	mouse
4	receptor dimerization	human
5	receptor dimerization	human
6	receptor dimerization	human
7	receptor dimerization	human
8	receptor dimerization	human
9	receptor dimerization	human
10	DNA binding	human
11	DNA binding	human
12	transcriptional activity	human
13	transcriptional activity	human
14	gene expression	human
15	gene expression	human
16	cell proliferation	human
17	gene expression	human
18	gene expression	human

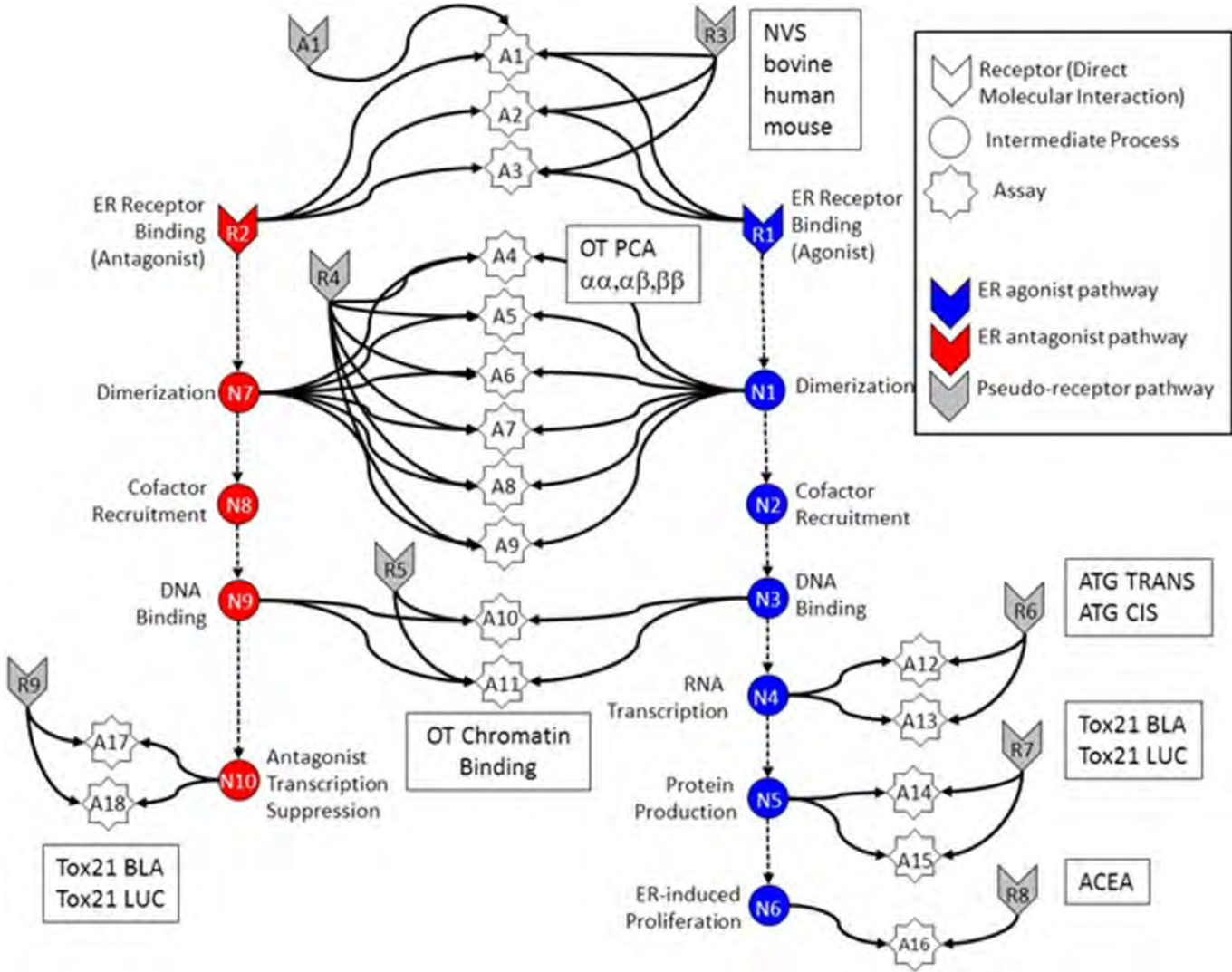
Key events

Binding

Dimerization

Transactivation

Proliferation



Endocrine Disruptor Science Policy Council (EDSPOC)

OPP established the EDSPOC in 2022 to make recommendations concerning

- FFDCA section 408(p)(4) **exemptions**
- When the use of validated **NAMs** as alternatives is acceptable
- Appropriate use of **OSRI** for use in a weight-of-evidence (WoE) analysis
- Assist in reviewing registrant-submitted rebuttals

Regularly scheduled meetings with 13 members consisting of two co-chairs, one secretary, nine other members and the OPP Senior Science Advisor.

EDSPOC will play a key role in ensuring continued progress in implementing EDSP.

EDSP Exemptions

Under FFDCA, EPA can exempt chemicals from the Endocrine Disruption Screening Program

Sufficient information to conclude that a chemical is anticipated not to produce an effect in humans or other organisms similar to an effect produced by a naturally occurring estrogen, androgen or thyroid hormone

Exemptions (8) have previously been issued for chemicals with limited use patterns and therefore limited potential for exposure and for chemicals with limited or targeted toxic effects

- *Exposure examples*: Acetominophen (2014) and Gonadatropin Releasing Hormone (2020)
- *Limited toxicity examples*: Agrobacterium Radiobacter strains K84 and K1026 (2012), Dioctyl Sodium Sulfosuccinate (DSS; 2014) and Undecylenic Acid (UDA; 2014), Polybutene Resin (2014), Kaolin (2015)

Since approval of the charter in 2022, EDSPOC has approved an additional 6 exemptions.

Other Progress

Program Management

- Established EDSPOC
- Developed coordination memo with Office of Water
- More frequently updating EDSP website (epa.gov/endocrine-disruption)
- Hired Senior Advisor to coordinate regulatory implementation (*that's me!*)

EDSP NAMs Paper

- Draft released January 2023
- Will release final paper following resolution of comments
- Includes Response to Comments on 2015 "Pivot" Notice and 2017 FIFRA SAP

EDSP Targeted Goals

2023

- Publish the EDSP NAMs Paper (January 19, 2023)
- Develop an EDSP strategic plan with implementation and performance measures
- Determine and publish need for List 1 Tier 2 data

2024

- Publish List 2 action plan
- Evaluate inclusion of Tier 1 in Part 158 registration

2025

- Initiate any List 1 Tier 2 test orders

Thank you!

Questions?

Contact: Aubee.catherine@epa.gov
Catherine Aubee, Senior Advisor
Endocrine Disruptor Screening Program
U.S. Environmental Protection Agency

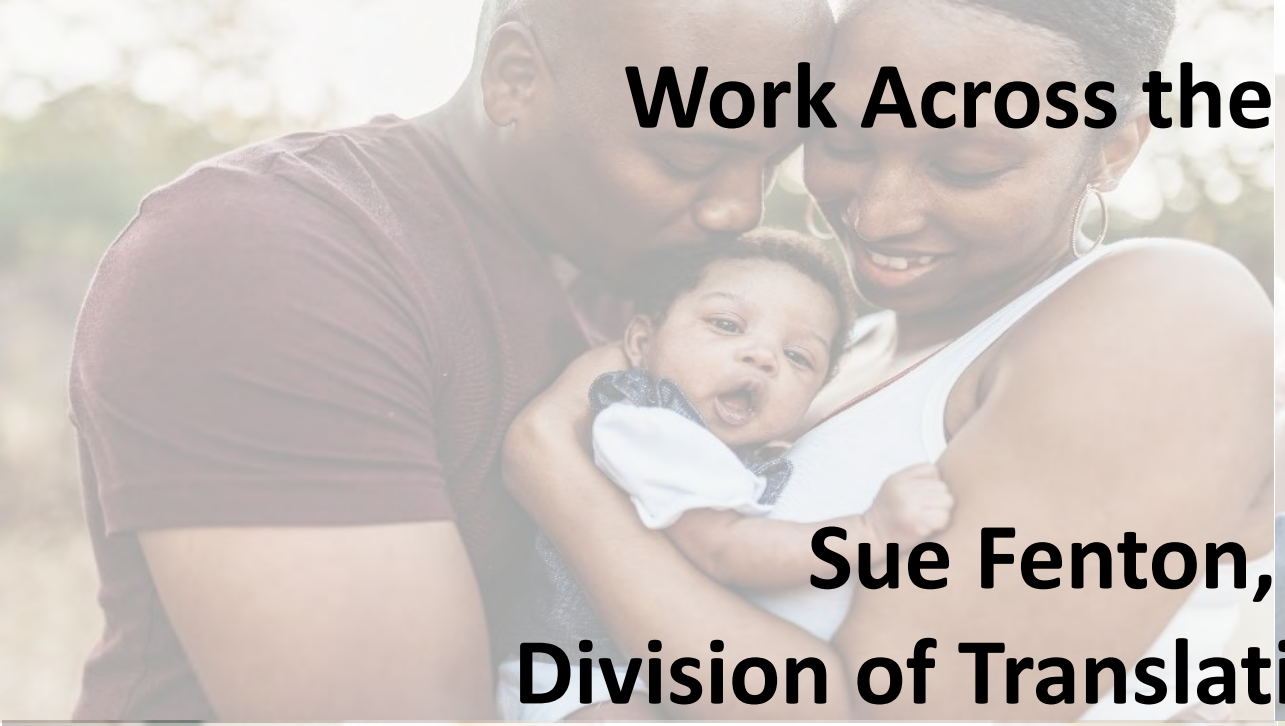
EPA

Work Across the Government

Sue Fenton

Reproductive Endocrinology Lead

NIEHS National Toxicology Program




Work Across the Government

Sue Fenton, PhD MS
Division of Translational Toxicology
- NIEHS -

July 19, 2023

Endocrine Disrupting Chemicals and Women's Health Symposium

National Institute of Environmental Health Sciences
Your Environment. Your Health.

The National Institute of Environmental Health Sciences

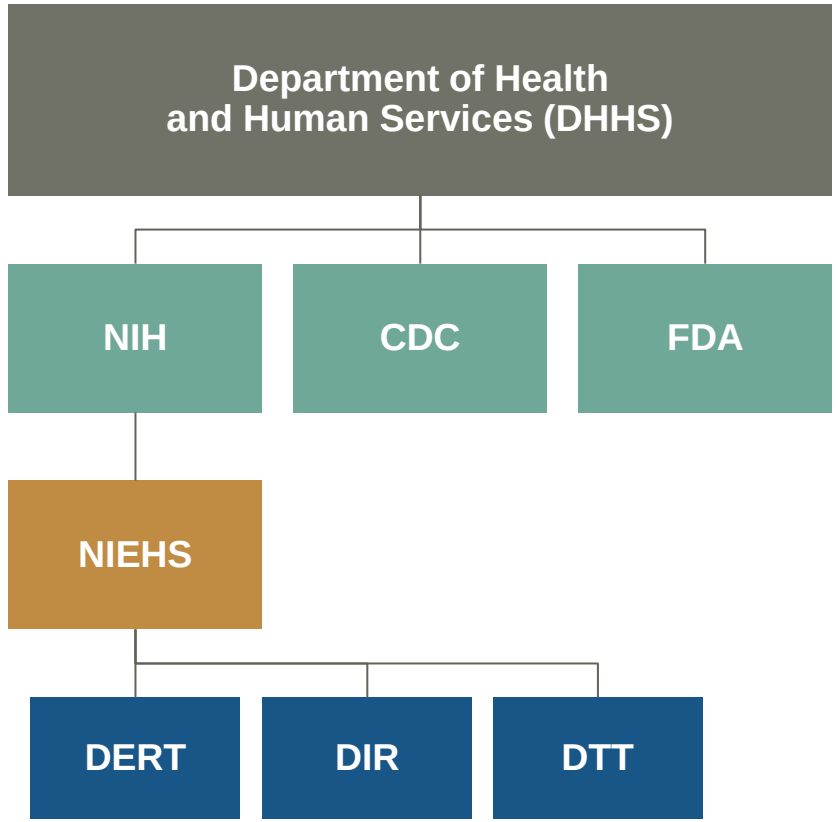
MISSION Discover how the environment affects people in order to promote healthier lives

VISION Provide global leadership for innovative research that improves public health by preventing disease and disability

Division of Extramural Research & Training (DERT)
- *Plans, directs, and evaluates grant programs that support research in environmental health*

Division of Intramural Research (DIR)
- *Carries out fundamental research in NIEHS laboratories to investigate the biological mechanisms that underlie response to environmental stressors*

Division of Translational Toxicology (DTT)
- *Evaluates chemicals/agents of public health concern by developing and applying tools of modern toxicology and molecular biology*

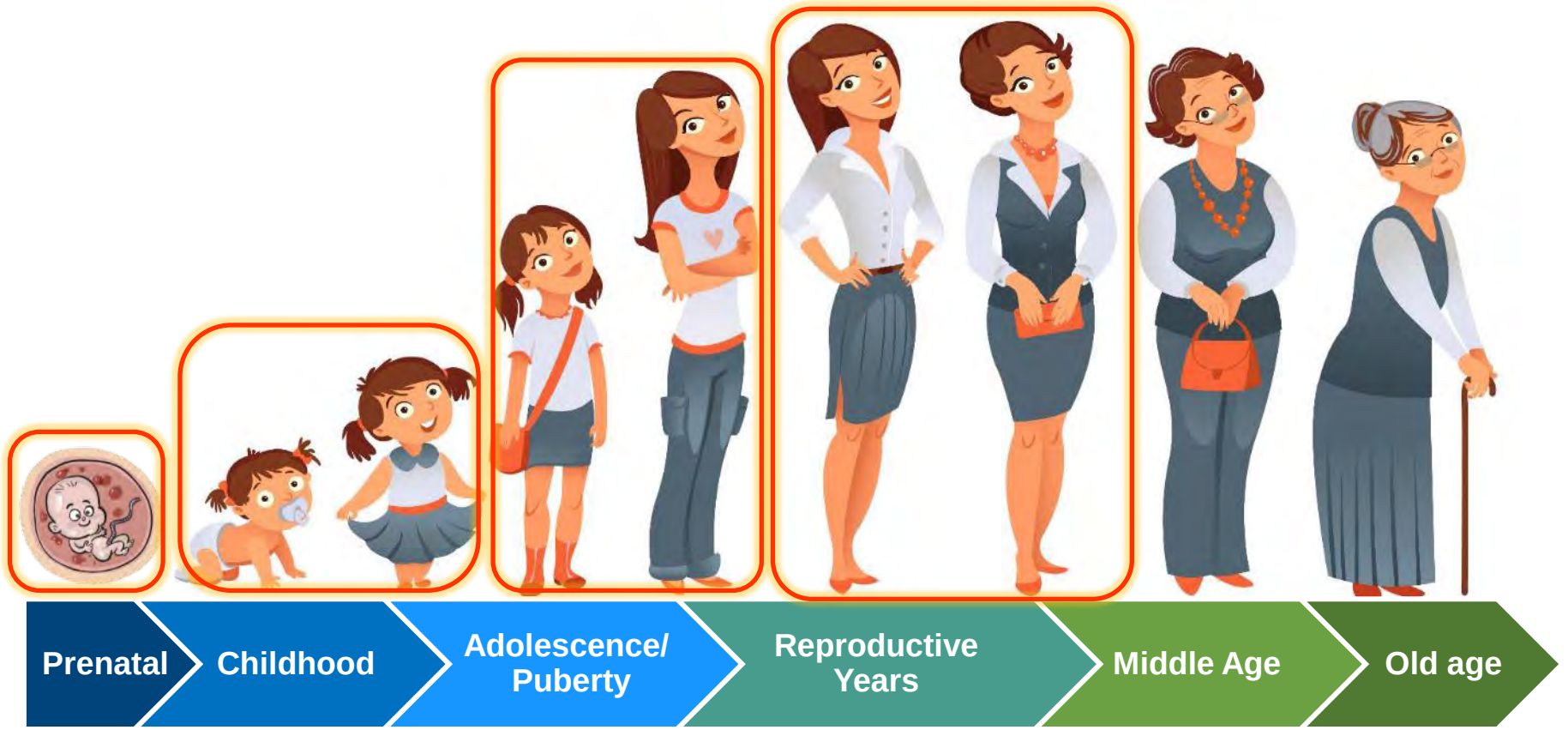


NIEHS: DES and Environmental Estrogens

- 1940's-71: DES prescribed to millions of women to reduce miscarriage; also given to suppress milk production, reduce hot flashes, stunt growth in "tall" girls, treat acne, etc…
- McLachlan, Korach, & Newbold reported:
  - Exposure to exogenous estrogens during fetal development will profoundly alter sexual differentiation (1975 and onward)
  - DES is a transplacental carcinogen
  - Developmental exposure to DES can cause obesity in offspring
- "Environmental Estrogens"
  - Certain chemicals can act like or interfere with hormones

John McLachlan

Windows of Susceptibility



Fenton SE. Endocrine-disrupting compounds and mammary gland development: early exposure and later life consequences. Endocrinology. 2006 Jun;147(6 Suppl):S18-24. doi: 10.1210/en.2005-1131.

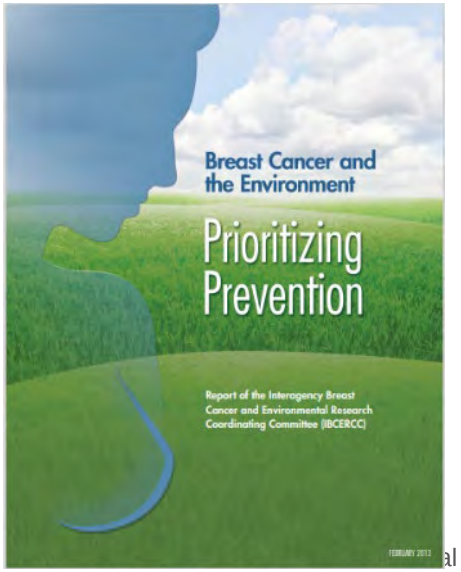
EDC's and Women's Health

- **Maternal Health**
- **Infertility**
- **Puberty and development**
- **Endometriosis, uterine fibroids, ovarian dysfunction, and lactational defects**
- **Premature menopause**
- **Breast, ovarian, cervical, and endometrial cancer**

Breast Cancer & the Environment Research Program (BCERP)

- **2004-2019 Multi-Center**
- **DOHaD approach**
- **Evaluation of multiple EDCs**
- **Puberty timing**
- **Mammographic density**
- **Breast outcomes**

- **Hundreds of publications**



NIEHS Initiatives in DOHaD Research

- Role of Environmental Chemical Exposures in the Development of Obesity, Type 2 Diabetes and Metabolic Syndrome
- Preconception and Transgenerational Inheritance programs - EDCs
- The Role of the Microbiome in DOHaD program
- Environmental influences on Placental Origins of Development (ePOD) program
- Maternal Health program
- Children's Environmental Health programs
  - NIEHS/EPA Children’s Centers
  - CHEAR/HHEAR
  - ECHO

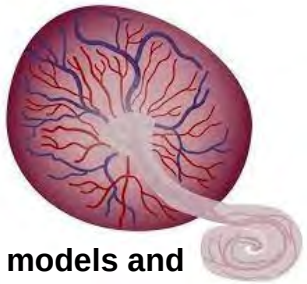
Jerry Heindel

Thad Schug

Heindel – founding member
U.S. DOHaD Society

Current EDC Programs

Environmental Influences on Placental Origins of Development (ePOD) Program (2014-current)



- Accelerate development and application of new models and methods for placental assessment
- Better understand the effects of exposures on early stage placental physiology, endocrine, immune, and metabolic functions
- Determine relationships between exposures, placental health, and subsequent effects on fetal and maternal health

Pregnancy as a Vulnerable Time Period for Women's Health (2020 – current)

- Program Goal: spur animal-based mechanistic and epidemiological research to investigate exposures during pregnancy and the postpartum period with impacts on maternal health and determine the life-long effects of on a woman's health
- Research includes a range of exposures and outcomes impacting women's health up to 12 years post partum
  - PFAS, PCBs, pesticides, flame retardants, PM2.5, phthalates, phenols/parabens, PAHs, metals
  - Cardiometabolic biomarkers and type 2 diabetes, weight retention and adiposity, atherosclerosis and cardiovascular health, immune cell function, endocrine function, and bone health

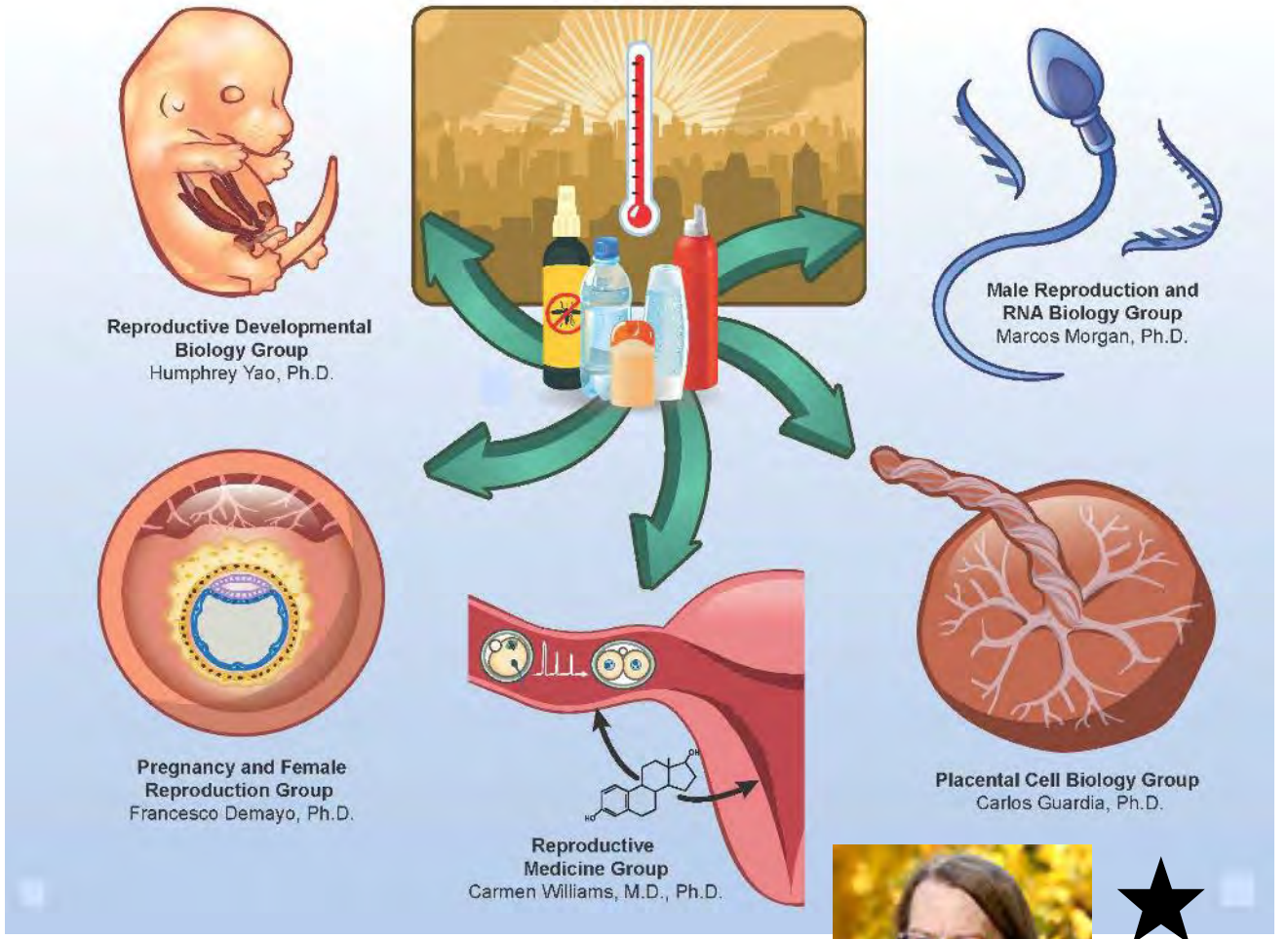
Preconception Exposure Program (2017- current)

- Work in established animal model systems
- Pre-fertilization exposures, NOT *in utero*, or post-conception
- Comprehensive mechanistic analysis
- Environmentally-induced germ cell alterations
- Endocrine disruptors, pesticides, components of air pollution, combined exposures, etc
- Studies should focus on link between exposure and health outcomes in first generation offspring

Thad Schug, PhD Abee Boyles, PhD

National Institute of Environmental Health Sciences
Your Environment. Your Health.

Reproductive and Developmental Biology Laboratory



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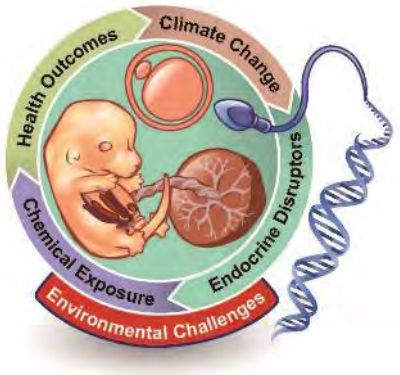


RDBL
REPRODUCTIVE & DEVELOPMENTAL BIOLOGY LABORATORY

★

The Sister Study

Enrolled over 50,000 women with a sister with breast cancer (2004-2009) to address concerns about environmental exposures

- Sisters have 2-fold breast cancer risk
- Increased power to detect associations
- Sisters highly motivated; response rates high

> 4,000 incident breast cancer cases

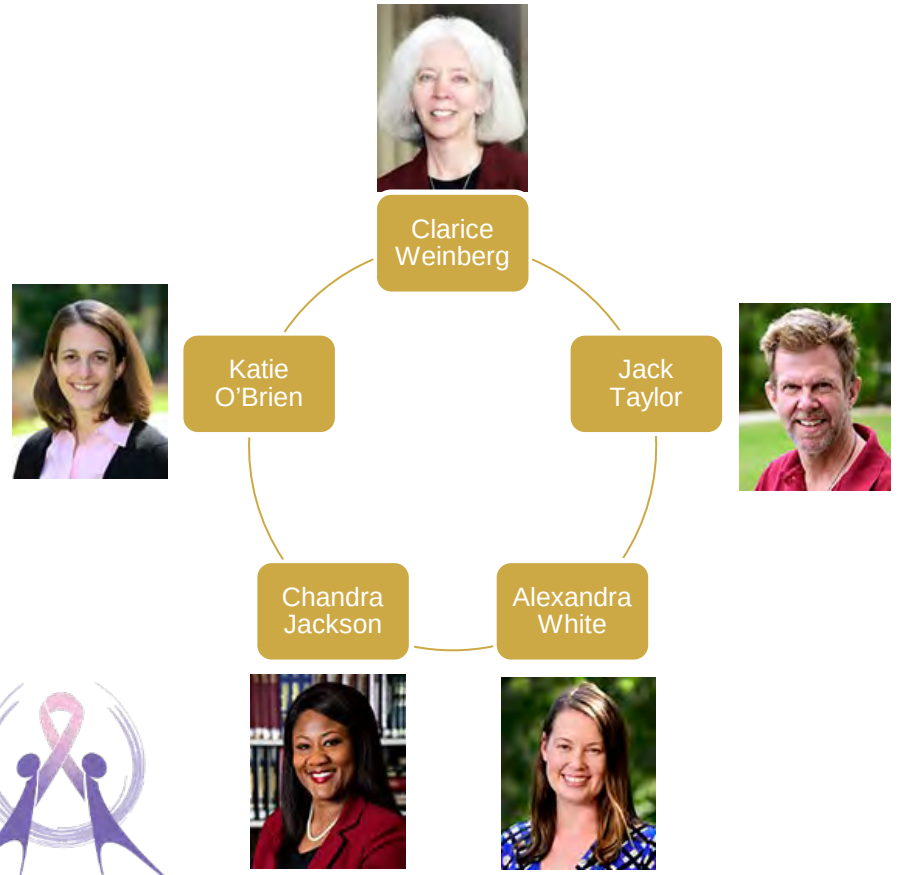
- Ongoing follow-up
- Able to consider breast cancer subtypes and population subgroups

Range of health outcomes & exposures, including EDCs

- Hormone responsive cancers (e.g., ovary, uterus, thyroid)
- Metabolic dysfunction and disease
- Exposomics, genomics, GIS-linkages, biomarkers, questionnaire data

Sandler et al., EHP 2017

Sister Study Co-investigators



THE SISTER STUDY
BREAST CANCER RESEARCH

National Institute of Environmental Health Sciences
Your Environment. Your Health.

Hair Straightener/Relaxers and Uterine Cancer Incidence

Background: Hair straightener/relaxers contain endocrine-disrupting chemicals, can release formaldehyde when heated

- Frequent use of straighteners/relaxers associated with breast and ovarian cancer *(Eberle et al., 2020 IJC, White et al., 2021 IJC, White et al., 2020 Carcinogenesis)*

Hypothesis: Chemical hair product use is associated with a higher uterine cancer incidence

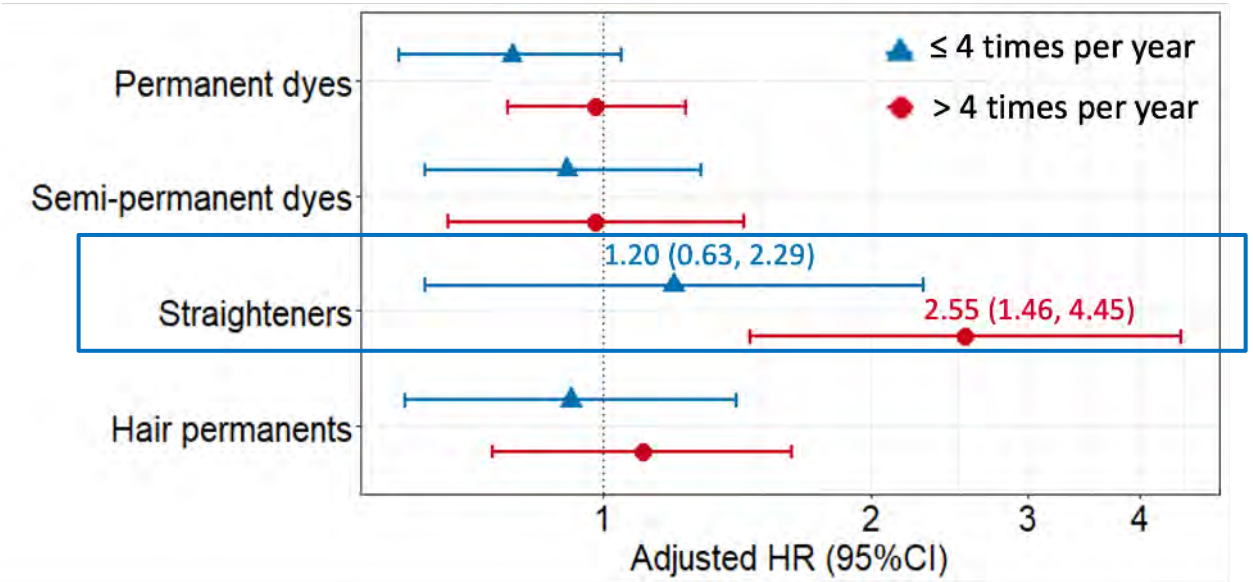
Methods: Sister Study participants with a uterus at enrollment (N=33,497, 2003-2009)

- Self-reported frequency of hair products use in <12 months; proxy for "usual adult use"
- ~10.9 years of follow-up
- N=378 uterine cancer cases

Lexie White, PhD

Results:

Frequent hair straightener/relaxer use (>4 times/year) associated with uterine cancer



- **Black women were 60% of ever users**
- **Associations similar for Black and Non-Hispanic White women**

Conclusion: Frequent hair straighteners/relaxer users were **more than twice as likely** to develop uterine cancer compared to non-users

- Implications may be greater for Black women due to higher prevalence of use

Chang et al, JNCI 2022

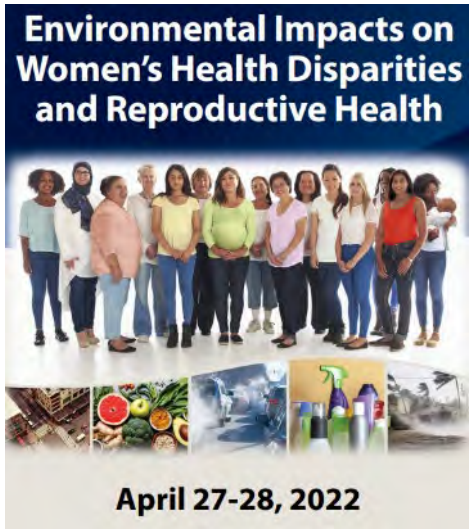
National Institute of Environmental Health Sciences
Your Environment. Your Health.

Health Disparities & U4 Focus

NIEHS Social and Environmental Determinants of Health Initiatives & Programs

EHD-EJ Faculty Website:
https://www.niehs.nih.gov/research/programs/ehd-ej/index.cfm

Workshop Website:
https://www.niehs.nih.gov/news/events/pastmtg/2021/ejworkshop2021/index.cfm



Workshop Website:
https://www.niehs.nih.gov/news/events/pastmtg/2022/ehdworkshop2022/index.cfm

Workshop Website:
https://www.niehs.nih.gov/news/events/pastmtg/2022/eheworkshop2022/index.cfm

Maintaining and Enriching Environmental Epidemiology Cohorts to Support Scientific and Workforce Diversity
U24 Program
RFA Reissue Forthcoming
NOT-ES-23-001
Closed February 10, 2023

Melissa M. Judd-Smarr, PhD

Research to Action: Assessing and Addressing Community Exposures to Environmental Contaminants
R01 Clinical Trial Optional
NIEHS – NIMHD
PAR-22-210
NIH Standard Due Dates

Lindsey Martin, PhD

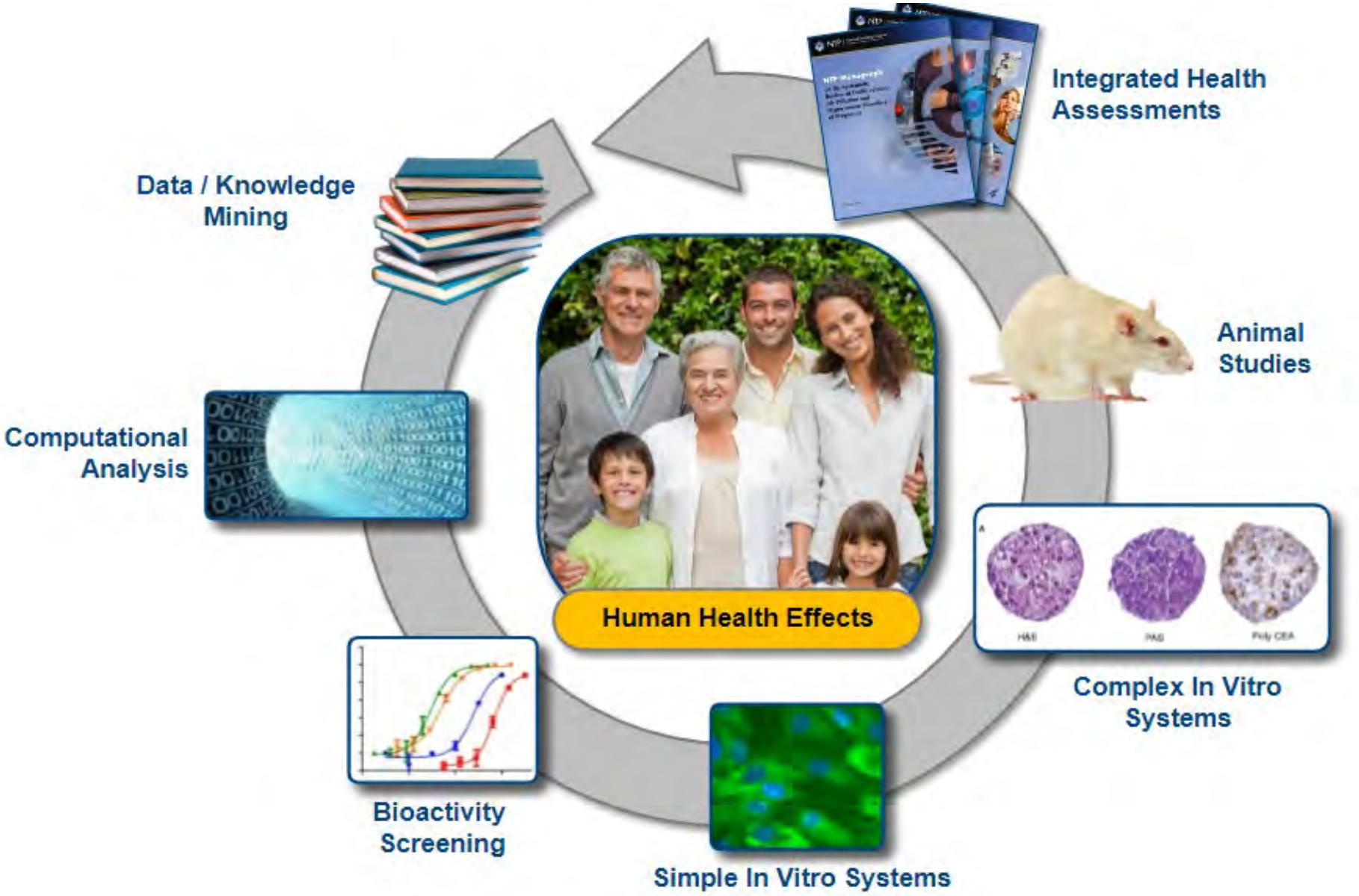
Liam O'Fallon, MA

Website:
https://www.niehs.nih.gov/research/programs/wha/index.cfm

Joan Packenham, PhD

National Institute of Environmental Health Sciences
Your Environment. Your Health.

Translational Toxicology Pipeline



Health Effects Innovation Programs

Exposure-based Research Programs

Responsive Research Programs

Strengthening Capabilities Programs

In utero PFAS exposure sets the stage for a lifetime of increased disease susceptibility

Hypertensive disorders of pregnancy
Adverse birth outcomes
Shortened lactation duration

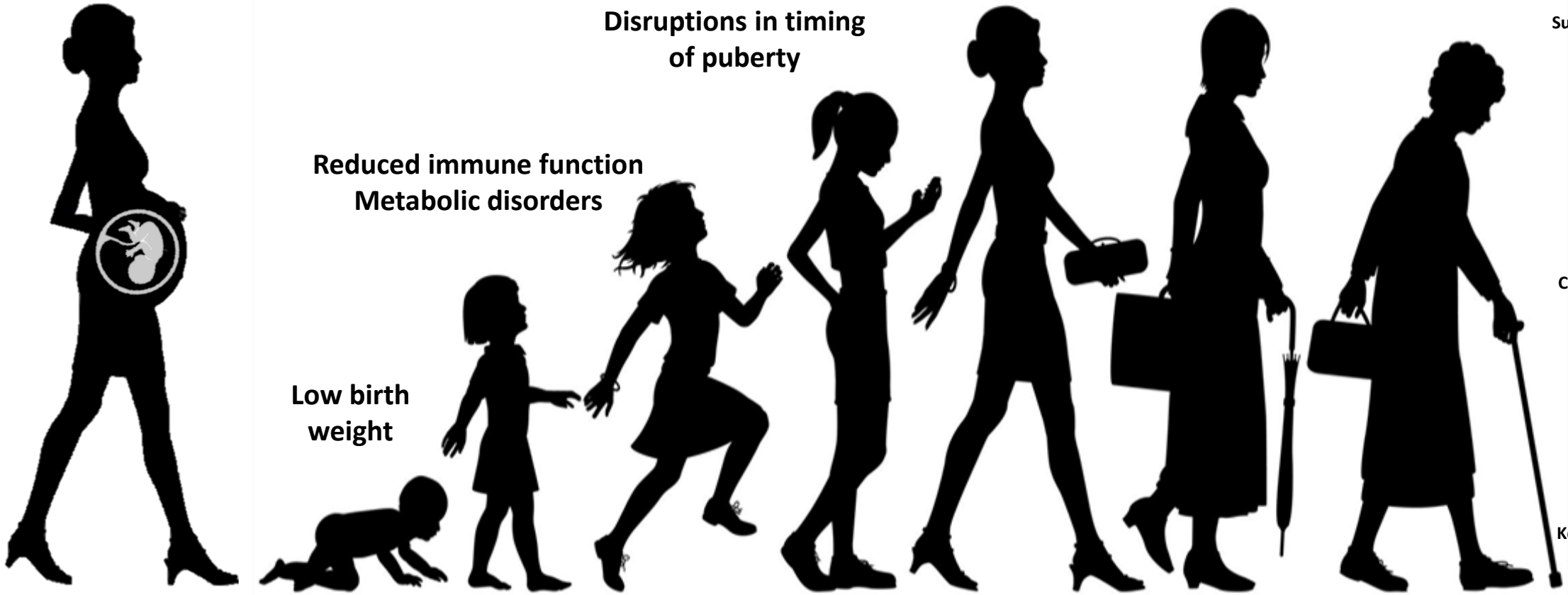
Low birth weight

Reduced immune function
Metabolic disorders

Disruptions in timing of puberty

Menstrual Issues
Reduced fertility

Elevated cholesterol/triglycerides
Reduced kidney function
Thyroid hormone disruption
Cancer



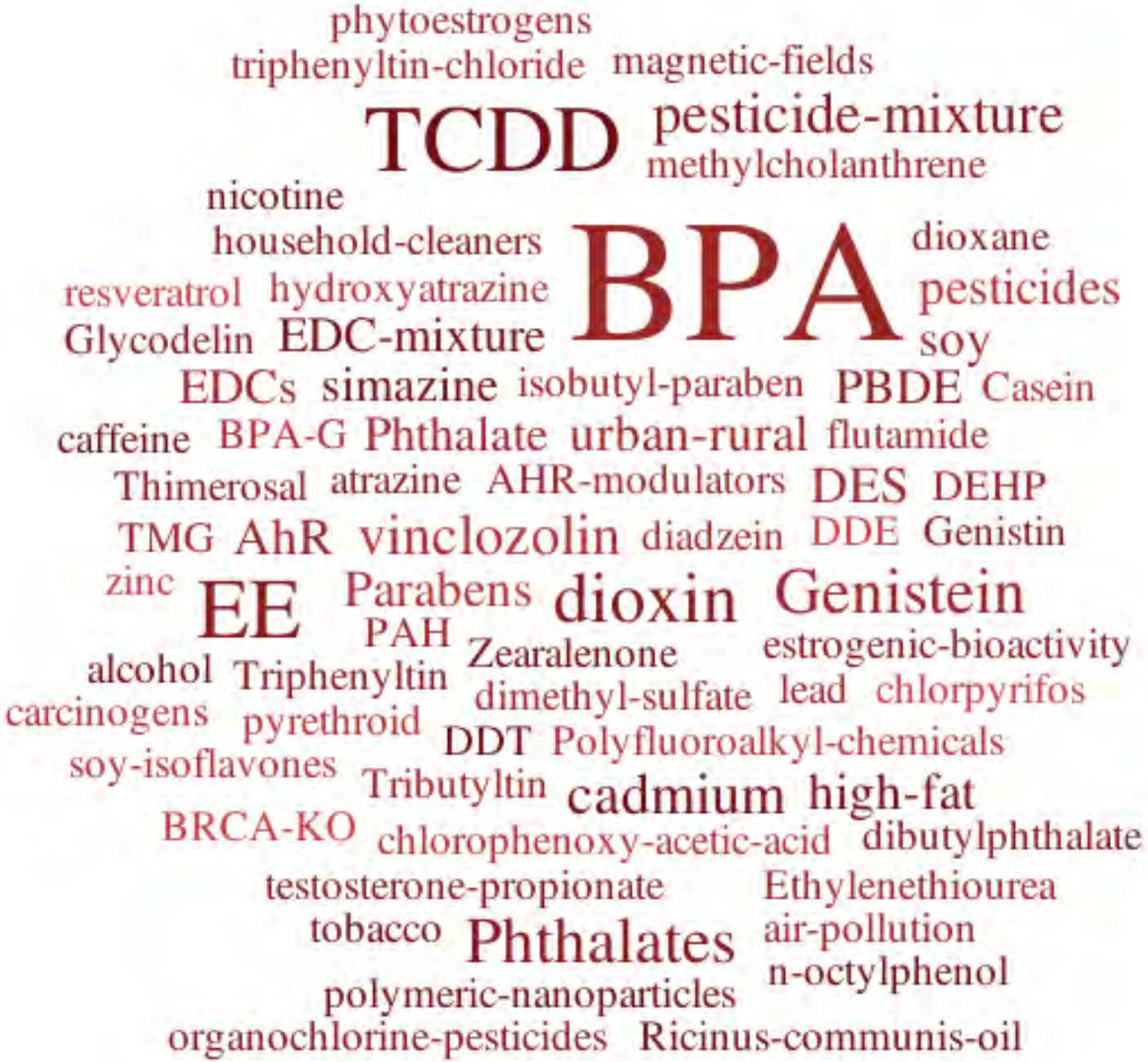
Sue Fenton, PhD MS

Chad Blystone, PhD

Kelly Ferguson, PhD

Thank you for your attention!

Questions??



Work Across the Government

Tucker A. Patterson, Ph.D.

Director

FDA National Center for Toxicological Research

FDA U.S. FOOD & DRUG ADMINISTRATION
NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

Working Across the Government

Tucker A. Patterson, Ph.D.
Director
National Center for Toxicological Research

July 19, 2023

National Center for Toxicological Research

NCTR was established in January 1971 as a non-regulatory national resource to conduct integrated toxicological research and foster interagency, academic, and industrial collaboration in support of risk-assessment needs related to public health.

PERSONNEL

- 5 Offices
- 6 Research Divisions
- ~500 employees

FACILITY

- > 1M sq. ft. − 30 buildings
- 100+ experimental labs
- 75+ AAALAC labs

Endocrine Disruptor Knowledge Base (EDKB)

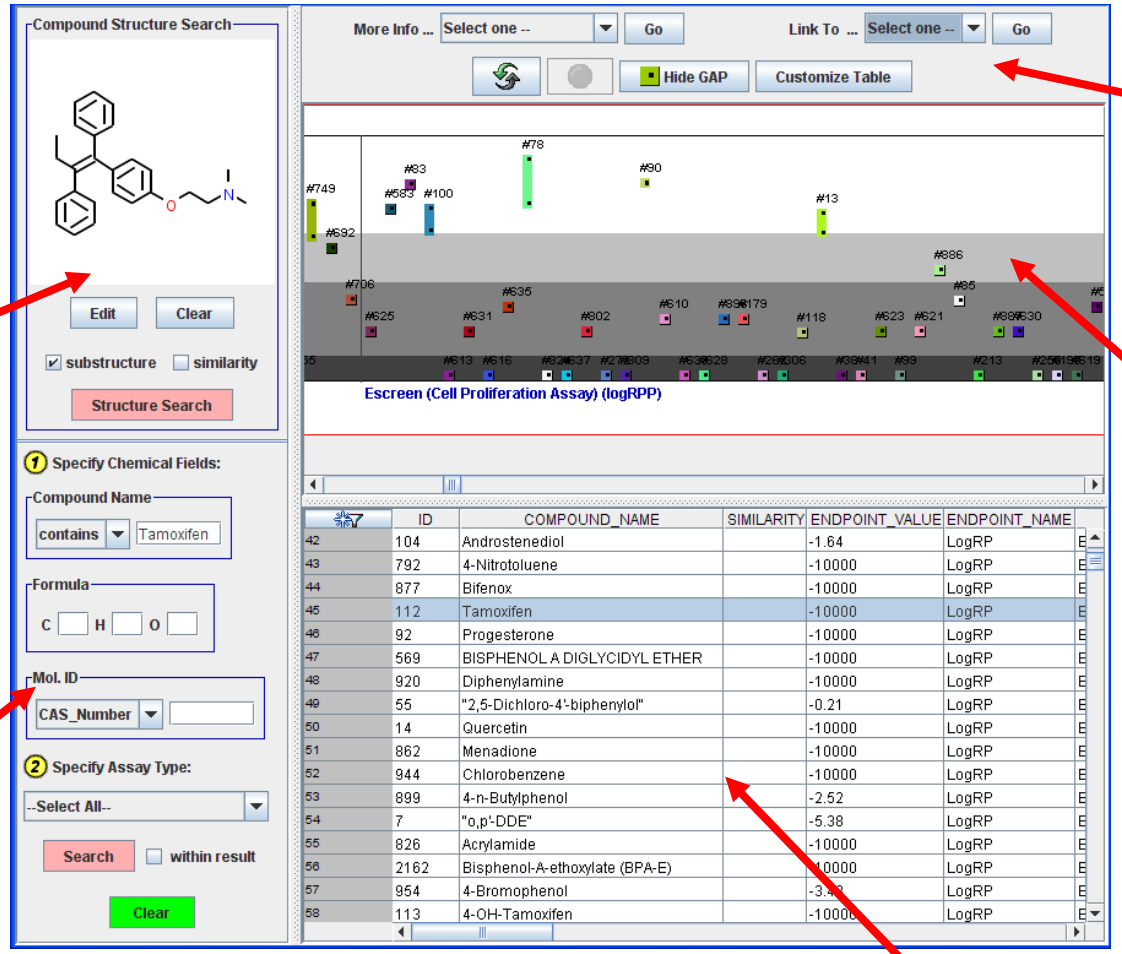
Objective: A resource that contains both experimental data and predictive models for endocrine disrupting compounds

EDKB is intended to serve as a resource for research and regulatory scientists to access endocrine activity data and to foster the development of computational predictive toxicology models. It consists of the following resources:

- a biological activity database
- QSAR (Quantitative Structure-Activity Relationship) training sets
- in vitro and in vivo experimental data for more than 3,000 chemicals
- literature citations
- chemical-structure search capabilities

https://www.fda.gov/science-research/bioinformatics-tools/endocrine-disruptor-knowledge-base-edkb

EDKB – Query and Presentation



Chemical structure & similarity search

Query interface

Link to external resources (e.g., PubChem, ToxNet)

Activity Profile

Excel-like spreadsheet

Estrogenic Activity Database (EADB)

Objective: A resource that contains a comprehensive collection of experimental estrogenic activity data for safety evaluation

Overview:

- Over 18,000 experimental estrogenic data points were curated for more than 8,000 compounds
- Four different types of data (binding, reporter gene, cell proliferation, and in vivo) from 11 species
- In addition to the standardized data and chemical structures, it contains assay protocols, literature references, and chemical properties
- Some SAR/QSAR models have been developed for predicting estrogenic activity

https://www.fda.gov/science-research/bioinformatics-tools/estrogenic-activity-database-eadb

Multigenerational Studies

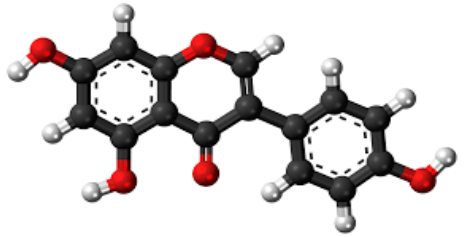
NCTR/NTP Multigenerational Studies

- Studies were initiated under the NIEHS/FDA IAA[1] in 1997 to address certain aspects of the then emerging “endocrine disruptor hypothesis.”
- Broad range of endpoints examined with primary focus on reproductive function and reproductive tract cancers
- Intent was to examine the long-term consequences of doses that produced subtle effects, including doses in the range of human exposures or at levels previously shown to have no or minimal effects in rodent models
- Study design also examined:
  - potential for magnification of subtle reproductive effects over multiple generations
  - importance of exposure windows
  - whether effects are reversible or are imprinted to carry over across generations

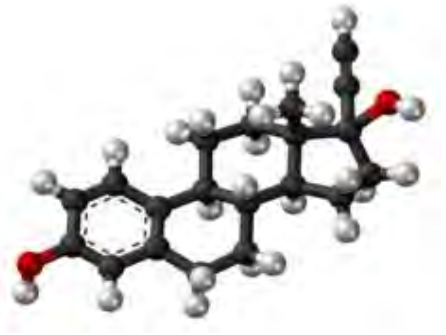
[1]NIEHS/FDA IAA, National Institute of Environmental Health Sciences/US Food and Drug Administration Interagency Agreement

Multigenerational Studies: Test Agents

- Genistein, an isoflavone and phytoestrogen to which there is widespread human exposure through soy foods, dietary supplements, and soy formula
- Ethinyl estradiol (EE_2), a potent synthetic estrogen that is commonly used as the estrogenic component of oral contraceptives
- Pharmacokinetic, neurotoxicology, behavioral, and immunotoxicology studies conducted, in addition to the multigenerational and chronic toxicity studies
- Other compounds with reported effects on estrogen and/or androgen signaling (nonylphenol, methoxychlor, and vinclozolin) also evaluated, although with a more limited scope



Genistein



Ethinyl estradiol

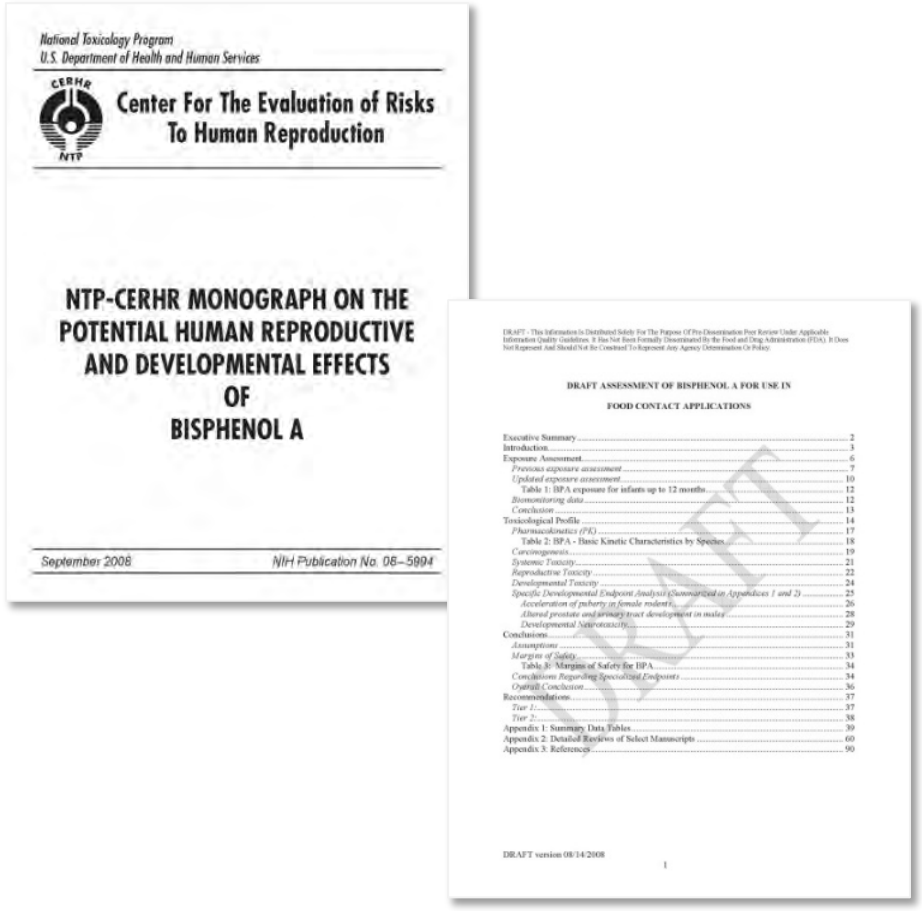
NCTR and NTP Peer-Reviewed Publications

[1]Complete list, [delclos kb newbold r - Search Results - PubMed (nih.gov)]

Bisphenol A (BPA)

- High-production volume industrial chemical
  - Production of polycarbonate plastic and epoxy resins
  - Manufacturing of food and drink storage containers, lining of food cans, dental sealants, medical devices, thermal paper, and optical disks
- Widespread low-level human exposure, mainly oral, due to migration from food packaging materials (indirect food additive)
  - Estimated mean intake range < 0.5 µg/kg body weight/day
- FDA's current assessment is that BPA is safe at the current levels occurring in foods

Back in 2008… Several Data Gaps Identified…



- FDA/NCTR Research Program on BPA was specifically designed to address data gaps identified by the NTP/CERHR[1] and FDA/CFSAN expert reviews, including the need for more research on:
  - Toxicokinetics in various experimental species, over a wide dose range, life stages, and routes of administration
  - Toxicity studies with robust design that include perinatal exposure and internal dosimetry measurements

[1]NTP/CERHR, NTP Center for the Evaluation of Risks to Human Reproduction; FDA/CFSAN, US FDA Center for Food Safety and Applied Nutrition

NCTR Research Program on BPA

Toxicokinetics

- ✓ *Species:* Mouse, rat, non-human primate
- ✓ *Routes of exposure*: Oral, subcutaneous, and intravenous
- ✓ *Life stages:* Fetal, neonatal, juvenile, adult, pregnant
- ✓ *Deuterated BPA* to avoid confounders from environmental BPA

Physiologically based pharmacokinetic (PBPK) models

- ✓ *Extrapolation to humans*
- ✓ *Extrapolation across routes of exposure*
- ✓ *Extrapolation across life stages*

[1]CLARITY-BPA, Consortium Linking Academic and Regulatory Insights on Bisphenol A Toxicity

Toxicity rat studies

- ✓ *90-day subchronic study*
- ✓ *Two-year chronic study (core study of CLARITY-BPA[1])*
- ✓ Life-long oral exposure, including during gestation
- ✓ Monitoring of BPA and estrogenic background exposures, large sample size, multiple doses and endpoints

NCTR Peer-Reviewed Publications

Toxicokinetic studies

RAPID COMMUNICATIONS IN MASS SPECTROMETRY
Rapid Commun. Mass Spectrom. 2010; **24**: 3011–3020
Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/rcm.4733

RCM

Quantification of deuterated bisphenol A in serum, tissues, and excreta from adult Sprague-Dawley rats using liquid chromatography with tandem mass spectrometry†

Nathan C. Twaddle, Mona I. Churchwell, Michelle Vanlandingham and Daniel R. Doerge*

Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, USA

Toxicology and Applied Pharmacology 255 (2011) 261–270

Contents lists available at ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

Distribution of bisphenol A into tissues of adult, neonatal, and fetal Sprague–Dawley rats

Daniel R. Doerge [a,*], Nathan C. Twaddle [a], Michelle Vanlandingham [a], Ronald P. Brown [b], Jeffrey W. Fisher [a]

[a] Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, USA
[b] Center for Devices and Radiological Health, U.S. Food and Drug Administration, Silver Spring, MD, USA

Toxicology and Applied Pharmacology 247 (2010) 158–165

Contents lists available at ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

Pharmacokinetics of bisphenol A in neonatal and adult Sprague-Dawley rats

Daniel R. Doerge [a,*], Nathan C. Twaddle [a], Michelle Vanlandingham [a], Jeffrey W. Fisher [b]

[a] Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, USA
[b] Department of Environmental Health Sciences, College of Public Health, University of Georgia, Athens, GA 30602, USA

Toxicology Letters 199 (2010) 372–376

Contents lists available at ScienceDirect

Toxicology Letters

journal homepage: www.elsevier.com/locate/toxlet

ELSEVIER

TL

Lactational transfer of bisphenol A in Sprague–Dawley rats

Daniel R. Doerge*, Michelle Vanlandingham, Nathan C. Twaddle, K. Barry Delclos

Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, 3900 NCTR Road, Jefferson, AR 72079, United States

Toxicology Letters 211 (2012) 114–119

Contents lists available at SciVerse ScienceDirect

Toxicology Letters

journal homepage: www.elsevier.com/locate/toxlet

ELSEVIER

TL

Pharmacokinetics of bisphenol A in serum and adipose tissue following intravenous administration to adult female CD-1 mice

Daniel R. Doerge*, Nathan C. Twaddle, Michelle Vanlandingham, Jeffrey W. Fisher

Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, United States

Toxicology and Applied Pharmacology 248 (2010) 1–11

Contents lists available at ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

Pharmacokinetics of bisphenol A in neonatal and adult rhesus monkeys

Daniel R. Doerge [a,*], Nathan C. Twaddle [a], Kellie A. Woodling [a], Jeffrey W. Fisher [b]

[a] Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, USA
[b] Department of Environmental Health Sciences, College of Public Health, University of Georgia, Athens, GA 30602, USA

Toxicology and Applied Pharmacology 267 (2013) 41–48

Contents lists available at SciVerse ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

Concurrent determination of bisphenol A pharmacokinetics in maternal and fetal rhesus monkeys

Tucker A. Patterson [a], Nathan C. Twaddle [b], Cindy S. Roegge [a], Ralph J. Callicott [c], Jeffrey W. Fisher [b], Daniel R. Doerge [b,*]

[a] Division of Neurotoxicology, National Center for Toxicological Research, Jefferson, AR 72079, USA
[b] Division of Biochemical Toxicology, National Center for Toxicological Research, Jefferson, AR 72079, USA
[c] U.S. Food and Drug Administration and Priority One Services Corp, Jefferson, AR 72079, USA

Toxicology Letters 207 (2011) 298–305

Contents lists available at SciVerse ScienceDirect

Toxicology Letters

journal homepage: www.elsevier.com/locate/toxlet

ELSEVIER

TL

Pharmacokinetics of Bisphenol A in neonatal and adult CD-1 mice: Inter-species comparisons with Sprague-Dawley rats and rhesus monkeys

Daniel R. Doerge*, Nathan C. Twaddle, Michelle Vanlandingham, Jeffrey W. Fisher

Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, United States

PBPK models

Toxicology and Applied Pharmacology 257 (2011) 122–136

Contents lists available at SciVerse ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

Pharmacokinetic modeling: Prediction and evaluation of route dependent dosimetry of bisphenol A in monkeys with extrapolation to humans

Jeffrey W. Fisher*, Nathan C. Twaddle, Michelle Vanlandingham, Daniel R. Doerge

Food & Drug Administration, National Center for Toxicological Research, Division of Biochemical Toxicology, 3900 NCTR Road, Jefferson, AR 72079, USA

Toxicology and Applied Pharmacology 270 (2013) 45–59

Contents lists available at SciVerse ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

Prediction and evaluation of route dependent dosimetry of BPA in rats at different life stages using a physiologically based pharmacokinetic model

Xiaoxia Yang*, Daniel R. Doerge, Jeffrey W. Fisher

Division of Biochemical Toxicology, National Center for Toxicological Research, Food & Drug Administration, 3900 NCTR Road, Jefferson, AR 72079, USA

Toxicology and Applied Pharmacology 289 (2015) 442–456

Contents lists available at ScienceDirect

Toxicology and Applied Pharmacology

journal homepage: www.elsevier.com/locate/ytaap

ELSEVIER

CrossMark

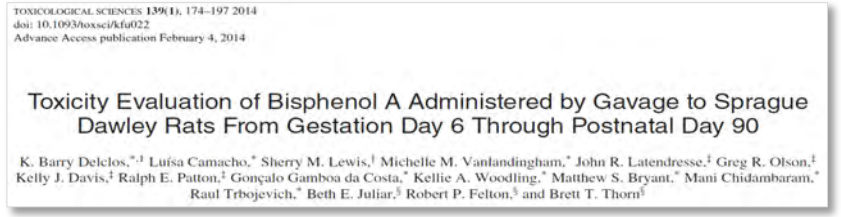
Development of a physiologically based pharmacokinetic model for assessment of human exposure to bisphenol A

Xiaoxia Yang [a,*], Daniel R. Doerge [a], Justin G. Teeguarden [b,c], Jeffrey W. Fisher [a]

[a] Division of Biochemical Toxicology, National Center for Toxicological Research, U.S. Food and Drug Administration, Jefferson, AR 72079, United States
[b] Health Effects and Exposure Science, Pacific Northwest National Laboratory, Richland, WA 99352, United States
[c] Department of Environmental and Molecular Toxicology, Oregon State University, Corvallis, OR 97331, United States

NCTR and NTP Peer-Reviewed Publications

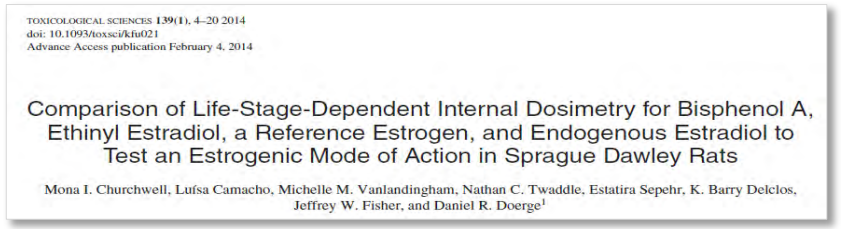
90-day toxicity rat study



TOXICOLOGICAL SCIENCES 139(1), 174–197 2014
doi: 10.1093/toxsci/kfu022
Advance Access publication February 4, 2014

Toxicity Evaluation of Bisphenol A Administered by Gavage to Sprague Dawley Rats From Gestation Day 6 Through Postnatal Day 90

K. Barry Delclos,*,1 Luísa Camacho,* Sherry M. Lewis,† Michelle M. Vanlandingham,* John R. Latendresse,‡ Greg R. Olson,‡ Kelly J. Davis,‡ Ralph E. Patton,‡ Gonçalo Gamboa da Costa,* Kellie A. Woodling,* Matthew S. Bryant,* Mani Chidambaram,* Raul Trbojevich,* Beth E. Juliar,§ Robert P. Felton,§ and Brett T. Thorn§



TOXICOLOGICAL SCIENCES 139(1), 4–20 2014
doi: 10.1093/toxsci/kfu021
Advance Access publication February 4, 2014

Comparison of Life-Stage-Dependent Internal Dosimetry for Bisphenol A, Ethinyl Estradiol, a Reference Estrogen, and Endogenous Estradiol to Test an Estrogenic Mode of Action in Sprague Dawley Rats

Mona I. Churchwell, Luísa Camacho, Michelle M. Vanlandingham, Nathan C. Twaddle, Estatira Sepehr, K. Barry Delclos, Jeffrey W. Fisher, and Daniel R. Doerge[1]

Food and Chemical Toxicology 81 (2015) 92–103

Contents lists available at ScienceDirect

Food and Chemical Toxicology

journal homepage: www.elsevier.com/locate/foodchemtox

ELSEVIER

Effects of oral exposure to bisphenol A on gene expression and global genomic DNA methylation in the prostate, female mammary gland, and uterus of NCTR Sprague-Dawley rats

CrossMark

Luísa Camacho [a,*], Mallikarjuna S. Basavarajappa [a], Ching-Wei Chang [b], Tao Han [c], Tetyana Kobets [a,1], Igor Koturbash [a,2], Gordon Surratt [a], Sherry M. Lewis [d], Michelle M. Vanlandingham [a], James C. Fuscoe [c], Gonçalo Gamboa da Costa [a], Igor P. Pogribny [a], K. Barry Delclos [a]

[a] Division of Biochemical Toxicology, National Center for Toxicological Research, Food and Drug Administration, 3900 NCTR Road, Jefferson, AR 72079, USA
[b] Division of Bioinformatics and Biostatistics, National Center for Toxicological Research, Food and Drug Administration, 3900 NCTR Road, Jefferson, AR 72079, USA
[c] Division of Systems Biology, National Center for Toxicological Research, Food and Drug Administration, 3900 NCTR Road, Jefferson, AR 72079, USA
[d] Office of Scientific Coordination, National Center for Toxicological Research, Food and Drug Administration, 3900 NCTR Road, Jefferson, AR 72079, USA

Chronic toxicity rat study (CLARITY-BPA core study)

Food and Chemical Toxicology 132 (2019) 110728

Contents lists available at ScienceDirect

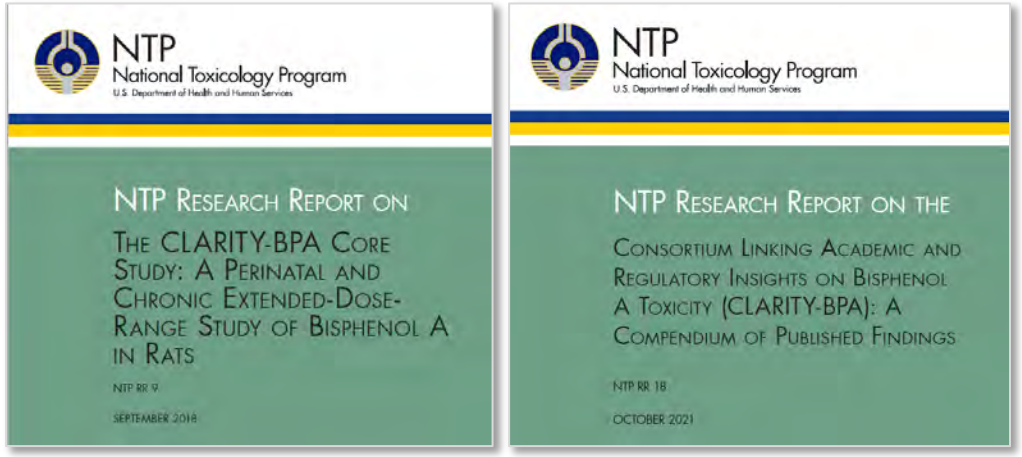
Food and Chemical Toxicology

journal homepage: www.elsevier.com/locate/foodchemtox

ELSEVIER

A two-year toxicology study of bisphenol A (BPA) in Sprague-Dawley rats: CLARITY-BPA core study results

L. Camacho[a], S.M. Lewis[a], M.M. Vanlandingham[a], G.R. Olson[b], K.J. Davis[b], R.E. Patton[b], N.C. Twaddle[a], D.R. Doerge[a], M.I. Churchwell[a], M.S. Bryant[a], F.M. McLellen[a], K.A. Woodling[a], R.P. Felton[a], M.P. Maisha[a], B.E. Juliar[a], G. Gamboa da Costa[a], K.B. Delclos[a,*]



NTP
National Toxicology Program
U.S. Department of Health and Human Services

NTP RESEARCH REPORT ON THE CLARITY-BPA CORE STUDY: A PERINATAL AND CHRONIC EXTENDED-DOSE-RANGE STUDY OF BISPHENOL A IN RATS

NTP RR 9

SEPTEMBER 2018

NTP
National Toxicology Program
U.S. Department of Health and Human Services

NTP RESEARCH REPORT ON THE CONSORTIUM LINKING ACADEMIC AND REGULATORY INSIGHTS ON BISPHENOL A TOXICITY (CLARITY-BPA): A COMPENDIUM OF PUBLISHED FINDINGS

NTP RR 18

OCTOBER 2021

CLARITY-BPA, Consortium Linking Academic and Regulatory Insights on Bisphenol A Toxicity

State Interventions

Christine Papagni

Moderated by Margaret Snyder

State Interventions

Christine Papagni

Supervising Environmental Scitentist, Safer Consumer Products Program

California Department of Toxic Substances Control

SAFER CONSUMER PRODUCTS

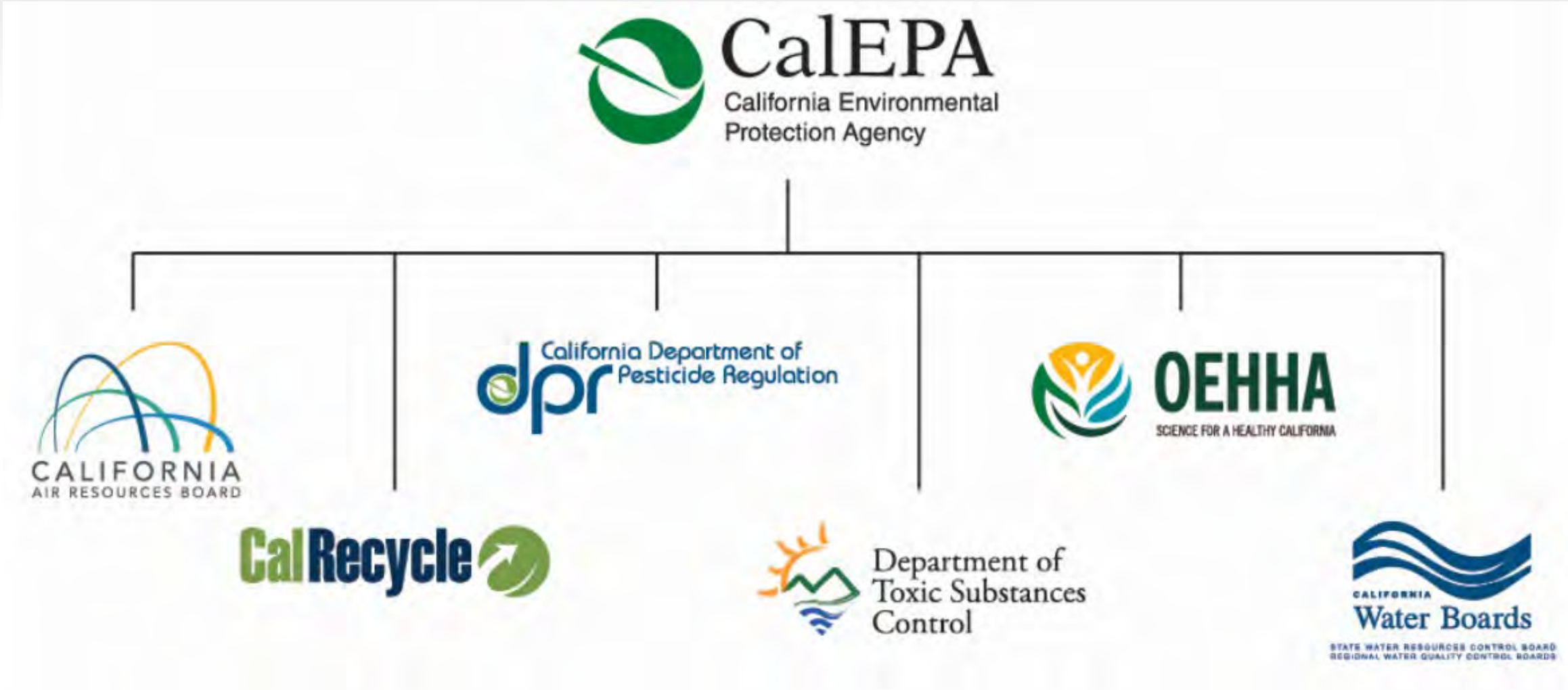
How California is Addressing Endocrine Disruptors in Consumer Products

Christine Papagni
Supervising Scientist, Safer Consumer Products Program

July 19, 2023

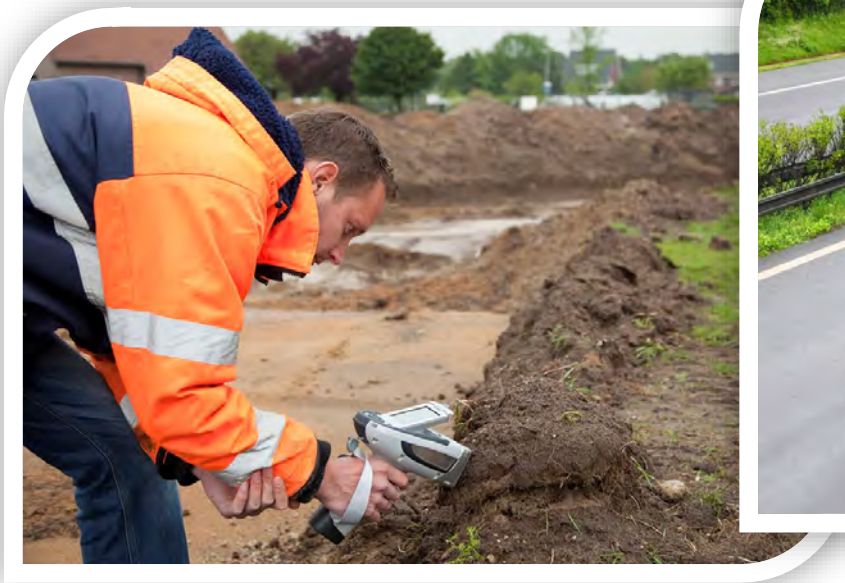
Department of Toxic Substances Control

CalEPA


CalEPA
California Environmental Protection Agency
CALIFORNIA AIR RESOURCES BOARD
California Department of Pesticide Regulation
OEHHA
SCIENCE FOR A HEALTHY CALIFORNIA
CalRecycle
Department of Toxic Substances Control
CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

DTSC Overview and Safer Consumer Products Program

Past



Site Cleanup

Present

Hazardous Waste Mngt

Future

Safer Consumer Products

Green Chemistry in Policy

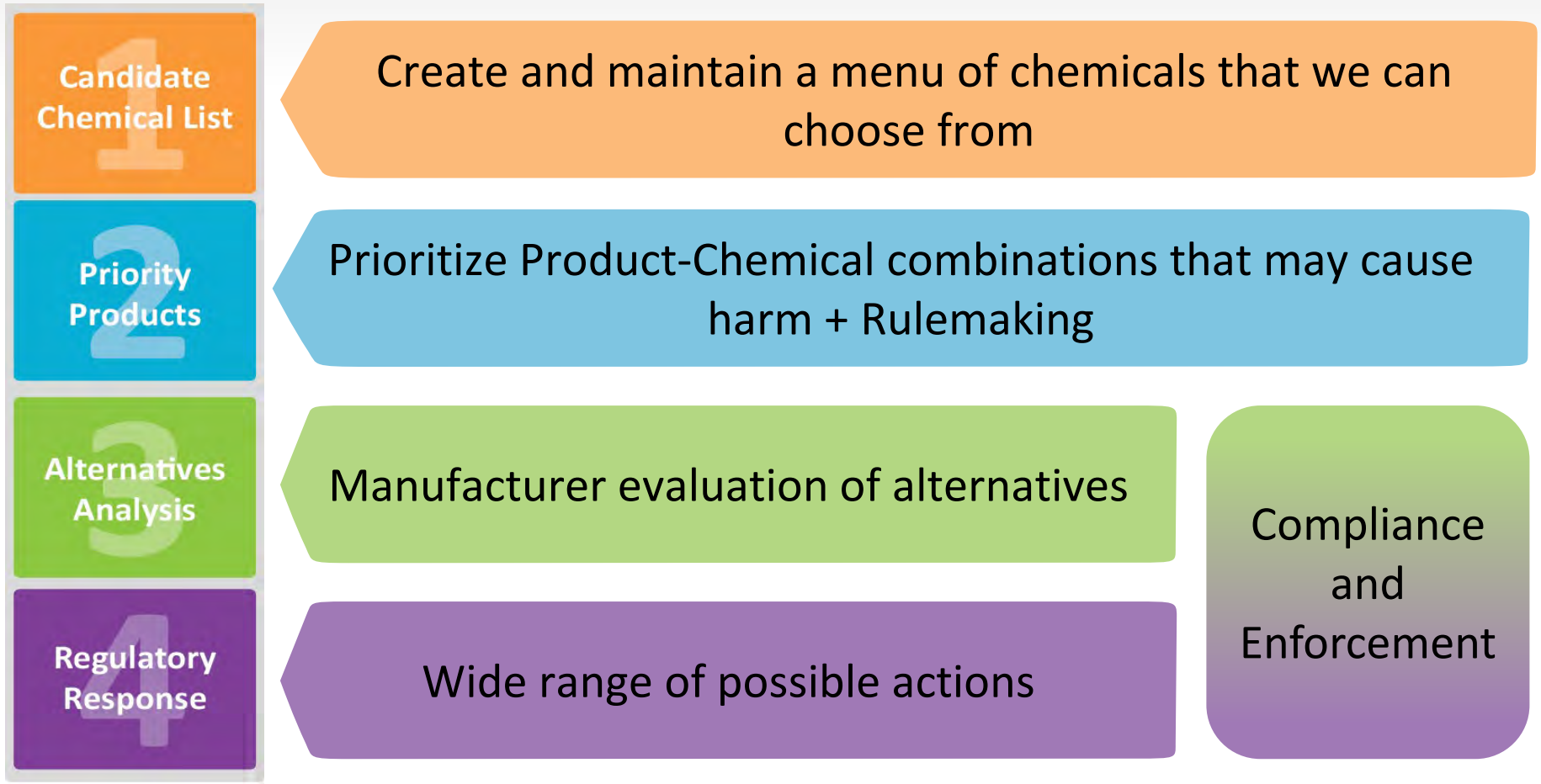
- 2008 California Green Chemistry Law
  - Health and Safety Code section 25252

- Safer Consumer Product Regulations
  - Took effect October 1, 2013
  - CCR Title 22 Chapter 55 Sections 69501 through 69511
- Green Chemistry – Hazard Trait Regulations
  - CCR Title 22 Chapter 55 Sections 69401 through 69407.2

Green Chemistry Law Objectives

- Develop a process to prioritize harmful chemicals in consumer products
- Develop a process to evaluate alternatives to hazardous chemicals
- Avoid regrettable substitutes
- Incentivize innovation and the search for safer alternatives
- Transparent and science-based decision making
- Enforceable

SCP Process


1
Candidate Chemical List
Create and maintain a menu of chemicals that we can choose from
2
Priority Products
Prioritize Product-Chemical combinations that may cause harm + Rulemaking
3
Alternatives Analysis
Manufacturer evaluation of alternatives
4
Regulatory Response
Wide range of possible actions
Compliance and Enforcement

Scope of Products

- Priority Product Work Plan
  - Menu of products
  - Released every 3 years

- Exclusions
  - FIFRA pesticides
  - Prescription drugs
  - Radioactive chemicals
  - Natural toxins

New Work Plan under development!

The 2021-2023 Priority Product Work Plan Categories

Beauty, Personal Care, and Hygiene Products

Building Products and Materials Used in Construction and Renovation

Motor Vehicle Tires

Food Packaging

Cleaning Products

Children's Products

Beauty, Personal Care, and Hygiene Products

- Nail Products
  - PP (toluene, MMA)
  - Info call-in, lab study
    - Dibutyl phthalate (DBP)
    - Diisobutylphthalate (DIBP)
    - Triphenyl phosphate

Beauty, Personal Care, and Hygiene Products (con't)

- Hair Straightening Products
  - Parabens
  - Ortho-phthalates
  - BP-3

- Leave-on products
  - n-butylparaben

Beauty, Personal Care, and Hygiene Products (con't)

- Disposable Menstrual Products (pads and tampons)
  - Ortho-phthalates
  - Parabens
  - Bisphenols

Future Research

- Children's Products
  - Ortho-phthalates screening research
  - Exposure modeling of EDCs
    - Parabens in PCPs
    - Bisphenol A and bisphenol alternatives in toys

Other California Regulations

- California Toxic-Free Cosmetic Act
  - CA HSC §108980
- Cosmetic Fragrance and Flavor Ingredient Right to Know Act of 2020
  - CA HSC §111792.6
- Labeling requirements for professional personal care products
  - CA HSC §110371

Conclusions

- California is trying to address EDCs in multiple ways
- SCP asks manufactures to look for safer alternatives
- Women's and children's health is a policy priority
- Reproductive and developmental effects are a concern
- SCP continues to research Candidate Chemicals in
  - Beauty, personal care, and hygiene
  - Children's products
  - Other Products with EDCs

Contact Information for SCP

- General Questions: Christine.Papagni@dtsc.ca.gov
  SaferConsumerProducts@dtsc.ca.gov

- Join our E-list to get updates: bit.ly/scpupdates

- Learn about career opportunities:
https://dtsc.ca.gov/scp/safer-consumer-products-career-opportunities/

Closing Remarks

Adrienne Smith
Director, Division of Policy and Performance Management
Office on Women's Health
U.S. Department of Health and Human Services

Thank you

The Post-Symposium Knowledge Assessment and Survey will be distributed today!

Thank you for your participation and feedback!

Symposium Website

How to Connect with Us

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