Racial/Ethnic Disparities in Environmental Chemical Exposures and Women's Reproductive Health

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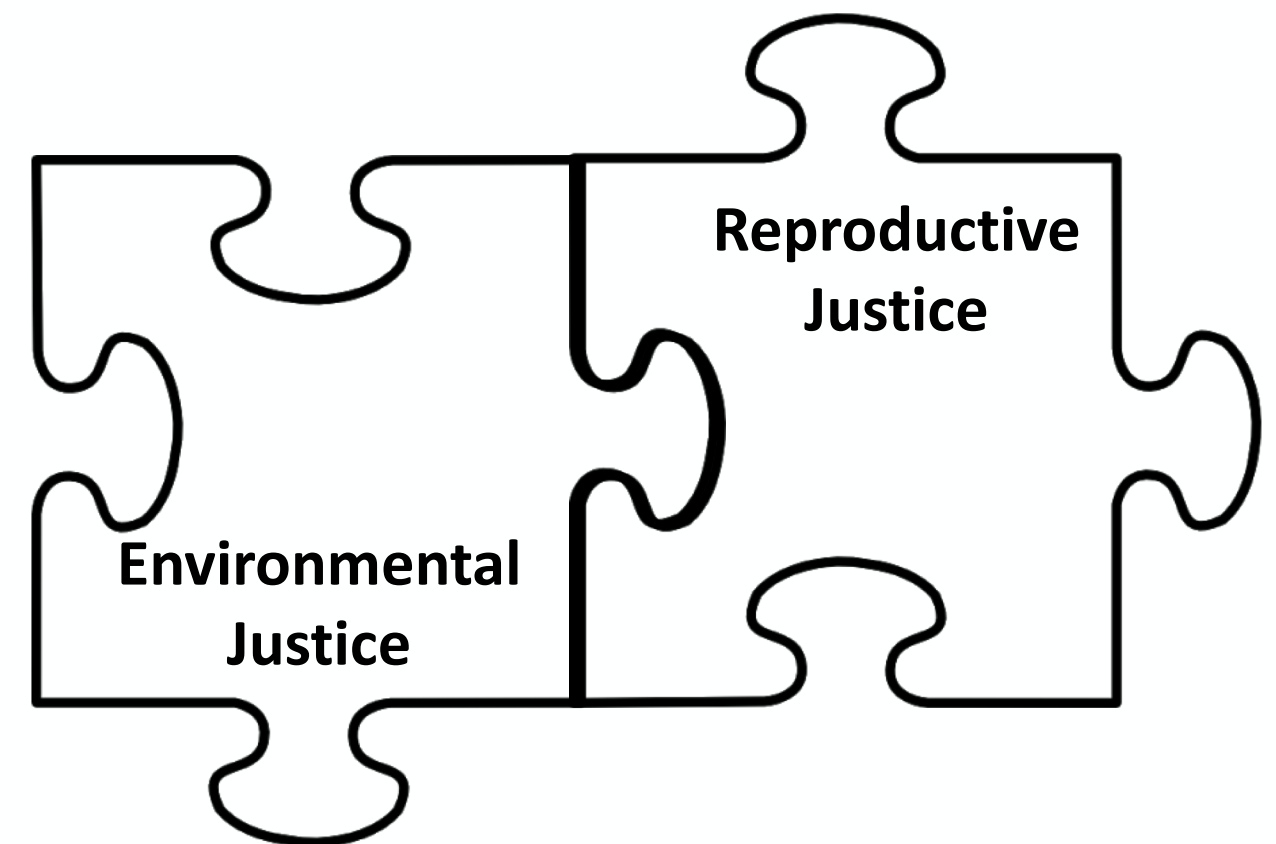
November 18, 2020

YOU DESERVE TO LIVE
IN A SAFE AND HEALTHY PLACE.
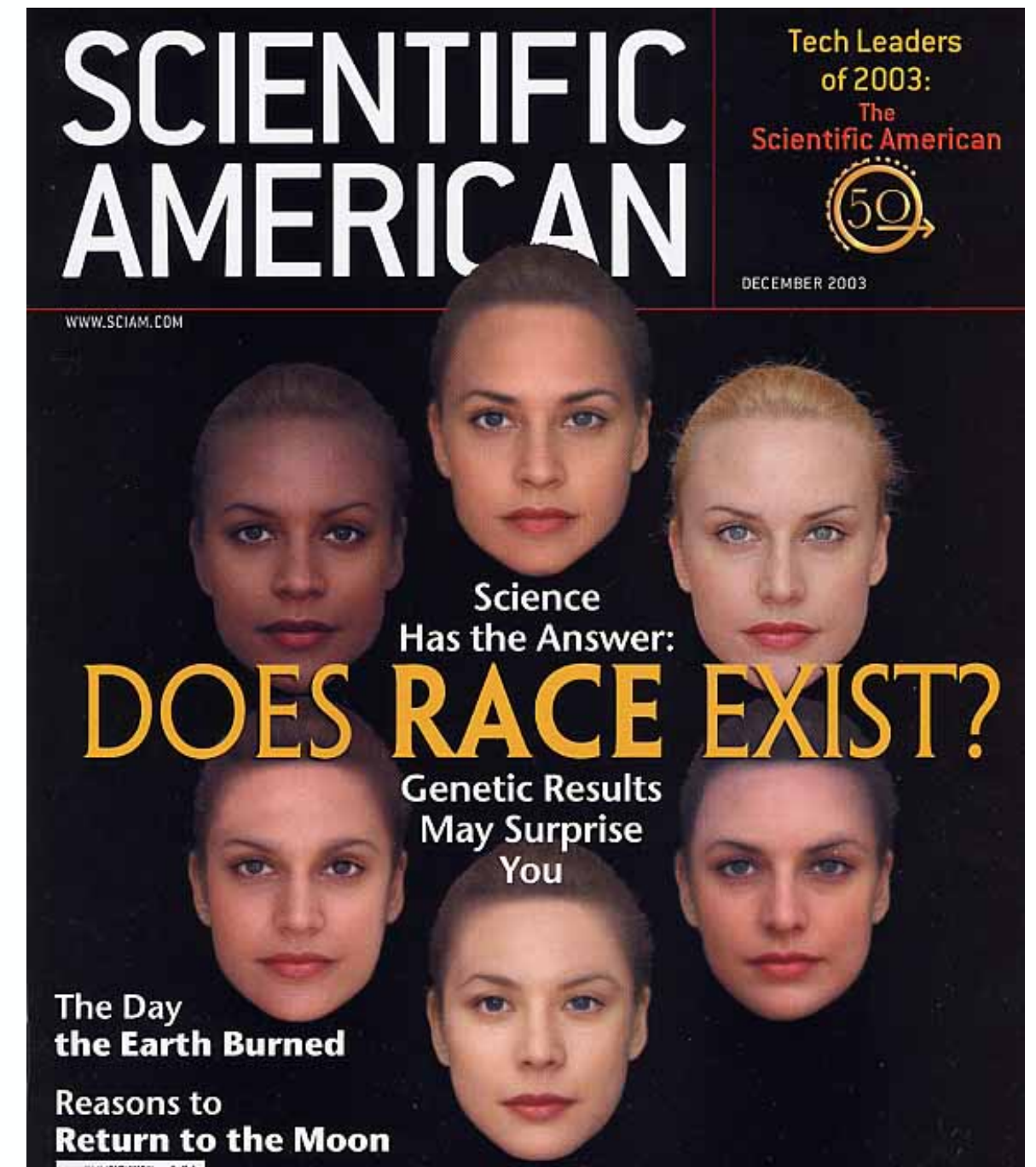
ENVIRONMENTAL JUSTICE
IS REPRODUCTIVE JUSTICE.

Credit: Repeal Hyde Art Project

Overview

❖ Definitions

❖ Framework for environmental reproductive justice research

❖ Environmental chemical and reproductive disparities

❖ Epidemiologic example

❖ Next steps

Key Definitions

❖Race: physical differences that groups and cultures consider socially significant (Am. Soc. Assoc.)

❖Ethnicity: shared culture, such as language, ancestry, practices, and beliefs (Am. Soc. Assoc.)

❖Health disparities: a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage (Healthy People 2020)

Key Definitions

❖ **Environmental Justice:** is the <u>fair treatment</u> and <u>meaningful involvement</u> of all people regardless of <u>race, color, national origin, or income</u> with respect to the development, implementation and enforcement of environmental laws, regulations and policies. (US EPA)

❖ **Environmental Racism:** Whether, by conscious design or institutional <u>neglect, actions and decisions</u> that <u>result in</u> the <u>disproportionate exposure of people of color to environmental hazards</u> and environmental health burdens. (Columbia Univ.)

❖ **Reproductive Justice:** the <u>human right</u> to <u>control</u> our sexuality, our gender, our work, and <u>our reproduction</u> (In Our Own Voice: Black Women's Reproductive Justice Agenda)
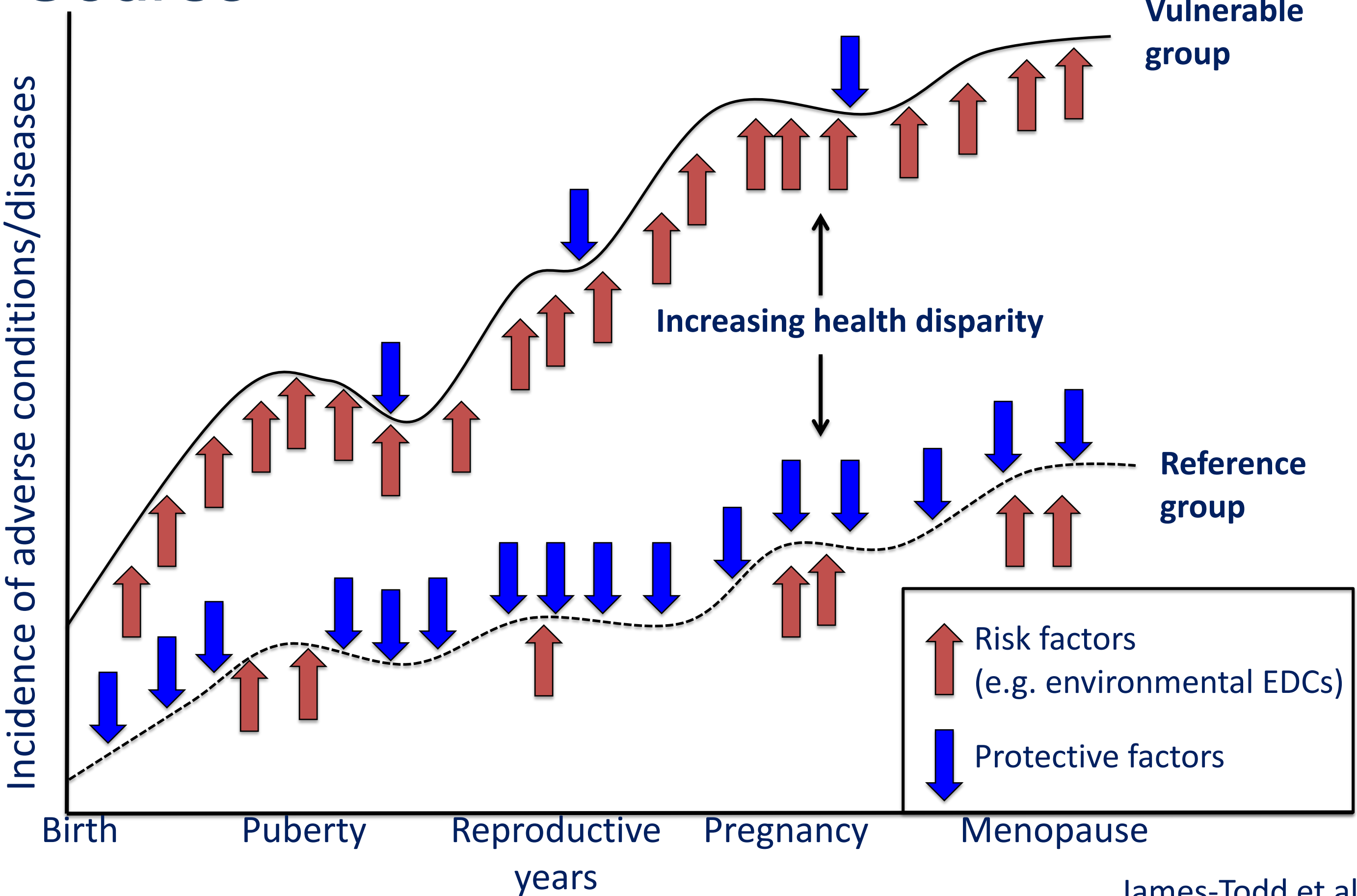
Determinants of Health

Environment

Geography

Genetics

Social conditions and policies

Behavior

Unequal Exposures and Health Disparities Across the Life Course

James-Todd et al, Curr Env Hlth Rep2016

Critical Questions in Environmental Health Disparities

What: What are the environmental factors or chemicals?
What are the conditions that are disparate?

Who: Who is at risk of high exposure?
Who has a high disease burden?

Where: Place or geographic region of greatest risk?

When: When are there critical or sensitive periods?

How: What are the mechanisms? Genetic? Epigenetic? Hormonal? Social or behavioral?

Key (Forgotten) Questions in Environmental Health Disparities

Why: Why do some populations have a higher exposure? Higher disease burden? Is there a connection?

So what: Can we do something about it?

Asking 'why' matters:

❖ Relevance and trust-building in understudied, high exposure/risk populations

❖ Key to developing sustainable and well-thought interventions
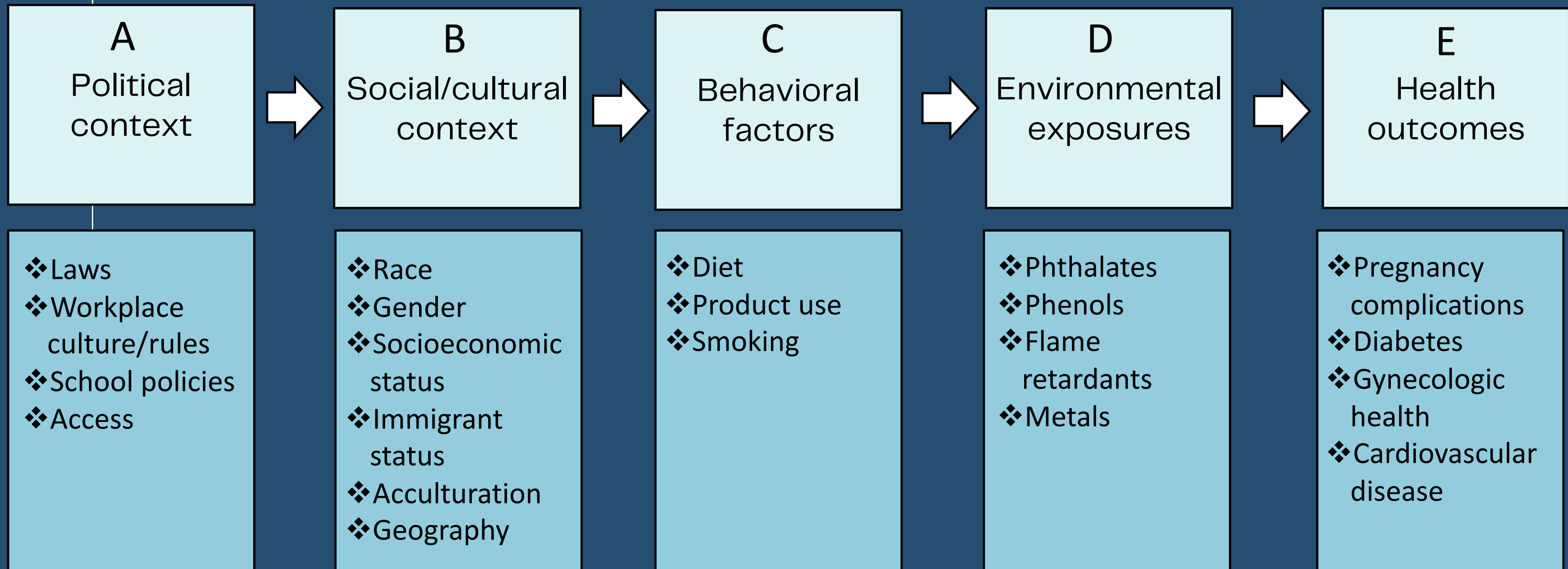
❖ Policy and social change to improve health

Examples:
❖ Structural Racism
❖ Stress
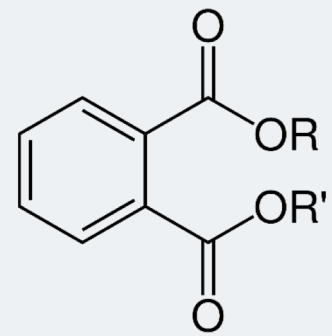❖ Access/ availability
❖ Housing/energy injustice
❖ Beauty injustice

Modifiable!

Translational Epidemiologic Approach to Health Disparities

A — Political context

→ **B** — Social/cultural context

→ **C** — Behavioral factors

→ **D** — Environmental exposures

→ **E** — Health outcomes

A
- Laws
- Workplace culture/rules
- School policies
- Access

B
- Race
- Gender
- Socioeconomic status
- Immigrant status
- Acculturation
- Geography

C
- Diet
- Product use
- Smoking

D
- Phthalates
- Phenols
- Flame retardants
- Metals

E
- Pregnancy complications
- Diabetes
- Gynecologic health
- Cardiovascular disease

Bellavia et al, Environ Epidemiol, 2018

Examples of Disparities in Environmental Chemical Exposures

Phthalates

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

NHANES 2001-2008

1/10th

James-Todd et al, Environ Health, 2014
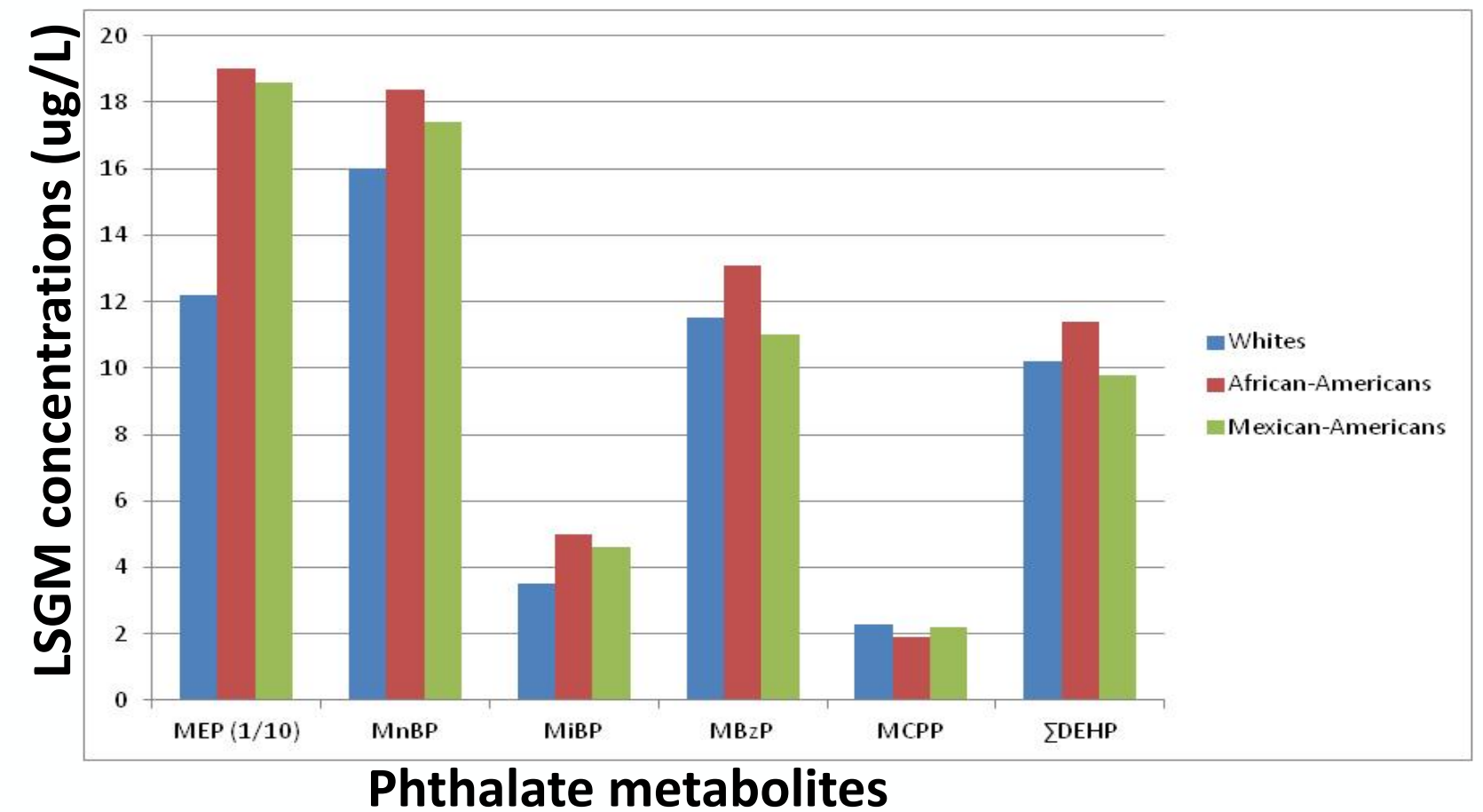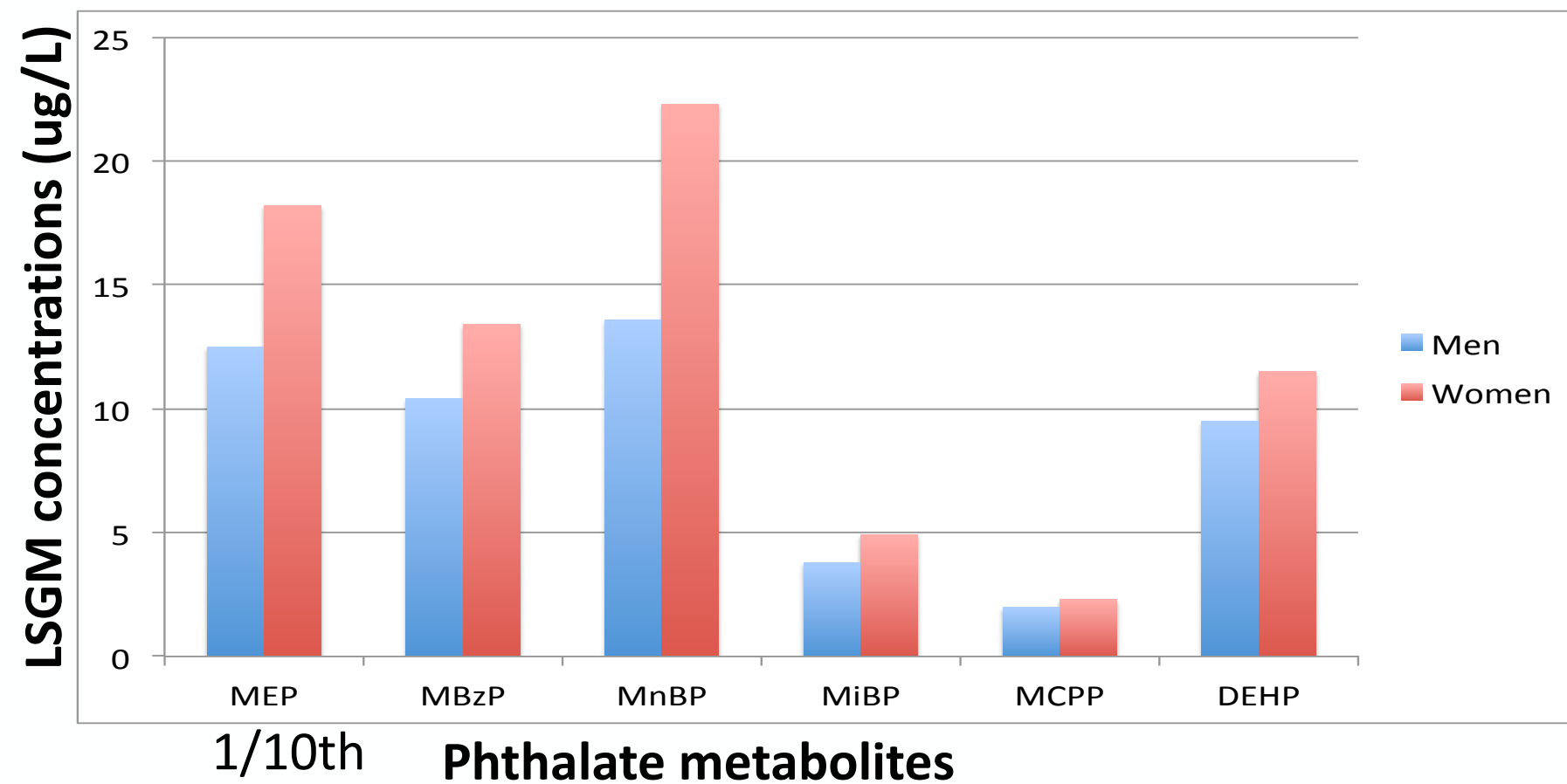
Examples of Disparities in Environmental Chemical Exposures
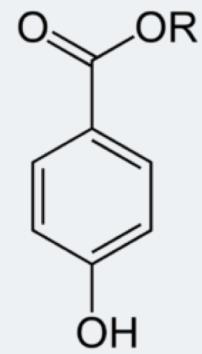
Parabens

Examples:
- ❖ Personal care products
- ❖ Foods/Diet

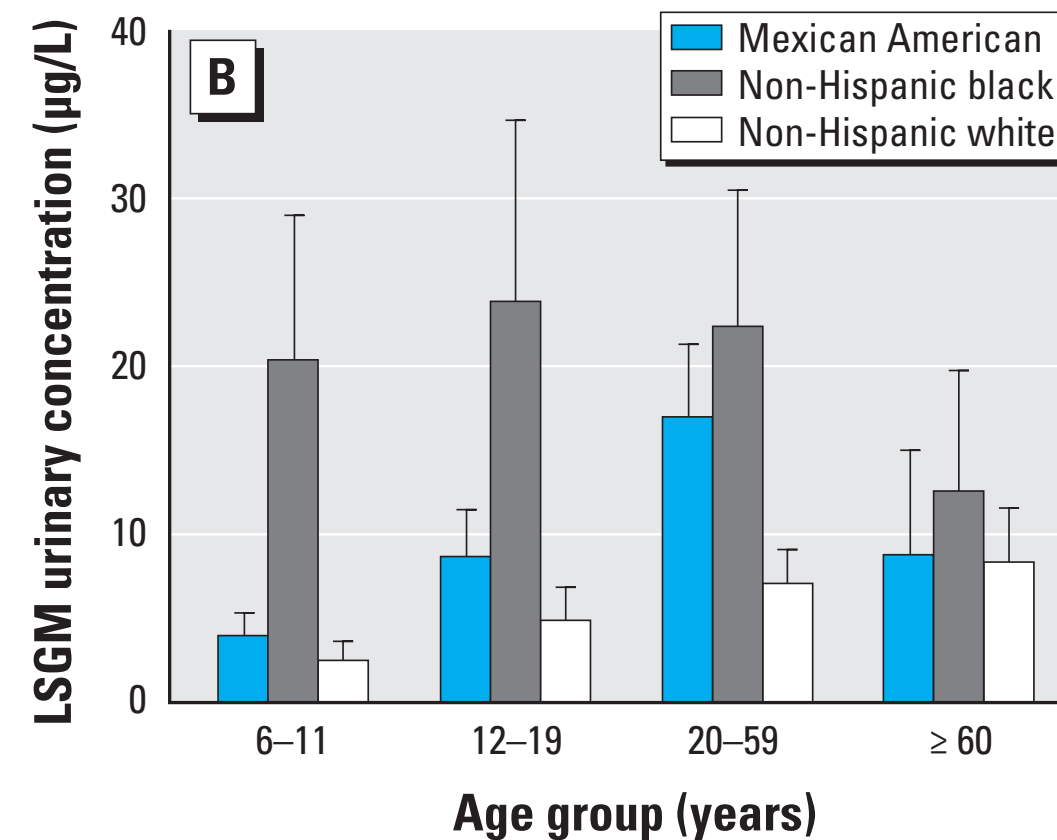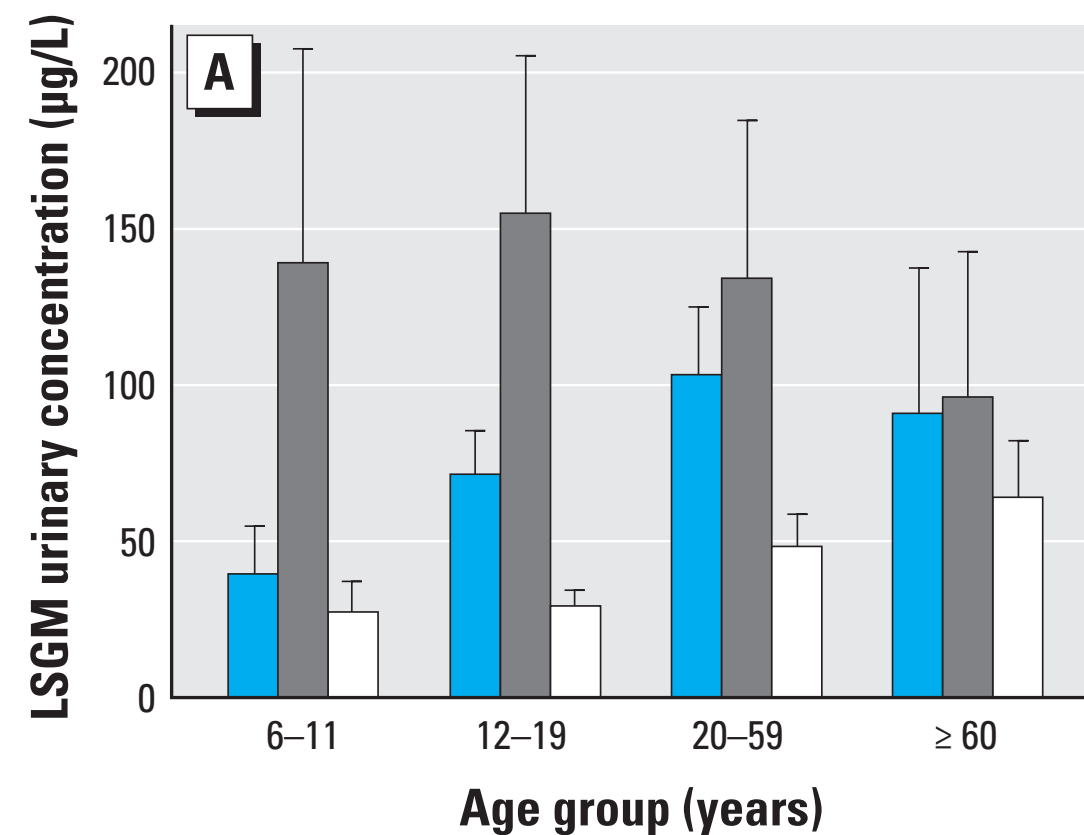Figure 2. LSGM urinary concentrations by age and race/ethnicity: (A) MP; (B) PP. Error bars indicate 95% CIs.
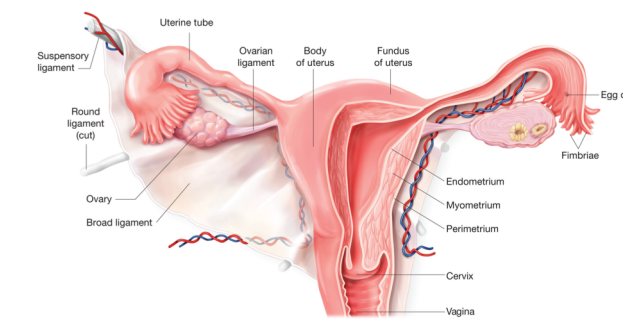
Calafat et al, EHP, 2010

EDCs and Women's Health

Infertility/subfertility

Preterm birth
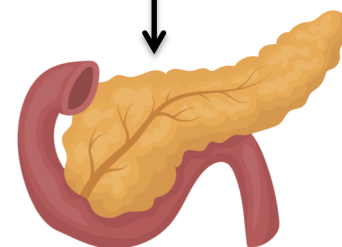Pregnancy hyperglycemia
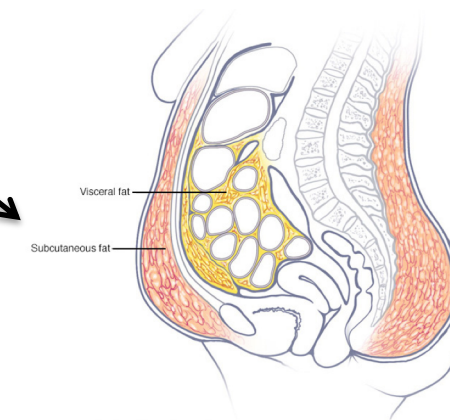
Early puberty

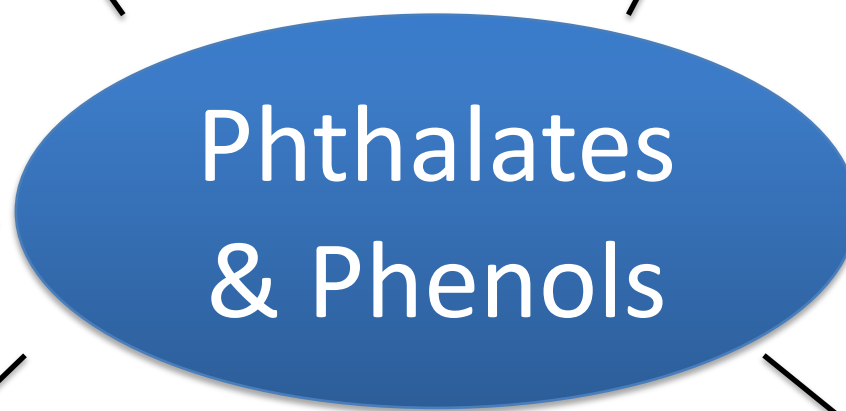## Phthalates & Phenols

Endometriosis and Fibroids
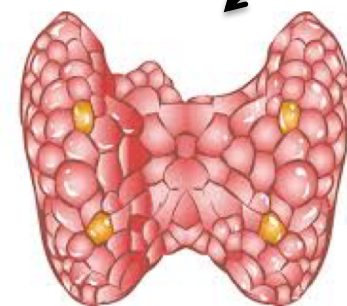
Thyroid

Diabetes and
Glucose Intolerance
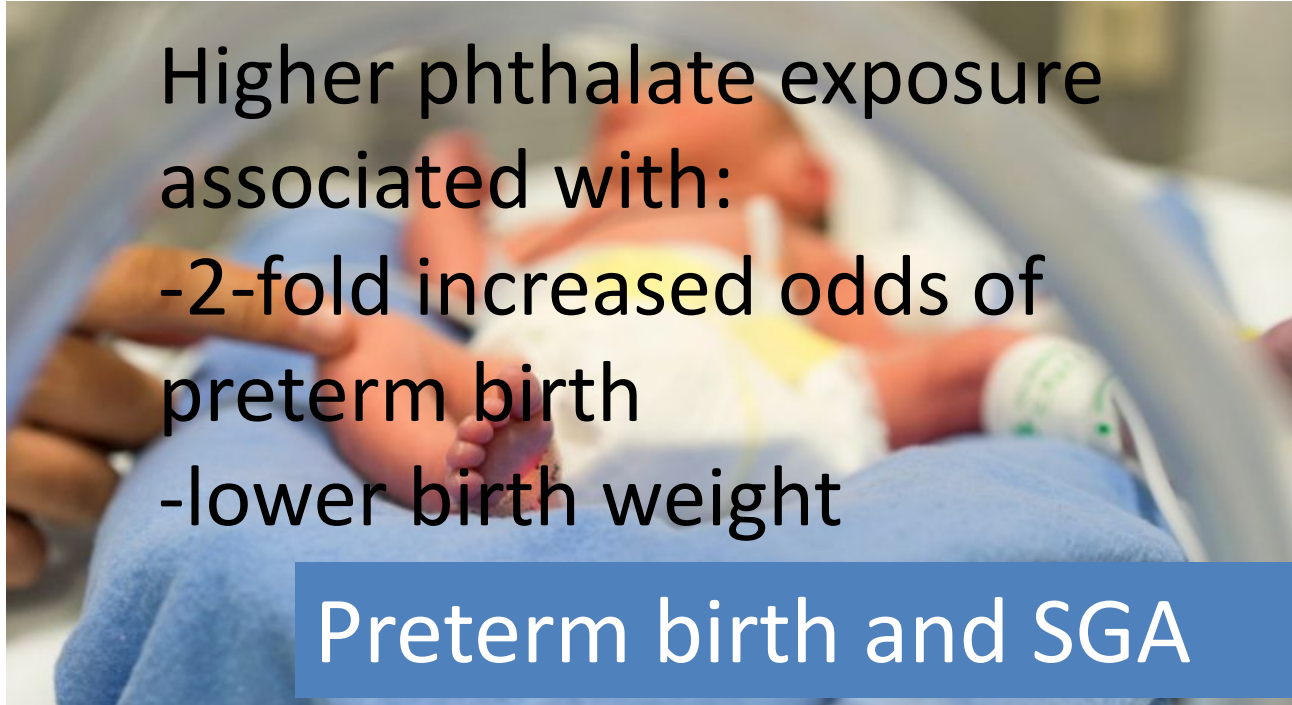
Adipogenesis and
Obesity

EDCs and Pregnancy Health

Once pregnant, ~25% of pregnancies in the United States have one of these 4 complications

Higher phthalate exposure associated with:
-~20% decrease in antral follicle count
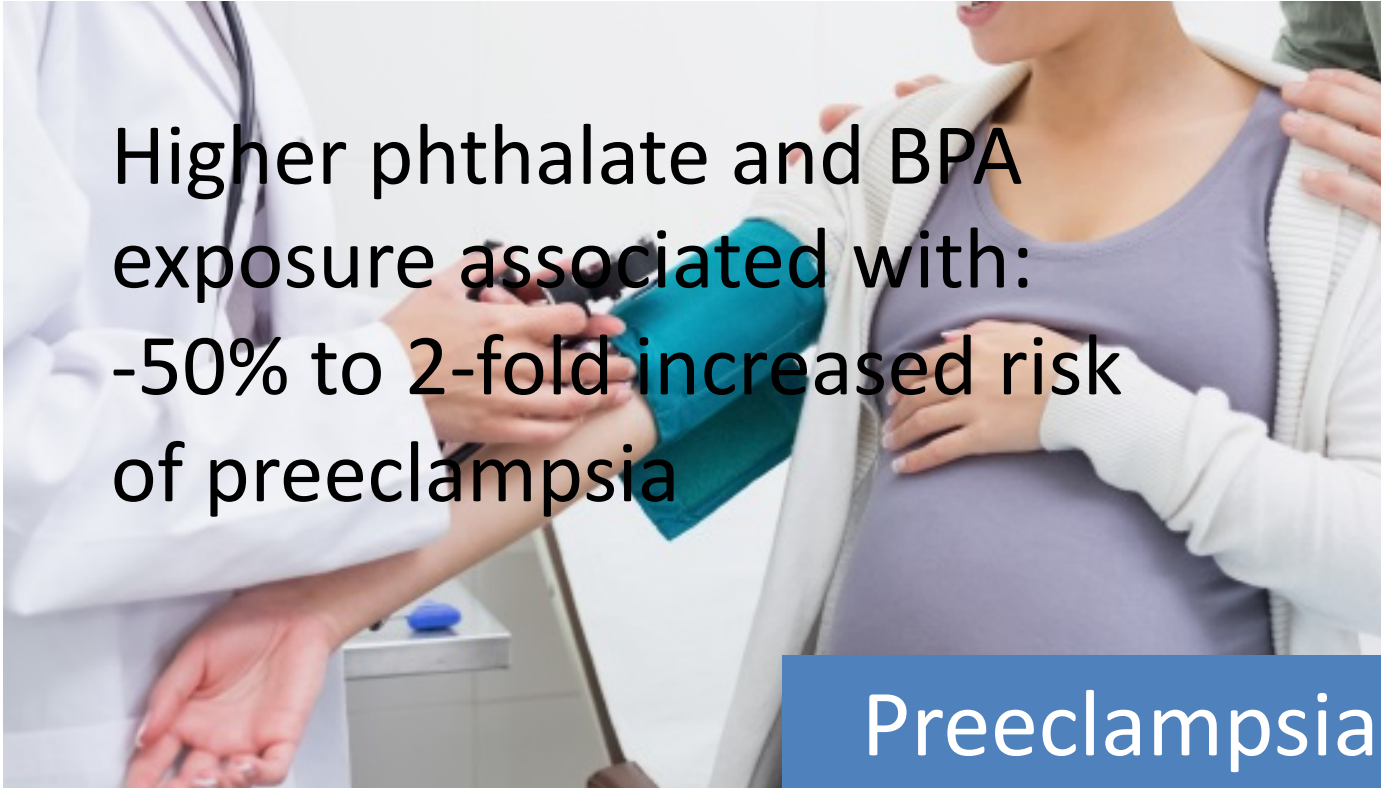-~3-fold increased risk of pregnancy loss

Infertility

Higher phthalate exposure associated with:
-2-fold increased odds of preterm birth
-lower birth weight

Preterm birth and SGA

Higher phthalate and BPA exposure associated with:
-50% to 2-fold increased risk of preeclampsia

Preeclampsia

Higher phthalate and BPA exposure associated with:
-~10-12 mg/dL higher glucose
-Excessive gestational weight gain
-60% increased risk of GDM

Gestational diabetes

EDCs and Women's Health

Black women are 2x as likely to experience infertility
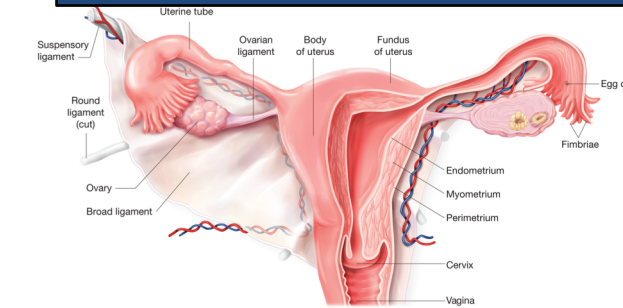
Hispanic and black girls were more likely to reach menarche earlier

❖ Native American women ~7x higher GDM
❖ Asian and Hispanic women are 2-3x more likely to have GDM

Black women are 50% more likely to experience a preterm birth

Fibroids are 2-3x higher in black women
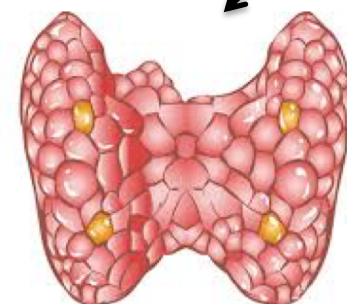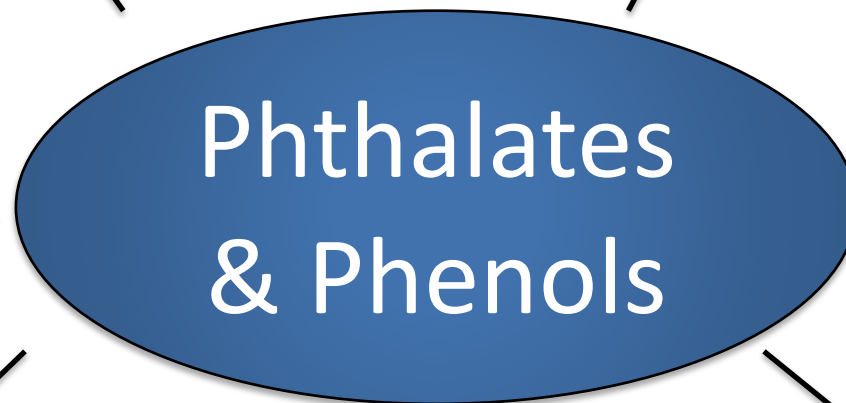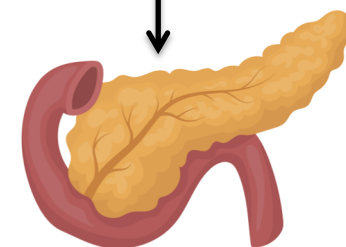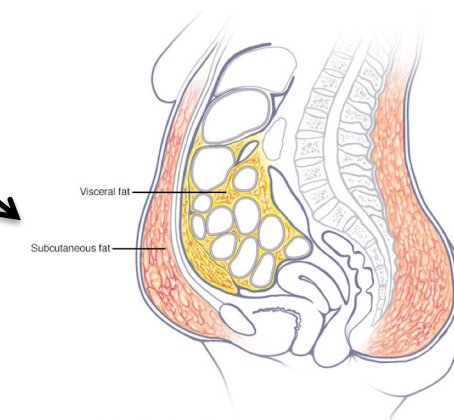
Hispanic and black women ~50% more likely to have pre-pregnancy obesity

Infertility/subfertility

Pregnancy hyperglycemia Preterm birth

Early puberty

Phthalates & Phenols

Endometriosis and Fibroids

Thyroid

Diabetes and Glucose Intolerance

Adipogenesis and Obesity

Epidemiologic Example of Environmental Reproductive Health Disparities

Hair product use, endocrine disrupting chemicals, and racial differences in preterm birth

Greater New York Hair Products Study (GNYHPS)
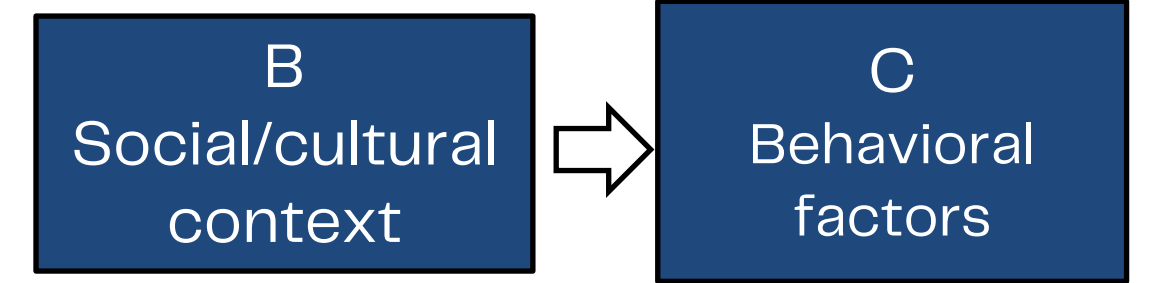
- Recruited 359 women between 2004 and 2006

- Self-identified black, African Caribbean, Hispanic, and non-Hispanic White women

- Research Goals:
  - Hair product usage patterns
  - Determine contents of hair products based on lab analysis and label information

Examples of Hair Product Types: GNYHPS
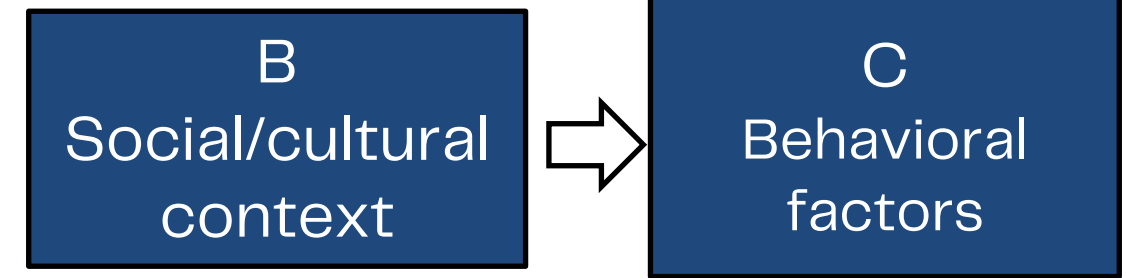
Lotion

Perm/Relaxer

Oil

Root Stimulator

Other products

Leave-in conditioner

Association between Race/Ethnicity and Hair Product Use: GNYHPS

James-Todd, J Immigr Minor Health. 2012

Race/Ethnicity & Hair Products Ingredients Label Content GNYHPS

B Social/cultural context	→	C Behavioral factors

James-Todd et al, J Immigr Minor Health. 2012
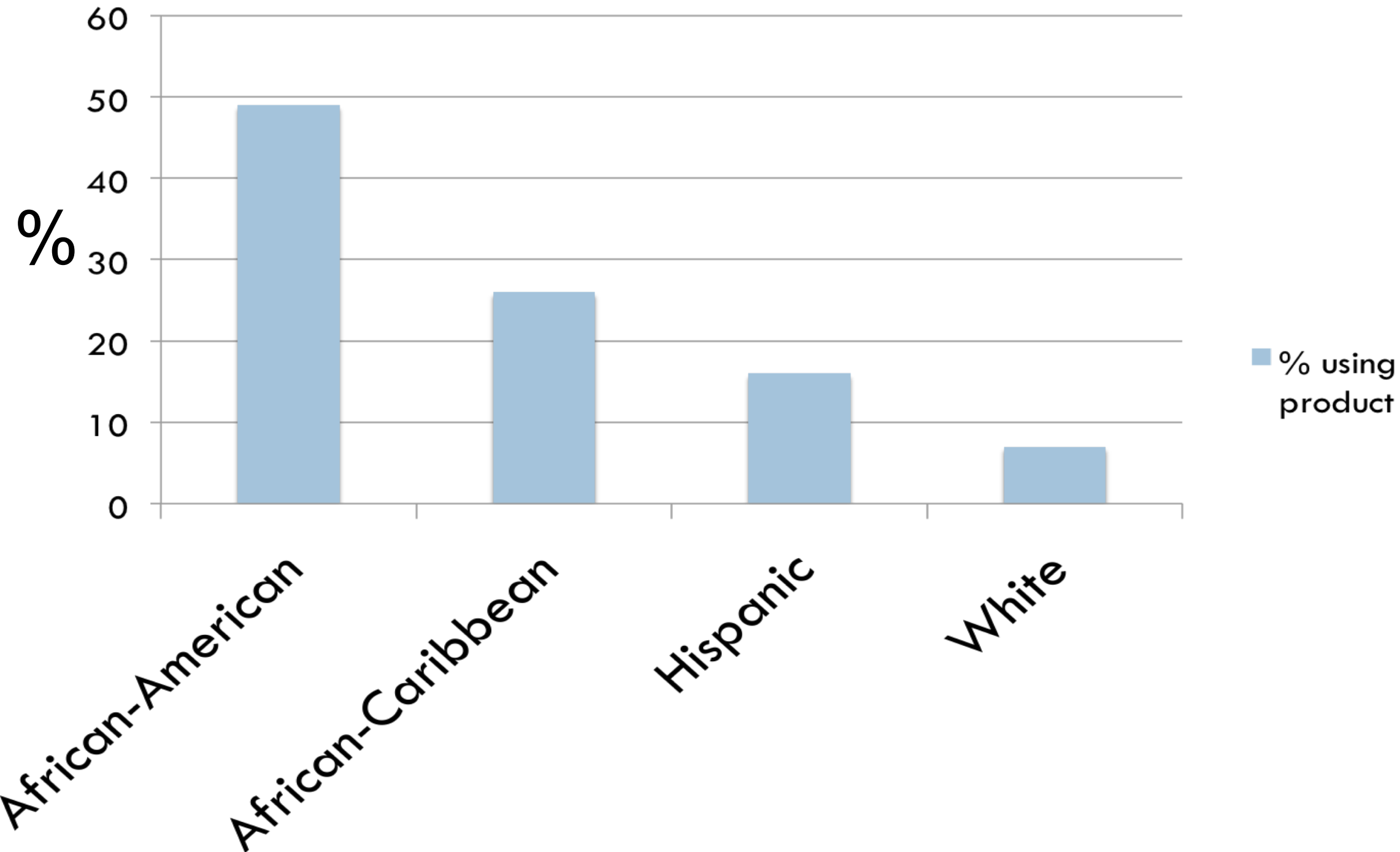
EDC content of commonly used hair products from GNYHPS
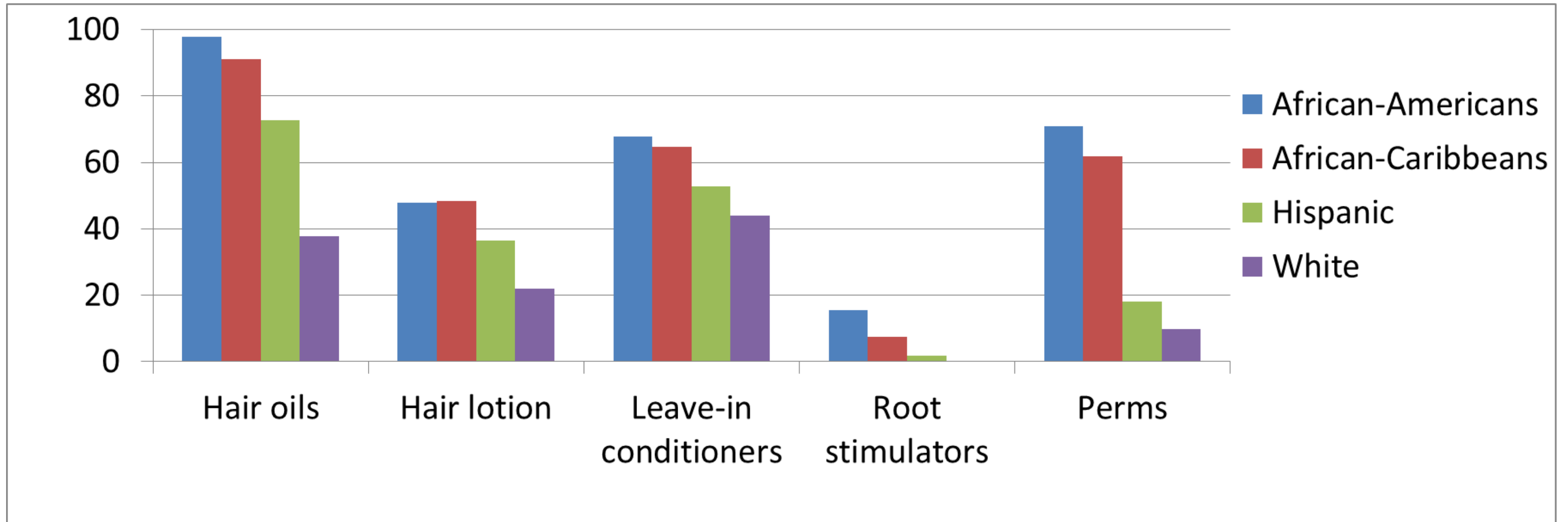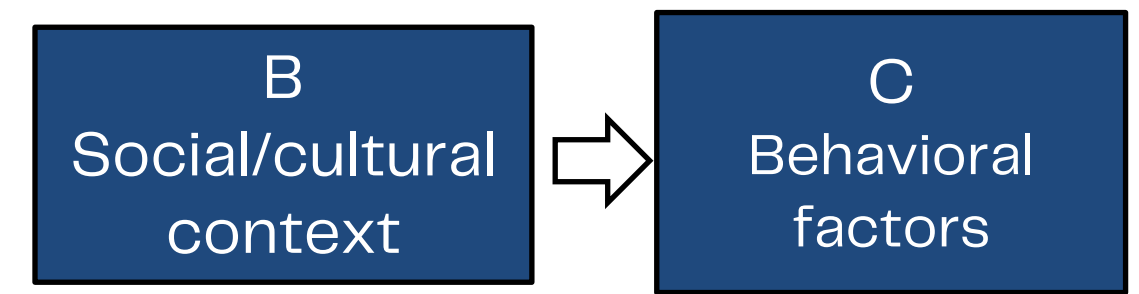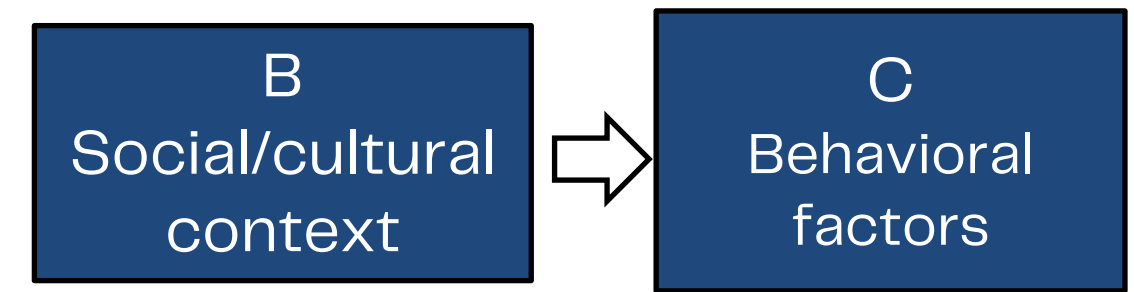
| B Social/cultural context | → | D Environmental exposure |
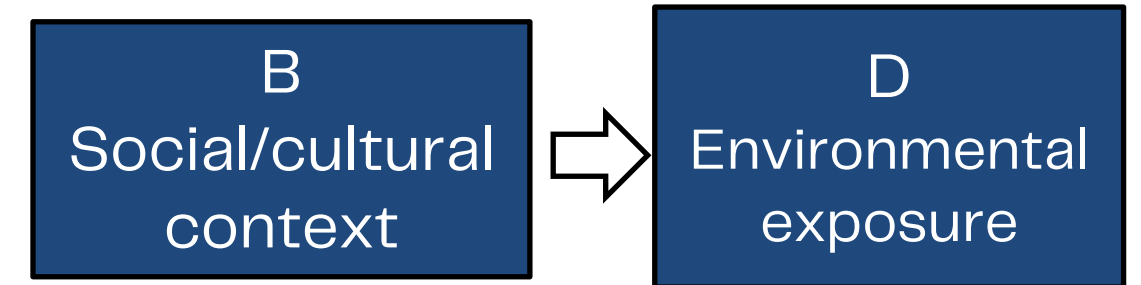
Chemical Group	Health Effects	Products
Alkyphenols	Endocrine disruption, developmental/reproductive disruption in animals	Hair relaxer, root stimulator, hair lotion, hot oil
Cyclosiloxanes	Endocrine disruption, potential carcinogen	Anti-frizz, leave-in conditioner, hair relaxer, root stimulator, hot oil
Ethanolamines	Exacerbate asthma, potential carcinogen	Hair relaxer, leave-in conditioner
Fragrances	Exacerbate asthma, endocrine disruption	Root stimulator, hair relaxer, hair lotion, anti-frizz, leave-in conditioner, hot oil
Parabens	Endocrine disruption	Hair lotion, hair relaxer, root stimulator, leave-in conditioner, hot oil
Phthalates	Exacerbate asthma, endocrine disruption, disrupt male reproductive development/fertility, potential carcinogen	Hair relaxer, root stimulator, hair lotion, anti-frizz, hot oil
UV Filters	Endocrine disruption, developmental/reproductive disruption in animals potential carcinogen	Anti-frizz, root stimulator, hair lotion, hair relaxer, leave-in conditioner, hot oil

Helm et al, Environ Hlth 2018

Hair products and hormonal activity from products commonly used in GNYHPS
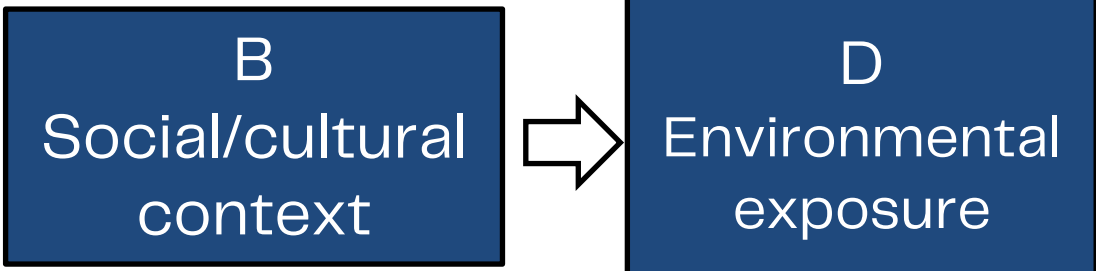
→Estrogen and progesterone receptors

→Estrogen and glucocorticoid receptors

→Androgen, progesterone, and glucocorticoid receptor

→Estrogen and androgen receptors

James-Todd et al, under review 2020

Association between Hair Product Use and Preterm Birth:

C Behavioral factor	⇨	E Health outcomes
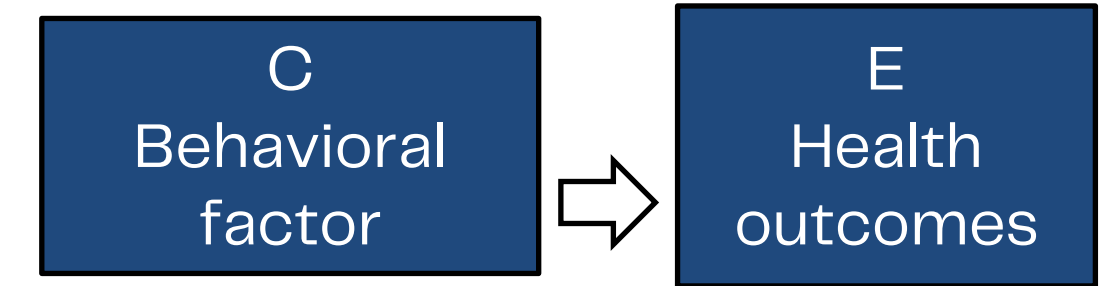
Table   Difference in Mean Gestational Age at Delivery Associated with Frequency of Hair Oil Use During Pregnancy (n=102)

		Days
Model	Frequency	Beta (95% CI)
Visit 1	Daily	-5.75 (-13.51, 2.00)
	< Daily	-0.57 (-6.88, 5.75)
	Never (ref)	0 (ref)
Visit 3	Daily	-1.66 (-8.72, 5.39)
	< Daily	-0.69 (-7.93, 6.55)
	Never (ref)	0 (ref)
Visit 4	Daily	-10.23 (-18.49, -1.98)
	< Daily	0.32 (-5.1, 5.73)

Adjusted for maternal age (years)

Daily use of hair oils in late pregnancy led to a 10 day earlier delivery

ERGO

Preston and Fruh et al, in prep 2020

Examples of ongoing work at the intersection of EJ & RJ

❖ Cosmetic use and phthalate metabolite concentrations in Mexican American girls/adolescents

❖ Feminine hygiene products, phthalates and fibroids

❖ Personal care product chemicals and preterm birth in Puerto Rican women

❖ Acculturation, phthalates, and gestational diabetes in Asian women

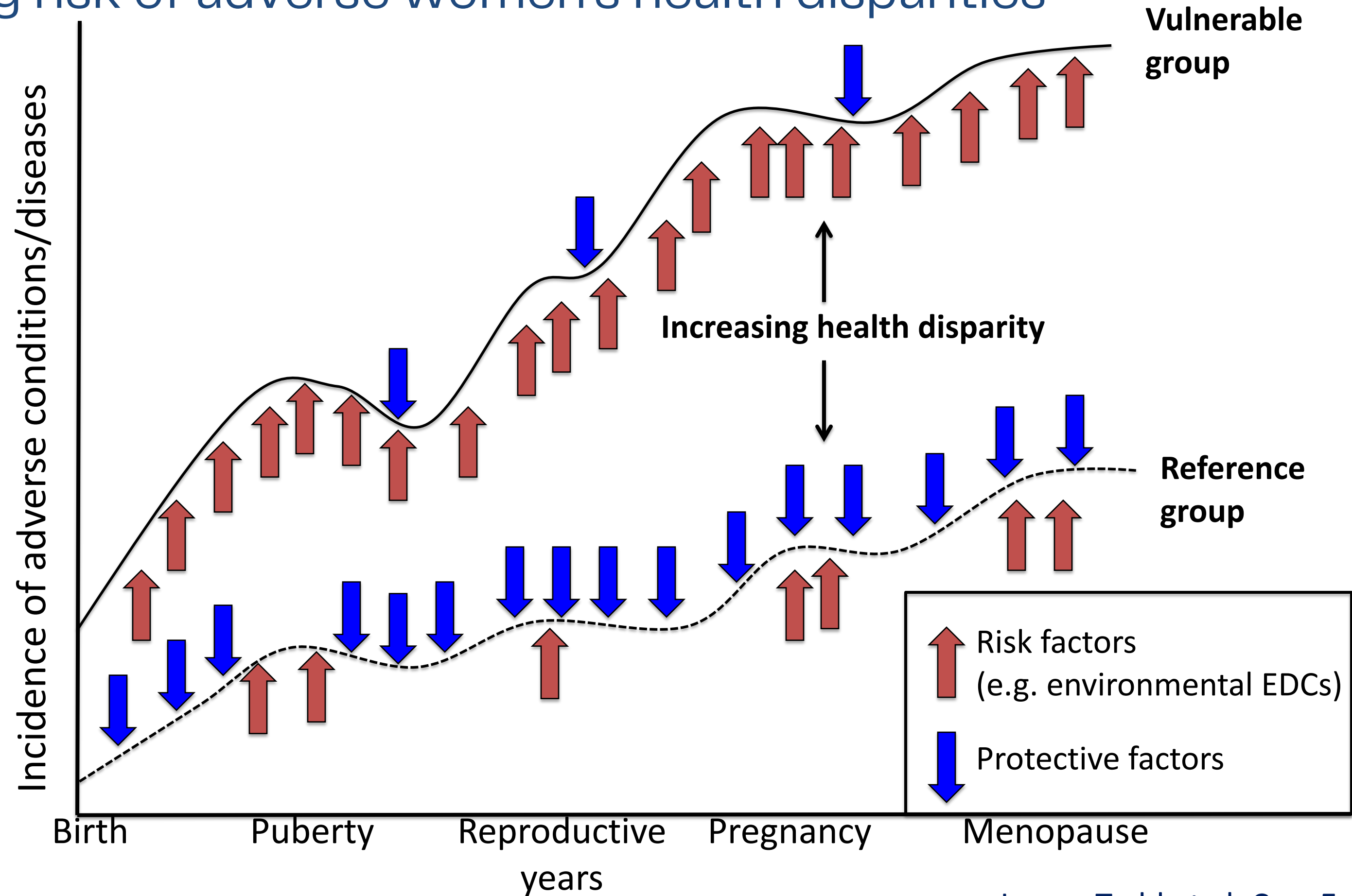❖ Environmental exposures and pregnancy and postpartum health in Black mothers

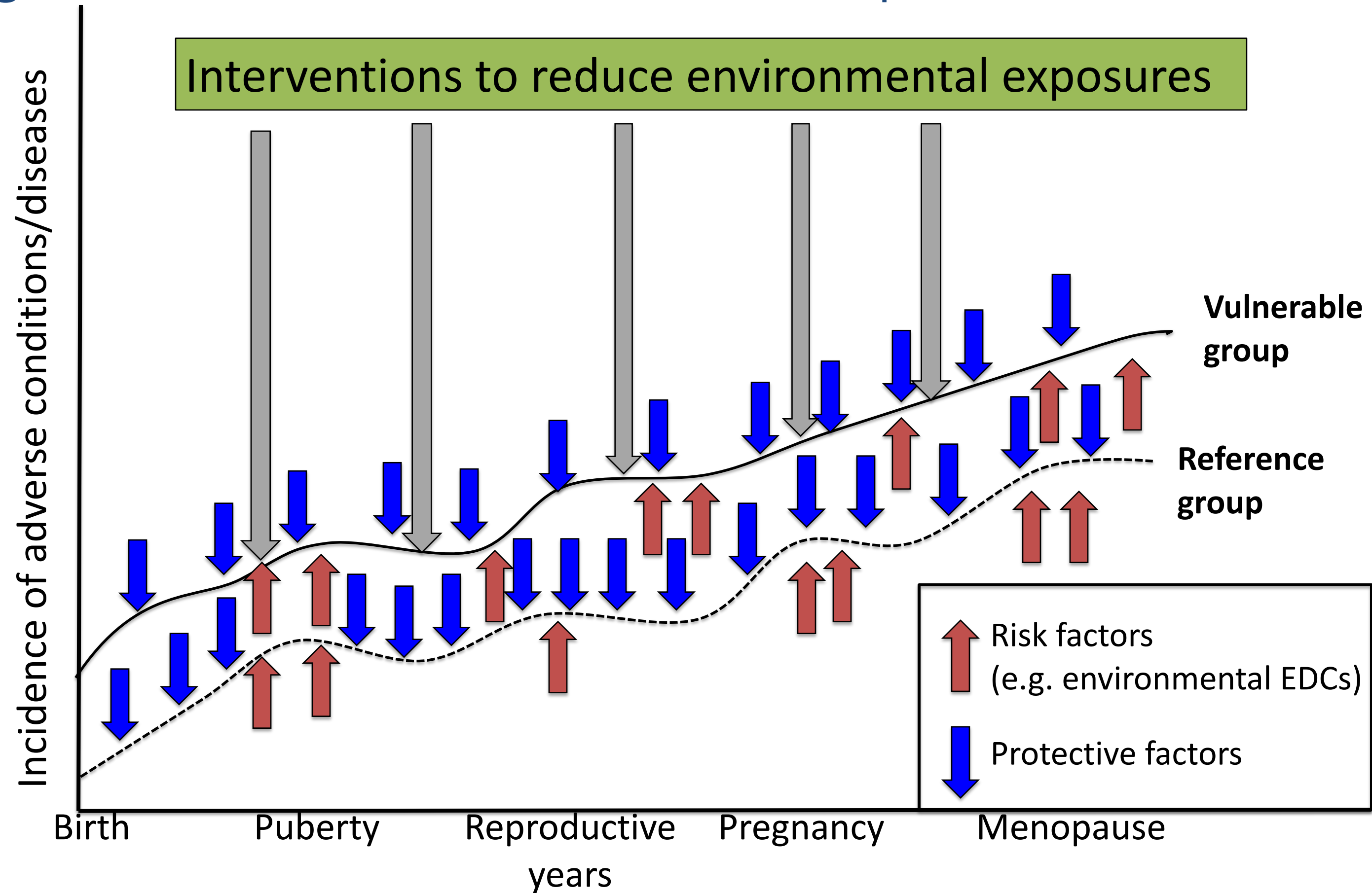# Recommendations for Future Work on Environmental Reproductive Justice

❖ Study more diverse populations—including Asian and other populations

❖ Examine individual *and* contextual determinants of EDC exposure—measure social, cultural, and policy-based determinants—involves multiple disciplines

❖ Describing associations through stratified analysis is <u>not sufficient</u>—evaluate sources of exposure, conduct mediation or mixed methods, & multi-level modeling analytic techniques

❖ Assess social x environmental toxin interactions

❖ Investigate understudied EDCs that may be more prevalent in underrepresented populations
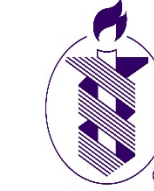
❖ Evaluate less-studied, disparate reproductive outcomes

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

James-Todd et al, Curr Env Hlth Rep2016

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

Interventions to reduce environmental exposures

Incidence of adverse conditions/diseases

Vulnerable group

Reference group

Risk factors (e.g. environmental EDCs)

Protective factors

Birth Puberty Reproductive years Pregnancy Menopause

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Questions?

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https://projects.iq.harvard.edu/james-toddlab