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# Forging New Intersections between Environmental and Reproductive Justice through Research and Advocacy

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CHE Webinar, January 24, 2018

# Our invisible chemical environment


Fragranced products


Food packaging

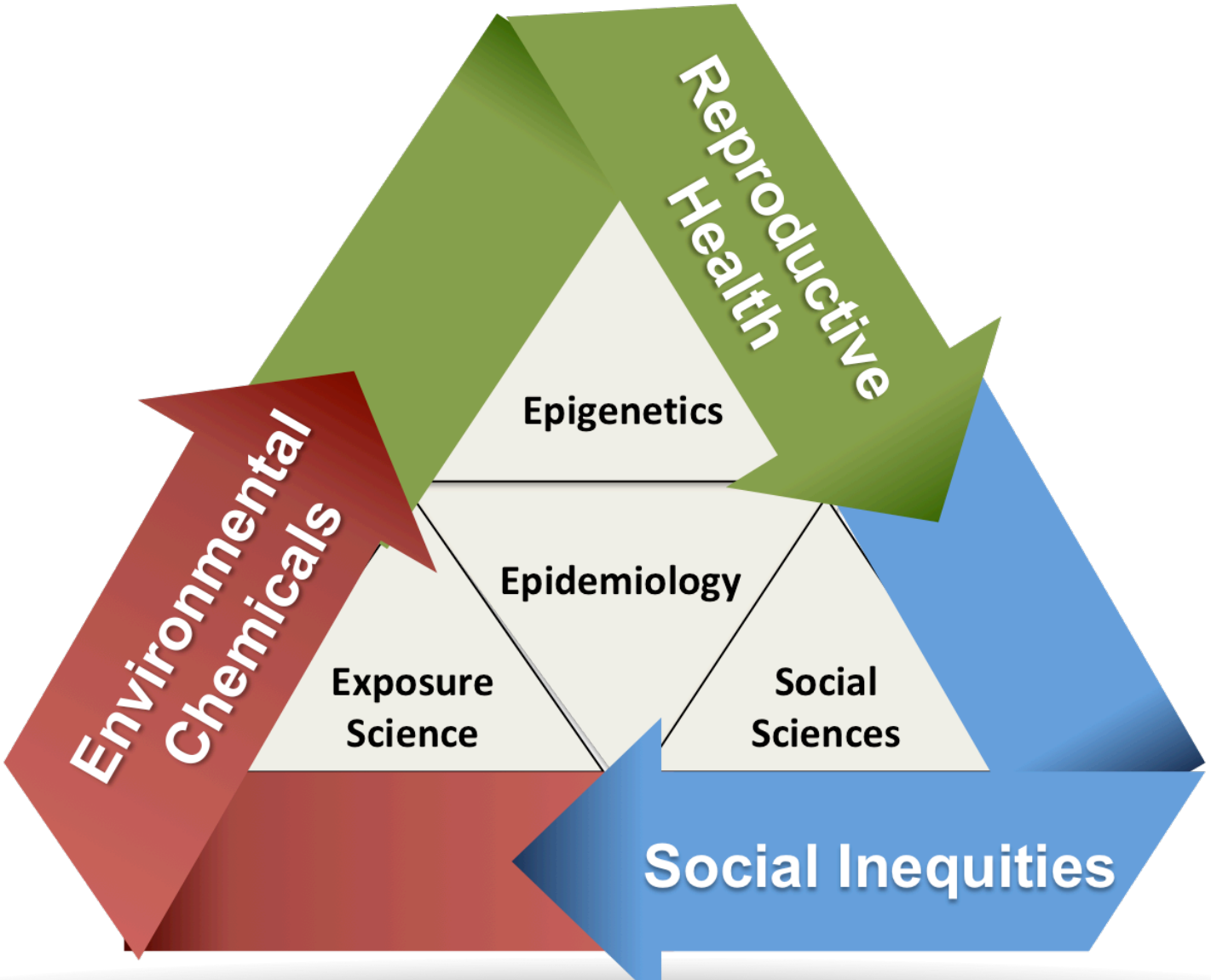
Cleaning products

Household furnishings

Personal care products

GW Public Health

# *Examining Consumer Product Chemicals and Reproductive Health Disparities through an EJ/RJ Lens*

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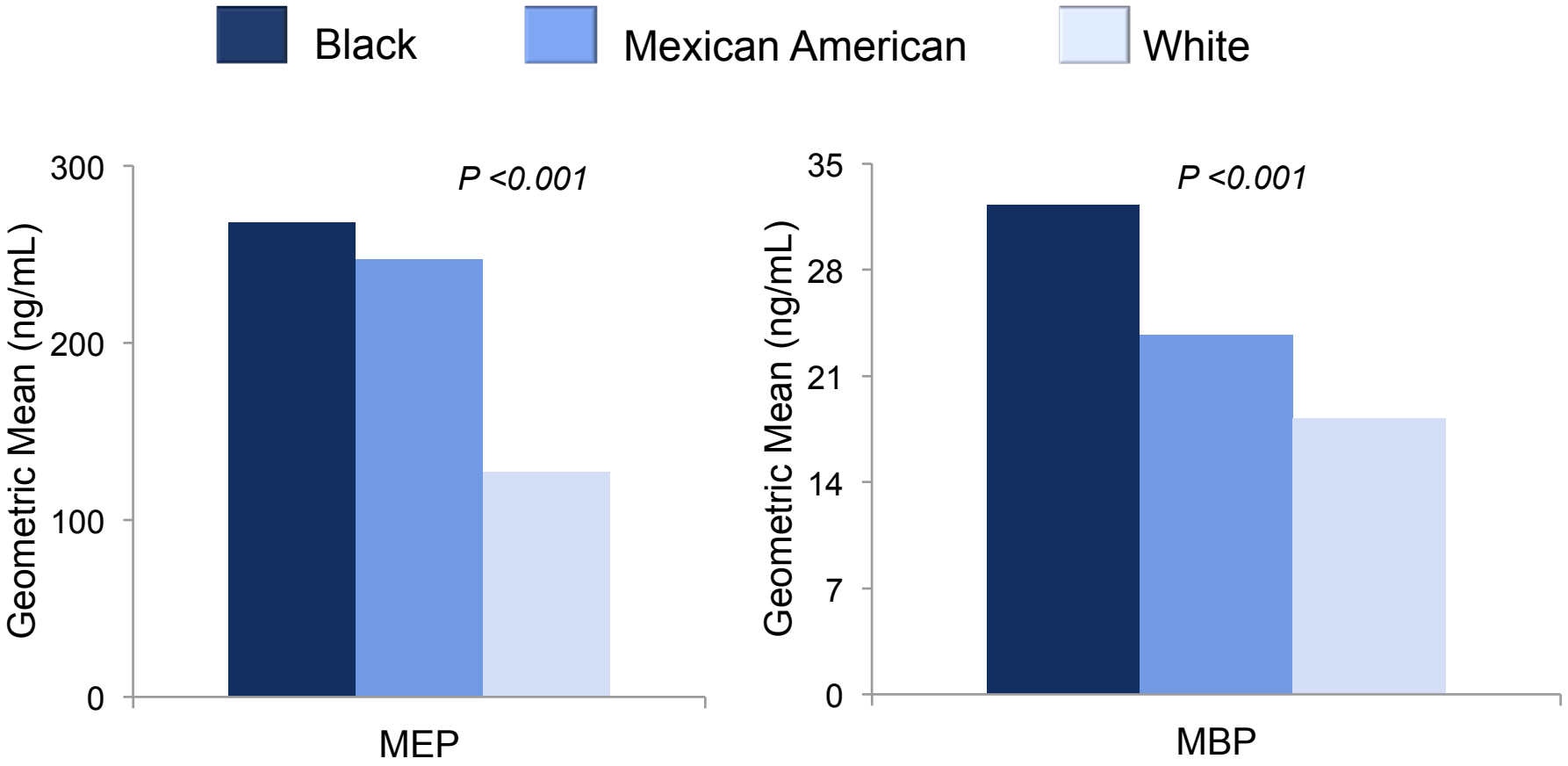
## Case Study #1

# Environmental Injustice of Beauty

# Black women have higher exposures to individual phthalates than other racial/ethnic groups

Reproductive-aged women (n=739), NHANES 2001-2004




Branch, Woodruff, Mitro, & Zota. Environ Health 2015

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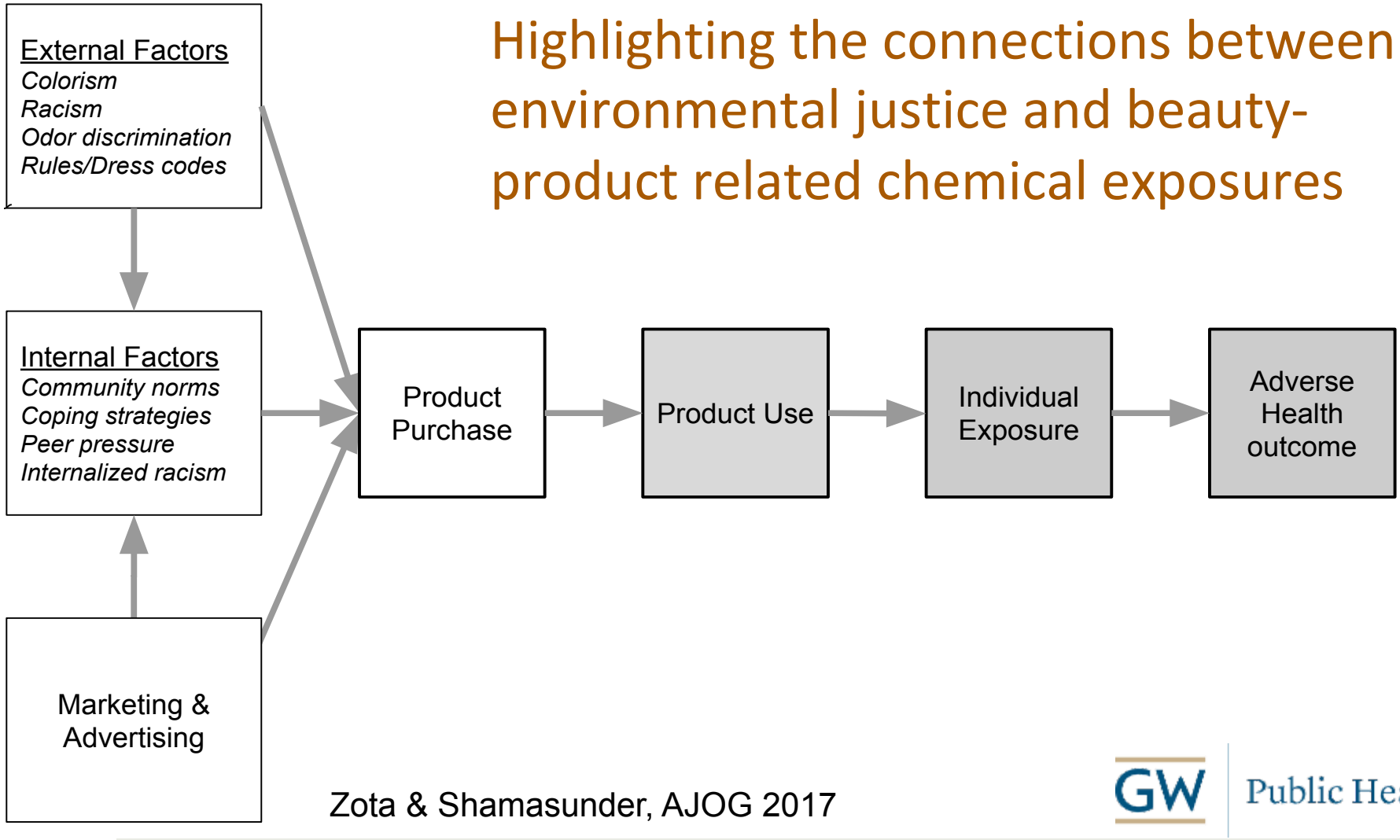
# Environmental Injustice of Beauty




Highlighting the connections between environmental justice and beauty-product related chemical exposures

Zota & Shamasunder, AJOG 2017

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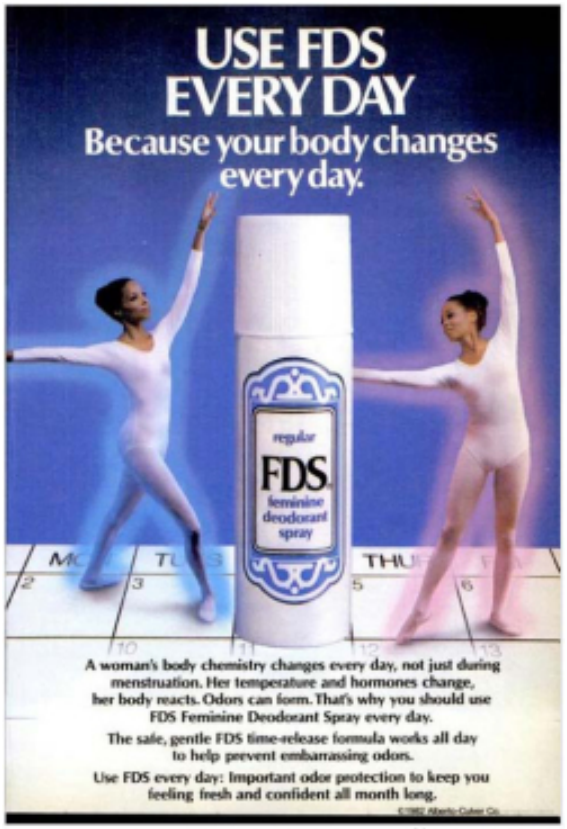
# Environmental Injustice of Beauty

- Racial/ethnic differences in cosmetic use occur across multiple product categories
- Structural racism can influence beauty norms and product use
- Beauty product use can contribute to disparities in chemical exposures and health outcomes
- Potential for cumulative impacts
  - Women of color often face elevated environmental exposures in their neighborhoods and workplaces




Ad in *Jet*, 1982 cited by Ferranti, 2011

Zota & Shamasunder, AJOG 2017

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# Environmental Injustice of Beauty Examples

| External factors | Vulnerable populations | Product use | Chemical exposures | Potential adverse outcomes |
|---|---|---|---|---|
| Colorism | Dark skinned women |   | Mercury | Mercury poisoning, neurotoxicity, kidney damage |
| Hair texture preferences | African American women |   | Parabens, placenta | Uterine fibroids, endocrine disruption |
| Odor discrimination | African American women |  | Phthalates, talc powder | Gynecologic cancers, endocrine disruption |

Zota & Shamasunder, AJOG 2017

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## Case Study #2

# Cumulative Impacts of Chemical Exposures during Pregnancy

# Cumulative impacts of consumer product chemicals during pregnancy

## Scientific Data Gaps

- Inflammation may be important pathway linking chemicals to pregnancy complications, such as preterm birth among women of color
- Health impacts of chemical mixtures
- Common co-morbidities among communities of color, like obesity, have the potential to modify impacts of chemicals

Zota et al., under revision

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# Cumulative impacts of consumer product chemicals during pregnancy

**Maternal Adiposity, Metabolism, and Stress Study (MAMAS)**

- Mindful eating intervention for overweight and obese pregnant women (majority women of color, income <500% poverty level)
- Exposure: PBDEs, PCBs, PFASs, OH-PBDEs in serum during 2nd trimester
- Outcome: inflammation & cellular aging biomarkers at 3 time points: 2nd trimester and 3 and 9 mos. postpartum (N=103)


Zota et al., under revision

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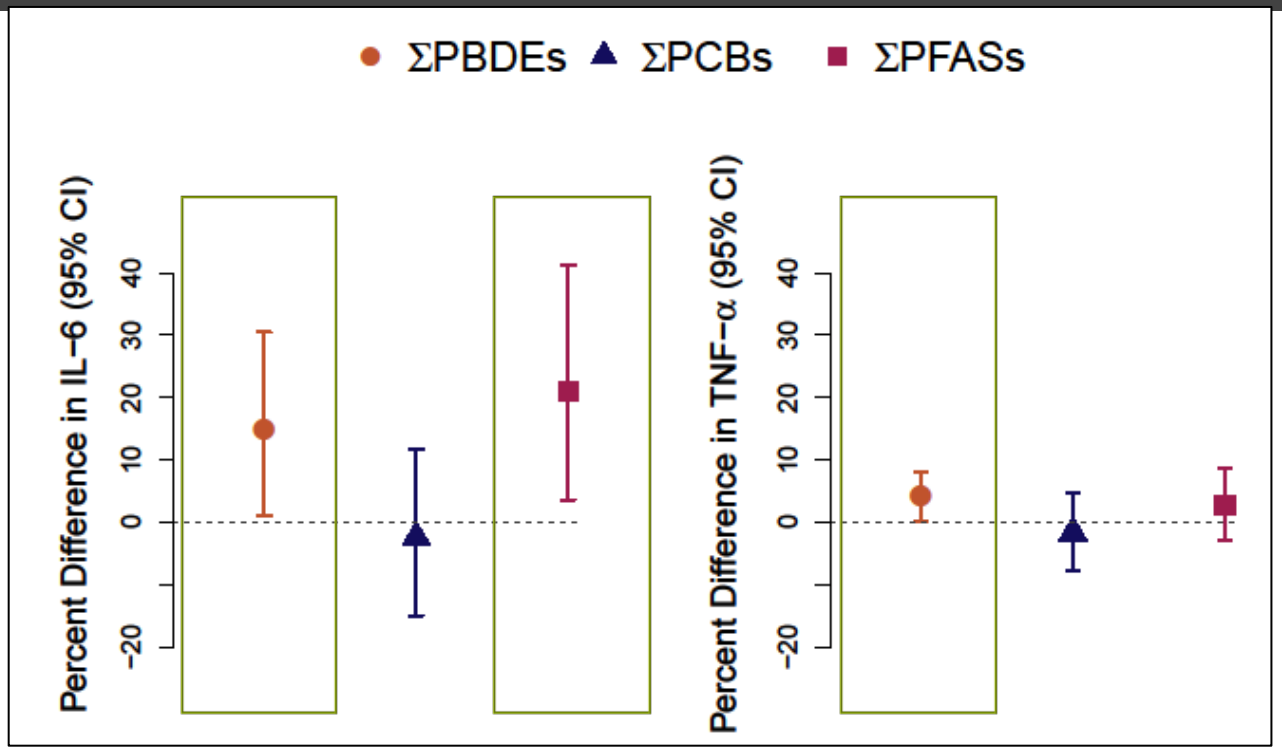
# Consumer product chemicals and inflammation during pregnancy

- PBDEs & PFASs associated with IL-6
- PBDEs associated with TNF-alpha




- Chemical mixtures analysis: 2-fold increase in chemical index associated with 36.4% increase in IL-6 during pregnancy (p=0.03)

Zota et al., under revision

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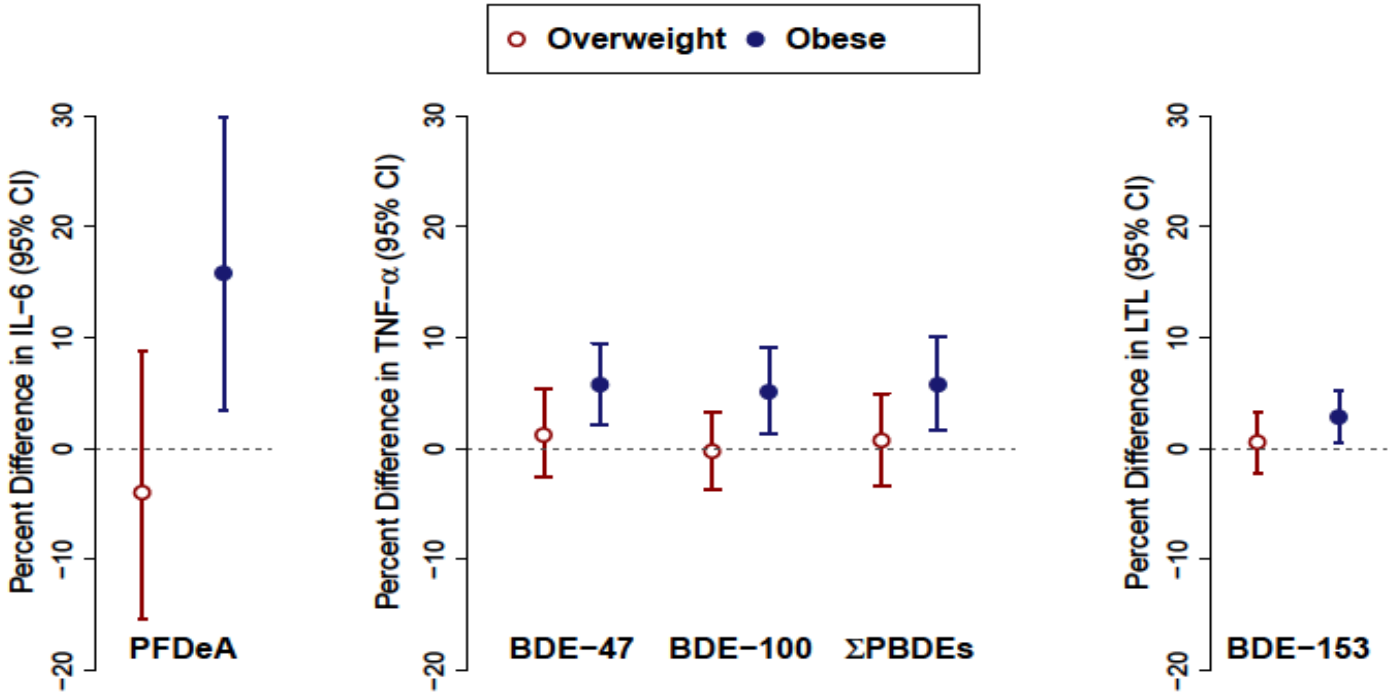
# Consumer product chemicals and inflammation during pregnancy

Stronger associations between chemical exposures and biomarkers of inflammation and cellular aging among obese (compared to overweight) women




Zota et al., under revision

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## Case Study #3

# Socio-exposome model of uterine fibroids

# Uterine leiomyoma (fibroids): towards an ecosocial model of disease

- Non-cancerous, hormone-dependent tumor
- Affect 7 in 10 premenopausal women
- US Black women disproportionately impacted
- Reproductive complications
- Economic burden: more than breast or ovarian cancer
- Few permanent treatment options
  - Invasive surgery only permanent treatment option
- Etiology and root causes of racial disparities unknown
  - Consumer product chemicals may play a role

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# Fibroids: Observational Research on Genes & the Environment (FORGE)

***To understand how socio-environmental factors may become biologically embedded and influence fibroid growth and severity***

## Study Design:

- 61 GW MFA patients undergoing surgery for uterine fibroids
- Phthalates and phenols (urine)
- Epigenetic modifications – miRNAs (blood and fibroid tissue)
- Demographic and medical information (survey, medical charts)
- Stress and stigma (qualitative interviews, perceived stress surveys)

| Variable | Median (Range) or % | Variable | Median (Range) or % |
|---|---|---|---|
| Age | 39 (26, 55) | Fibroid size (cm) | 7.2 (2, 28.5) |
| Black race | 64% | Uterine vol. ($cm^3$) | 563 (54, 7229) |
| College/grad degree | 67% | Myomectomy | 58% |

Zota et al., work in progress

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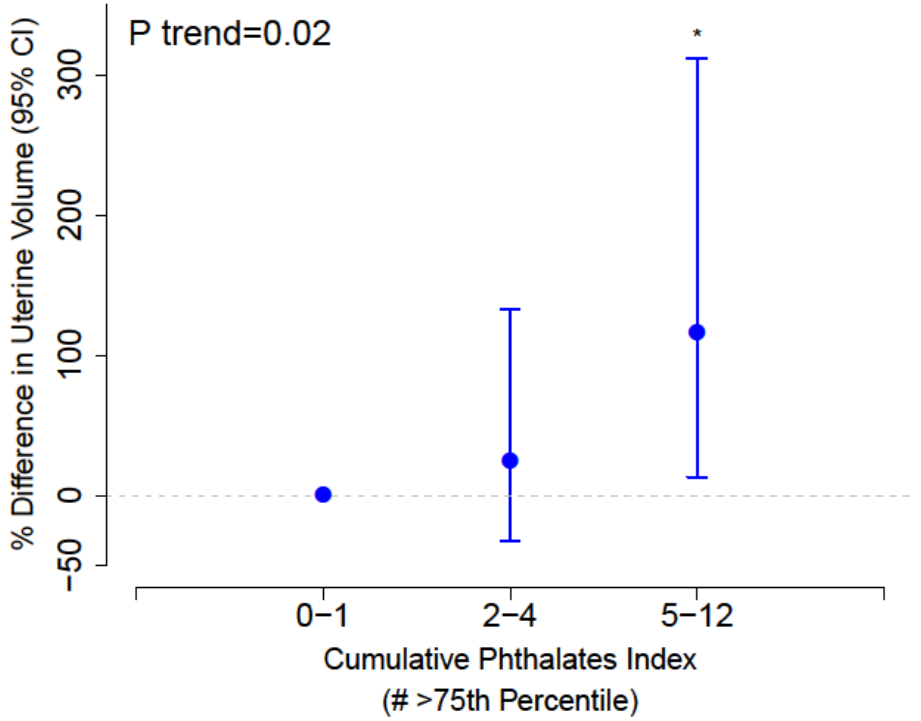
# Associations of phthalates with uterine fibroid burden

Uterine volume significantly associated with:

- **ΣDEHP** metabolites (OR 3.05, 95% CI 1.08, 8.63)
- **ΣDiNP** metabolites (OR 1.87, 95% CI 1.07, 3.29)
- **Cumulative phthalates** (p trend = 0.02)

**Percent difference in uterine vol. associated with cumulative phthalates index**




Zota et al., work in progress

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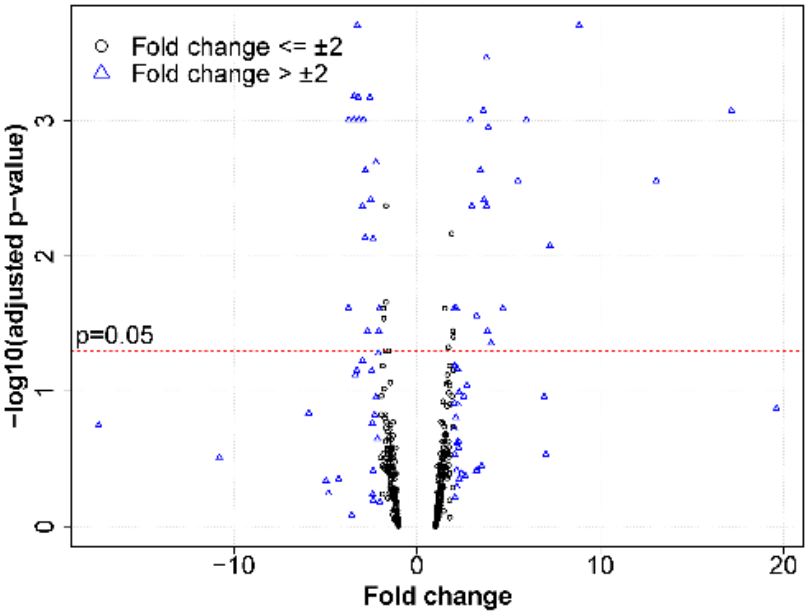
# MiRNAs may mediate EDC toxicity on fibroids

- miRNAs: Small, noncoding RNA molecules that regulate post-transcriptional gene expression
- miRNA expression varies between fibroid tissue and healthy myometrium




- Of the miRNAs that were differentially expressed in fibroid and myometrium, 1 miRNA (miR-577) in fibroid tissue significantly differed between women with low and high DEHP exposure after multiple comparison adjustment

Zota et al., work in progress

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# Concluding Remarks

- Zota Lab is forging new intersections between environmental and reproductive justice by developing novel conceptual frameworks and original empirical evidence
- The long-term goals of this work are to secure environmental justice and improve equity in women's health through advancements in science, policy, and clinical practice.

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