

Social Disparities in Phthalate Exposures: Implications for Women's Health

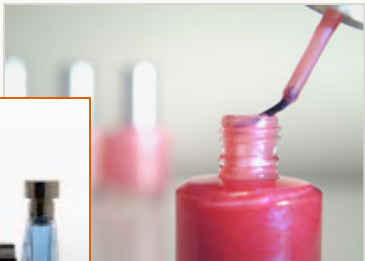
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Phthalates in Consumer Products



Cosmetics and fragrances



Toys and Home Furnishings



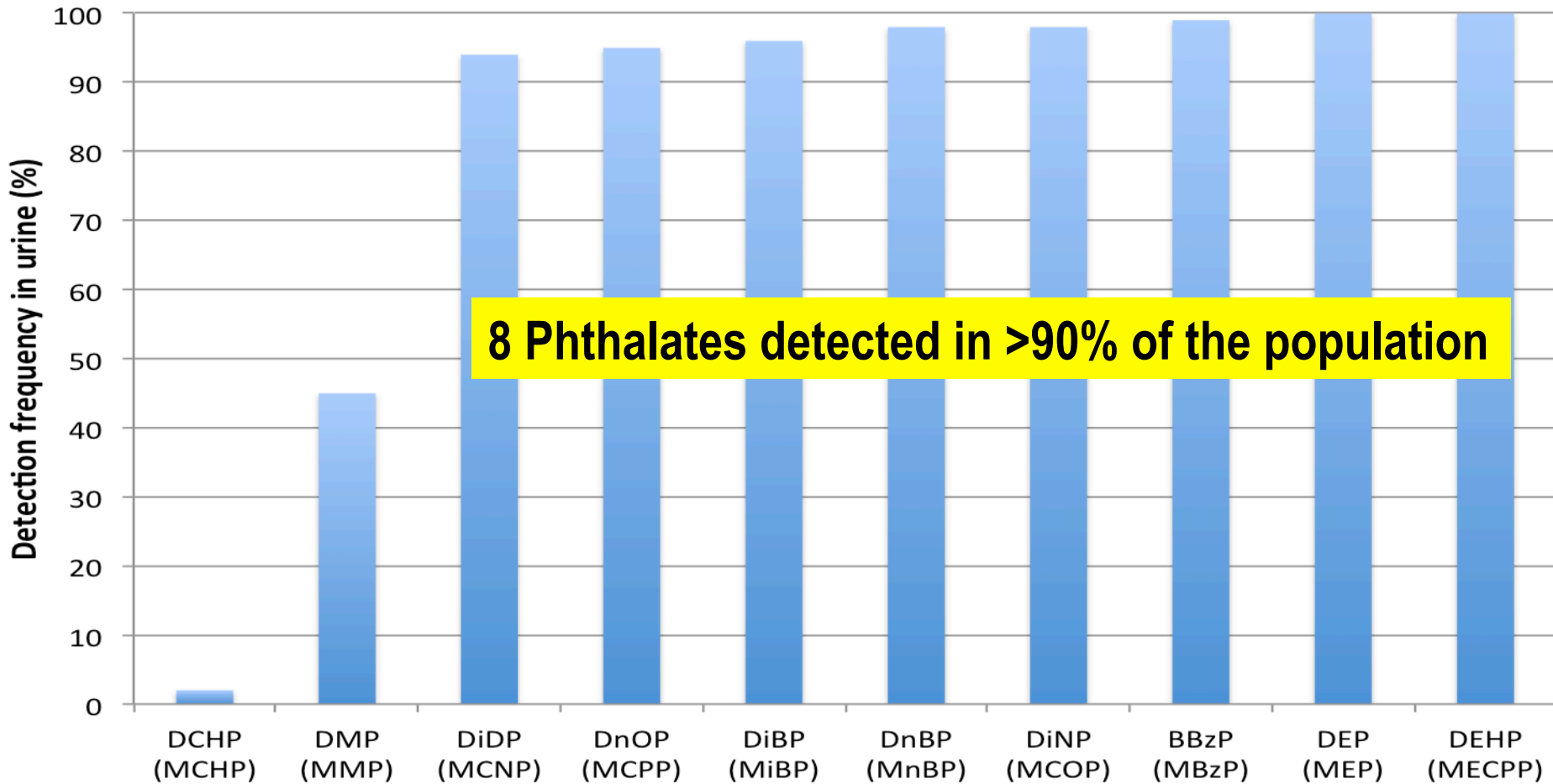
Medical Devices



Food and Food Packaging

US population widely exposed to multiple phthalates

CDC NHANES 2009-2010 data



Phthalates are associated with adverse health effects at levels commonly found in the environment

Exposures during early life may contribute to:

- Endocrine dysfunction
- Problems in male reproductive tract development
- Neurodevelopmental disorders
- Respiratory problems

Exposures during adulthood may contribute to:

- Endocrine dysfunction
- Pregnancy complications
- Chronic disease: Type 2 diabetes and obesity

Attina T.M. et al. *The Lancet Diabetes & Endocrinology* 2016; Chronic Hazard Advisory Panel on Phthalates and Phthalate Alternatives 2014; Ferguson et al. *JAMA Pediatrics* 2014; Braun et al. *Current Opinion in Pediatrics* 2013.

Economic burden of phthalates exposure in USA: ~60 billion dollars in 2010

Outcome	Burden of Disease	Economic Costs
Adult obesity	5900 cases	1.7 billion
Adult diabetes	1300 cases	91.4 million
Endometriosis	86,000 cases	47 billion
Male infertility	240,100 cases	2.5 billion
Low testosterone resulting in increased early mortality	10,700 attributable deaths	8.8 billion

Vulnerable Populations: Socially Disadvantaged Communities



Exposures and related health effects are inequitably distributed among populations within and between countries (FIGO Opinion)

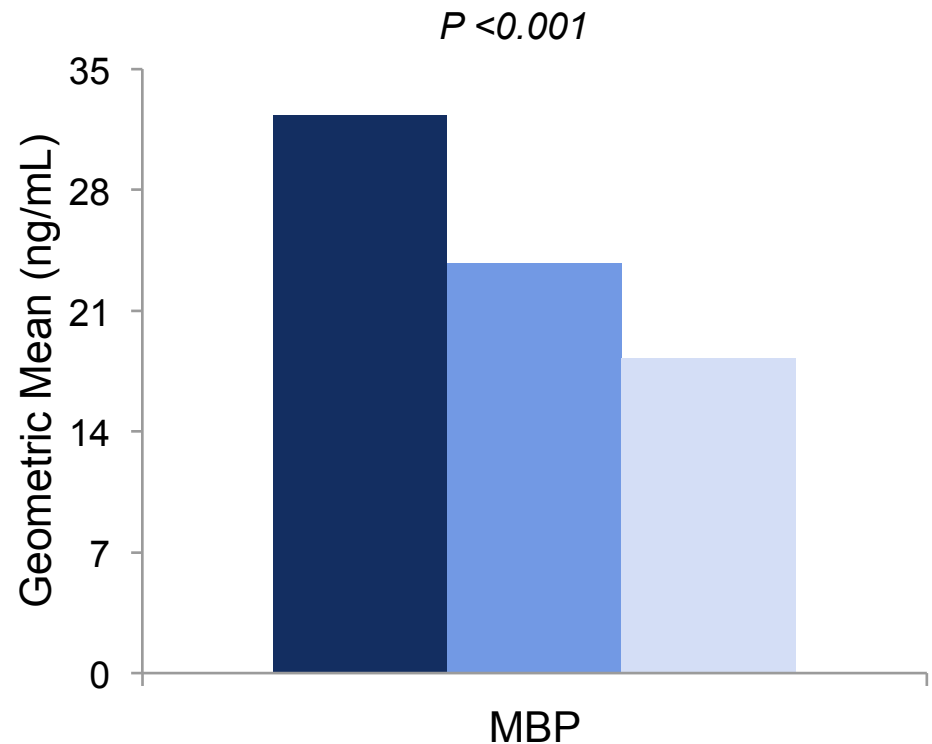
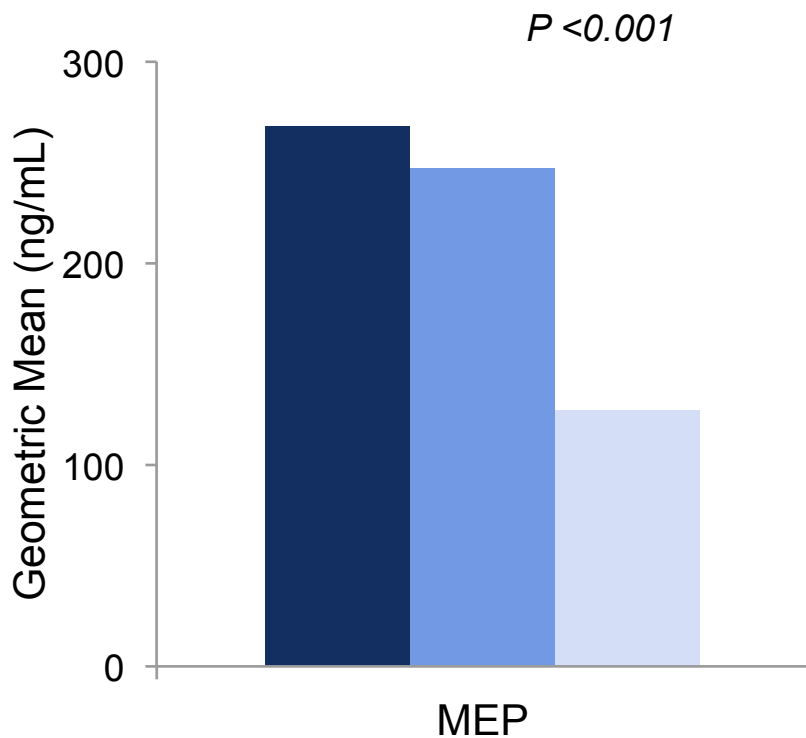
Roadmap for Today's Presentation

- Racial disparities in phthalates exposure
 - Individual phthalates
 - Cumulative exposures
- Drivers of racial exposure disparities
 - Proximate sources
 - Contextual/institutional upstream factors
- Implications for disparities in women's health
 - Results of systematic review
 - Recommendations for future research

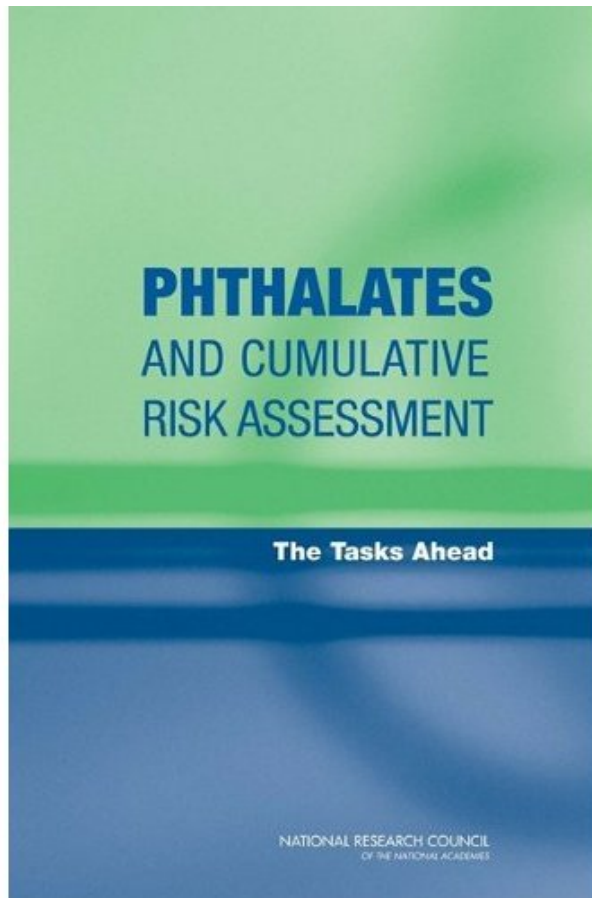
Black women have higher exposures to individual phthalates than other racial/ethnic groups

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

Black Mexican American White



Black women have higher cumulative phthalate exposures than white women



- Multiple phthalates can have greater impacts than individual exposure
- NAS recommends them for cumulative assessment
- We developed a anti-androgenic potency-weighted sum of cumulative phthalates based on NAS recommendations
- Racial/ethnic differences persisted after controlling for SES

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Just as lotions and creams protect your beauty, "Lysol" protects your daintiness!

For douching with "Lysol" stops odor by killing odor-causing germs. You know you can't offend!

Yet new "Lysol" is mild. Can't harm you. Leaves you sweet and clean!

Discover new daintiness. Use "Lysol" brand disinfectant regularly—and be sure of your daintiness!

For free booklet on how to douche, write: "Lysol," Bloomfield, N. J., Dept. NN-58.



Lysol

BRAND DISINFECTANT

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Synthetic Chemicals and Feminine Care

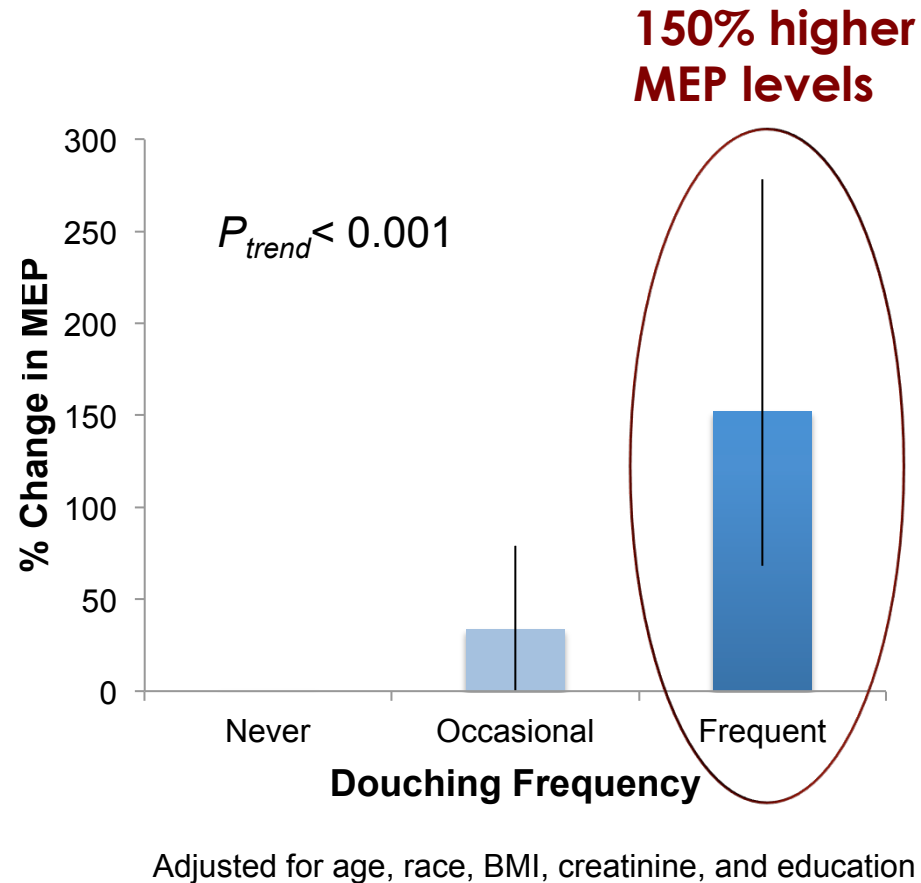


Photo Credit: Women's Voices for the Earth

Branch et al. Environ Health 2015

Vaginal Douching Use Associated with MEP

- Vaginal Douches
- Feminine Spray
- Feminine Powder
- Wipes/Towelettes
- Tampons



Douching mediates the race → phthalates association ($p < 0.001$)

Environmental Injustice of Beauty

Reframing beauty product purchasing and related chemical exposures within a broader social and economic context, thereby bringing it into conversations of environmental justice

Hair Straightening



Skin Whitening



Vaginal Douching



Synthetic Chemicals and Fast Food

- Food is an important exposure route for BPA and high molecular weight phthalates (e.g. DEHP)
- Fast food is highly processed, packaged, & handled



Study Design: 24 hour dietary recall data and urinary chemical biomarkers, NHANES 2001-2010 (n = 8,792)

- Fast food consumption is associated with **higher DEHP and DINP**, with evidence of dose-response

	Σ DEHPm	DINPm
	% Difference (95% CI)	% Difference (95% CI)
TEI (kcal)		
Low	Ref	Ref
Moderate	4.3 (-3.7, 13.1)	6.2 (-2.5, 15.6)
High	3.6 (-4.5, 12.3)	6.5 (-2.0, 15.8)
P for trend	0.39	0.13
Fast food intake (% TEI from fast food)		
None	Ref	Ref
Low	15.5 (6.3, 25.6)**	24.8 (12.9, 37.9)**
High	23.8 (11.9, 36.9)**	39.0 (21.9, 58.5)**
P for trend	<0.0001	<0.0001

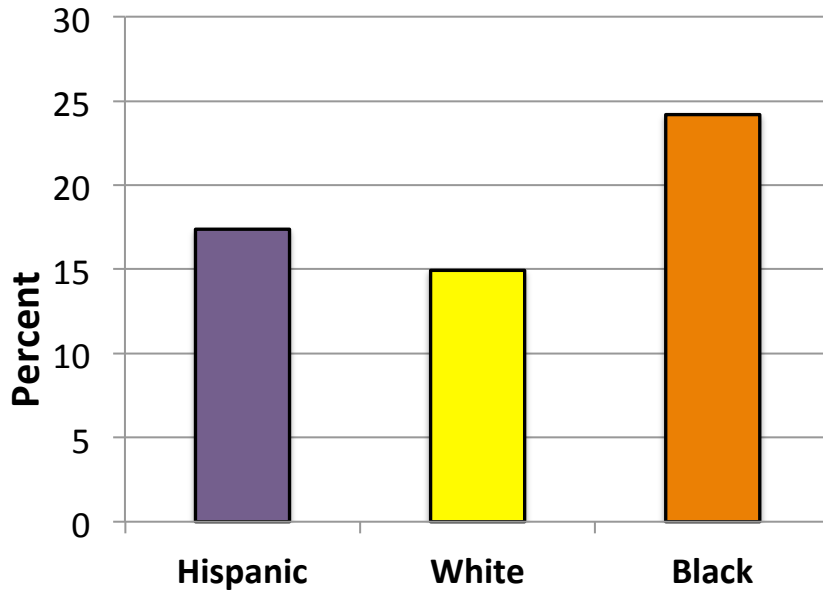
* $p < 0.01$; ** $p < 0.0001$

Model adjusted for age, sex, race, household income, BMI, urine creatinine, and NHANES cycle, survey population weights

Zota et al. 2016

Disproportionate Impacts among U.S. Blacks

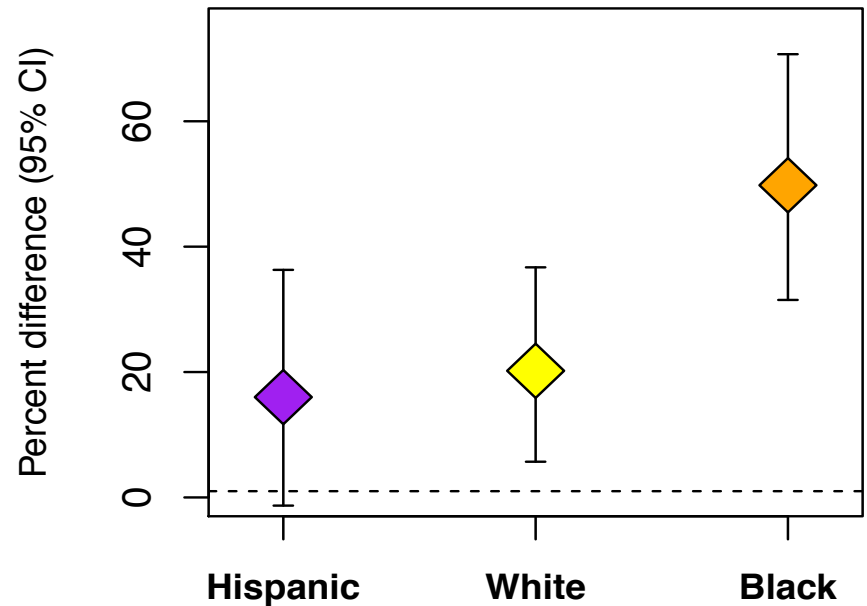
“High” Fast Food Consumption



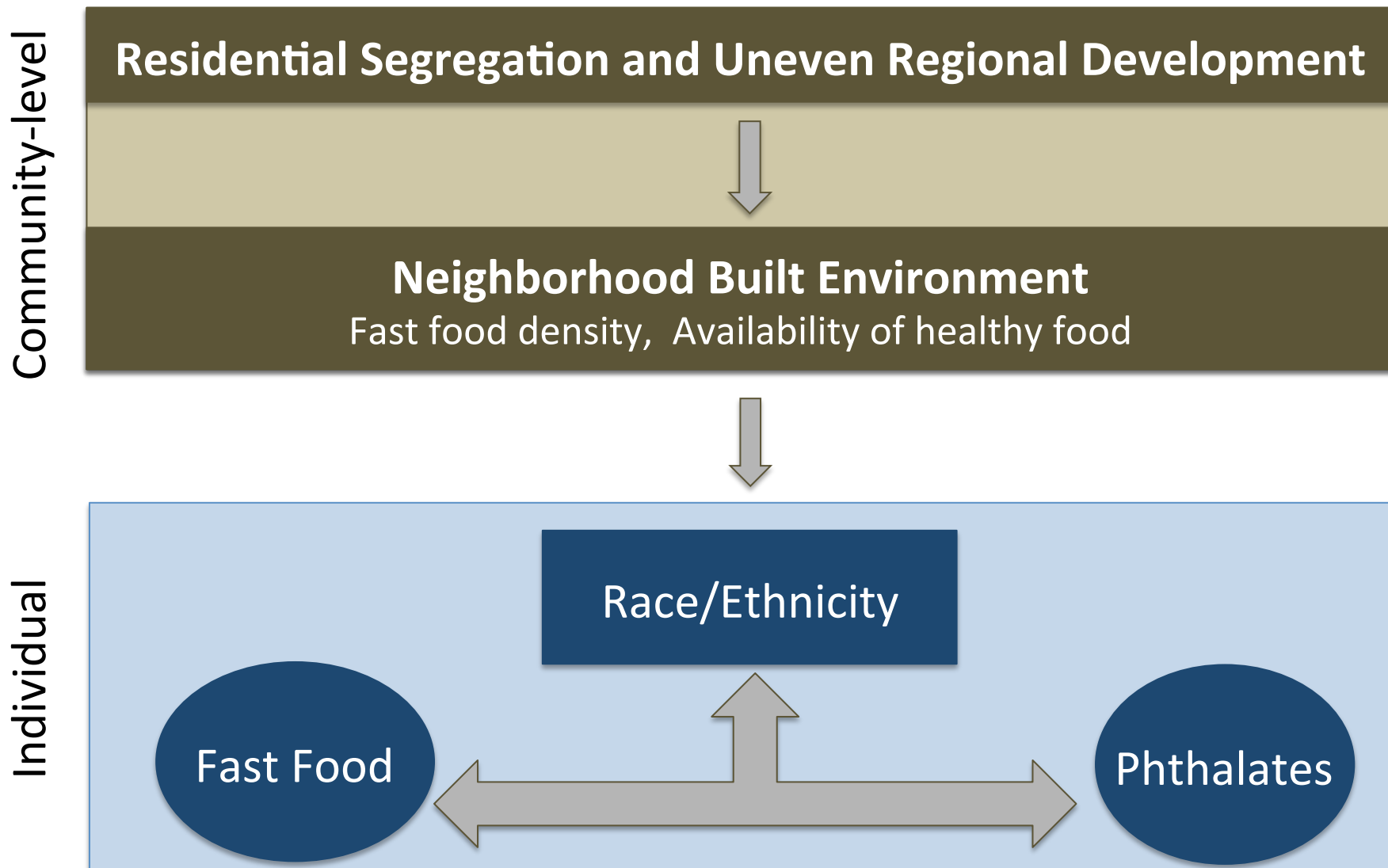
Steeper dose-response association between fast food and DEHP among U.S. blacks

Greater fast food consumption among U.S. blacks

Association between high fast food consumption and DEHP

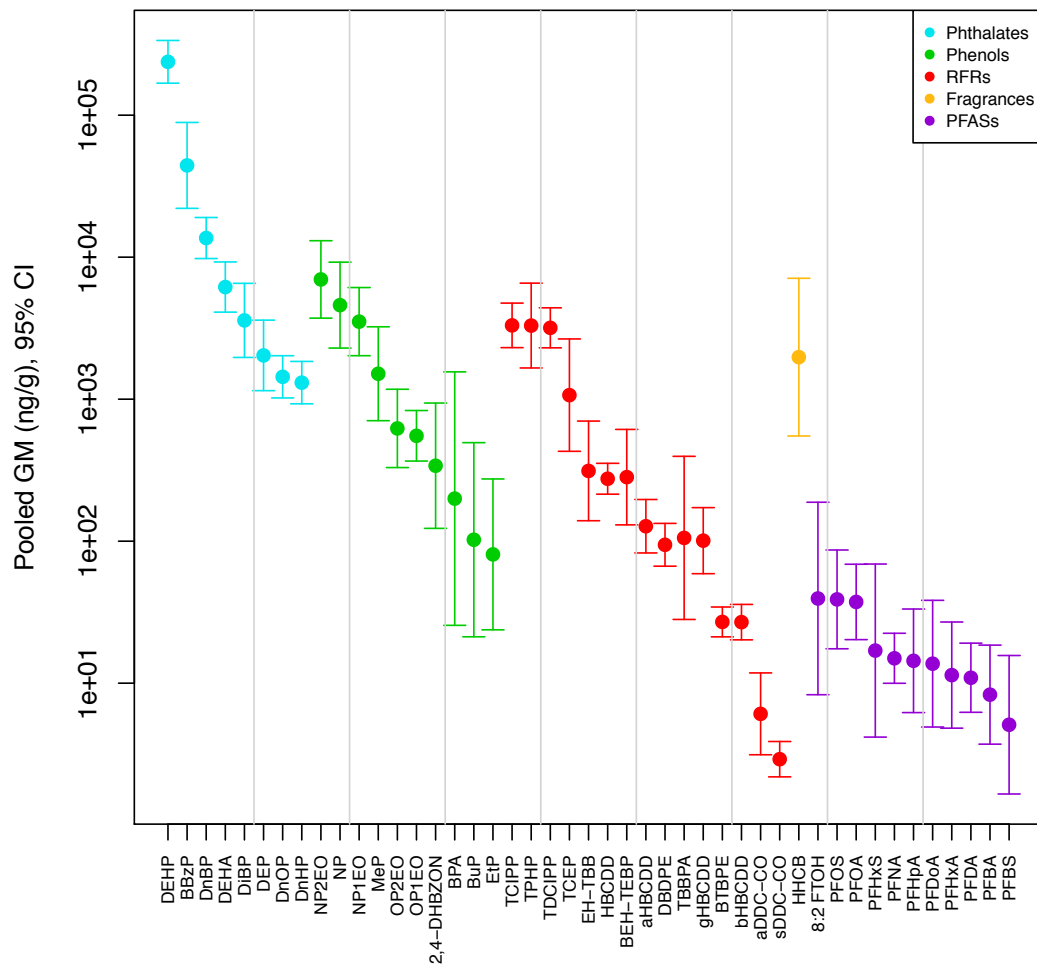


Examining the linkages between race, fast food, and phthalates through an Environmental Justice lens



Morello-Frosch and Lopez 2006; Morland et al. 2002

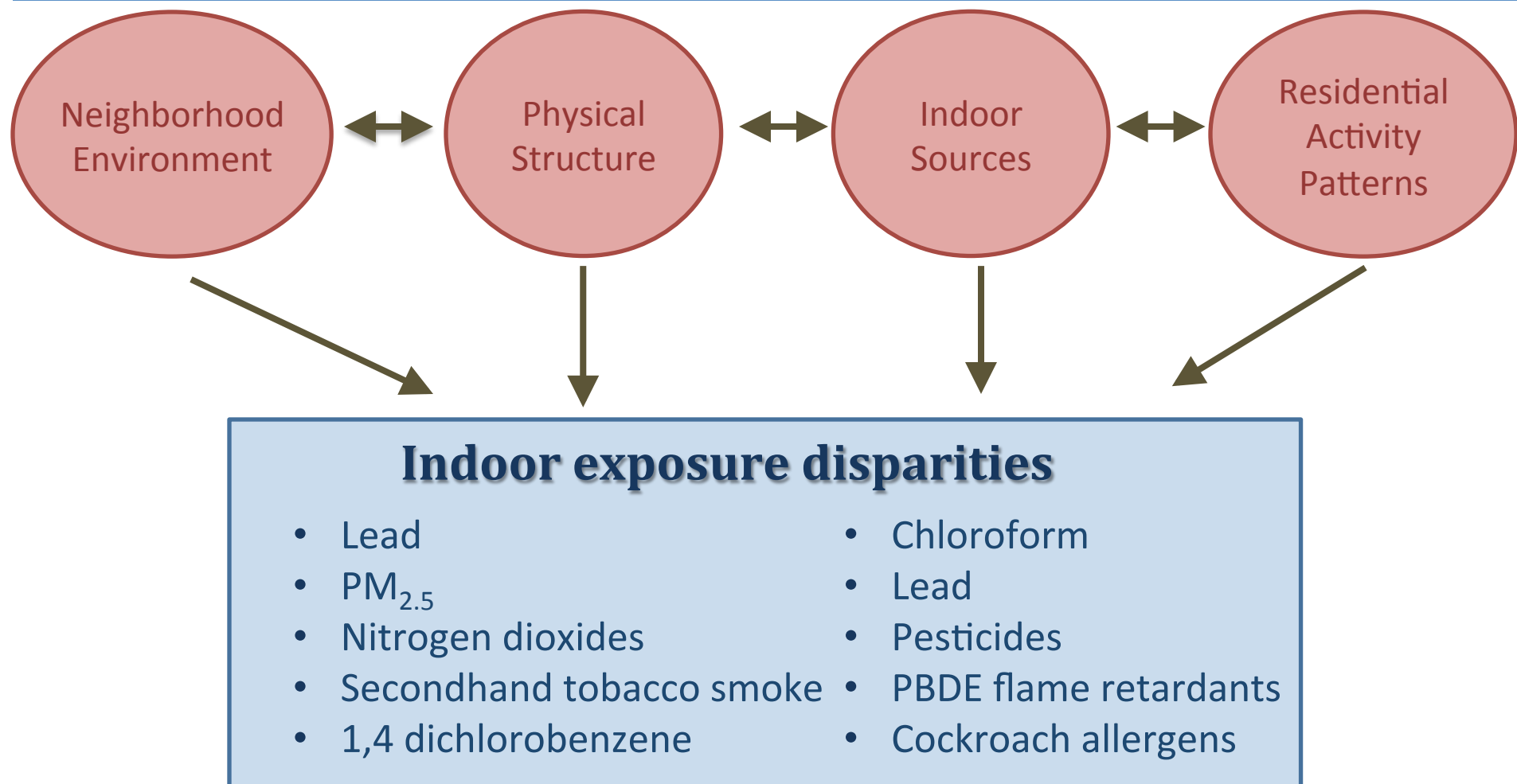
Systematic Review: Consumer product chemicals in US indoor dust



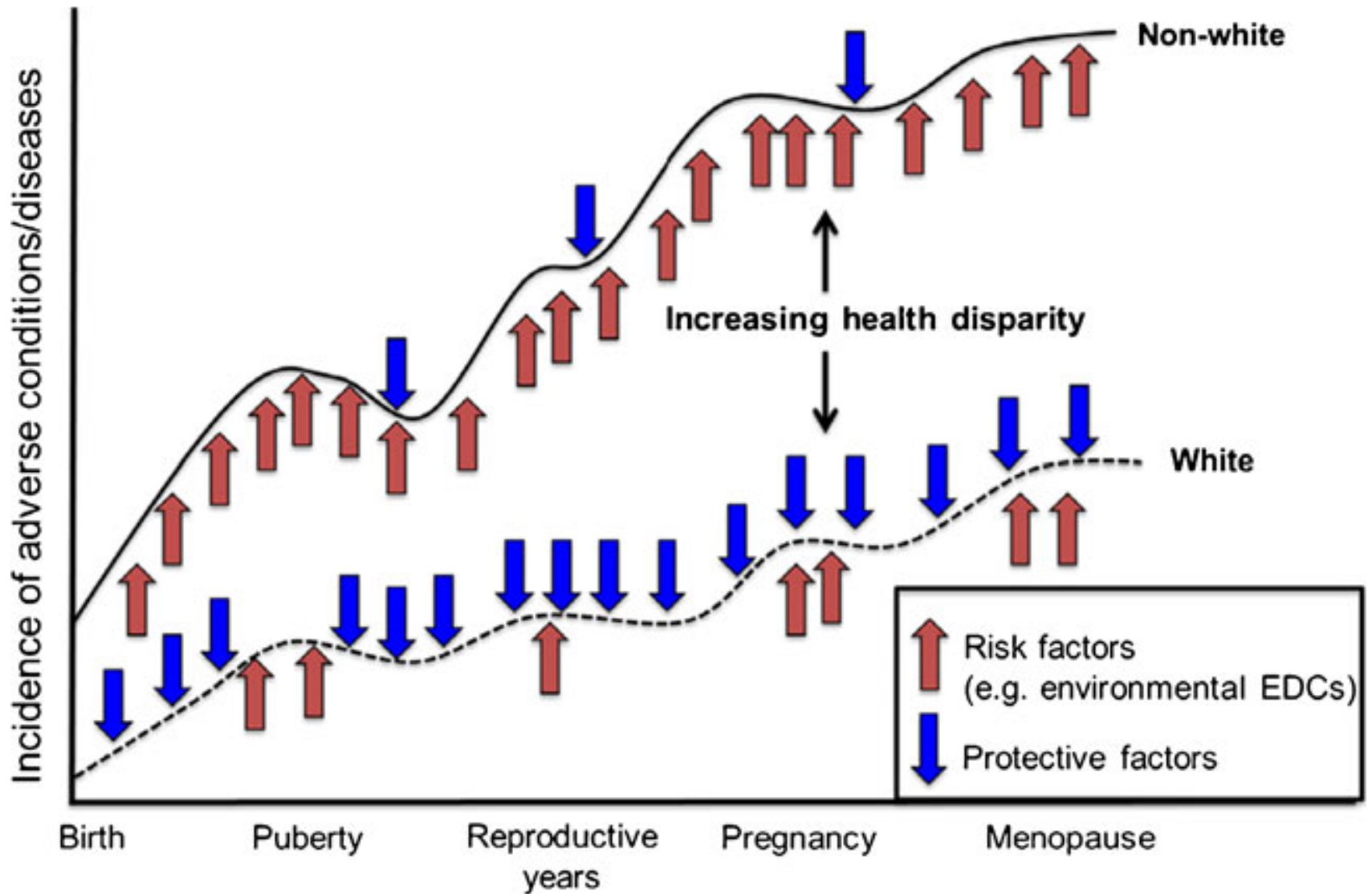
- Many phthalates detected in 95-100% of homes
- Phthalates occurred in highest concentrations (among 5 chemical classes studied)

Moving Environmental Justice Indoors: Understanding Structural Influences on Residential Exposure Patterns in Low-Income Communities

Gary Adamkiewicz, PhD, MPH, Ami R. Zota, ScD, MS, M. Patricia Fabian, ScD, Teresa Chahine, ScD, Rhona Julien, ScD, John D. Spengler, PhD, and Jonathan I. Levy, ScD



Contribution of unequal environmental exposures to increasing risk of adverse health disparities across the life course



Do phthalates contribute to racial/ethnic differences in women's reproductive health outcomes?

- Systematic review of four health outcomes: puberty, uterine fibroids, infertility and pregnancy complications
- Accumulating evidence that phthalates may play a role in infertility and pregnancy complications.
- Limitations: Most studies only adjusted for race/ethnicity as a confounder and many studies were too racially homogenous to examine differential vulnerability.
- Recommendations: Need to examine effects of EDCs and women's health outcomes in more diverse populations and use appropriate analytical techniques to assess how disparities in exposure may influence disparities in health outcomes.

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Relevant Publications

- **Zota A.R.**, Calafat A.M., and Woodruff T.J. Temporal trends in phthalate exposures: Findings from the National Health and Nutrition Examination Survey 2001-2010. *Environmental Health Perspectives* 2014, 122: 235–241.
- Branch F., Woodruff T.J., Mitro S.D., **Zota A.R.** Vaginal douching and racial/ethnic disparities in phthalates exposure among reproductive-aged women: National Health and Nutrition Examination Survey 2001-2004. *Environmental Health* 2015, 14(1):57
- **Zota A.R.**, Phillips C., and Mitro S.D. Recent fast food consumption and Bisphenol A and phthalates exposures among the US population in NHANES, 2003 – 2010. *Environmental Health Perspectives* 2016: 124(10):1521-1528
- James-Todd T.M., Chiu Y.H., and **Zota A.R.** Racial/ethnic disparities in environmental endocrine disrupting chemicals and women’s reproductive health outcomes: epidemiological examples across the life course. *Current Epidemiology Reports* 2016: 3(2): 161-180
- Mitro S.D., Dodson R.E., Singla V., Adamkiewicz G., Elmi A., Tilly M.K, **Zota A.R.** Consumer product chemicals in indoor dust: a quantitative meta-analysis of US studies. *Environmental Science & Technology* 2016, 50(19):10661-10672.
- Varshavsky J.R., **Zota A.R.**, Woodruff T.J. A novel method for calculating potency-weighted cumulative phthalate exposure with implications for identifying racial/ethnic disparities among U.S. reproductive-aged women in NHANES 2001-2012. *Environmental Science & Technology* 2016, 50(19):10616-10624.

Thank you

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