

Indoor environments and environmental health disparities



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Racial Disparities in Low Birth Weight

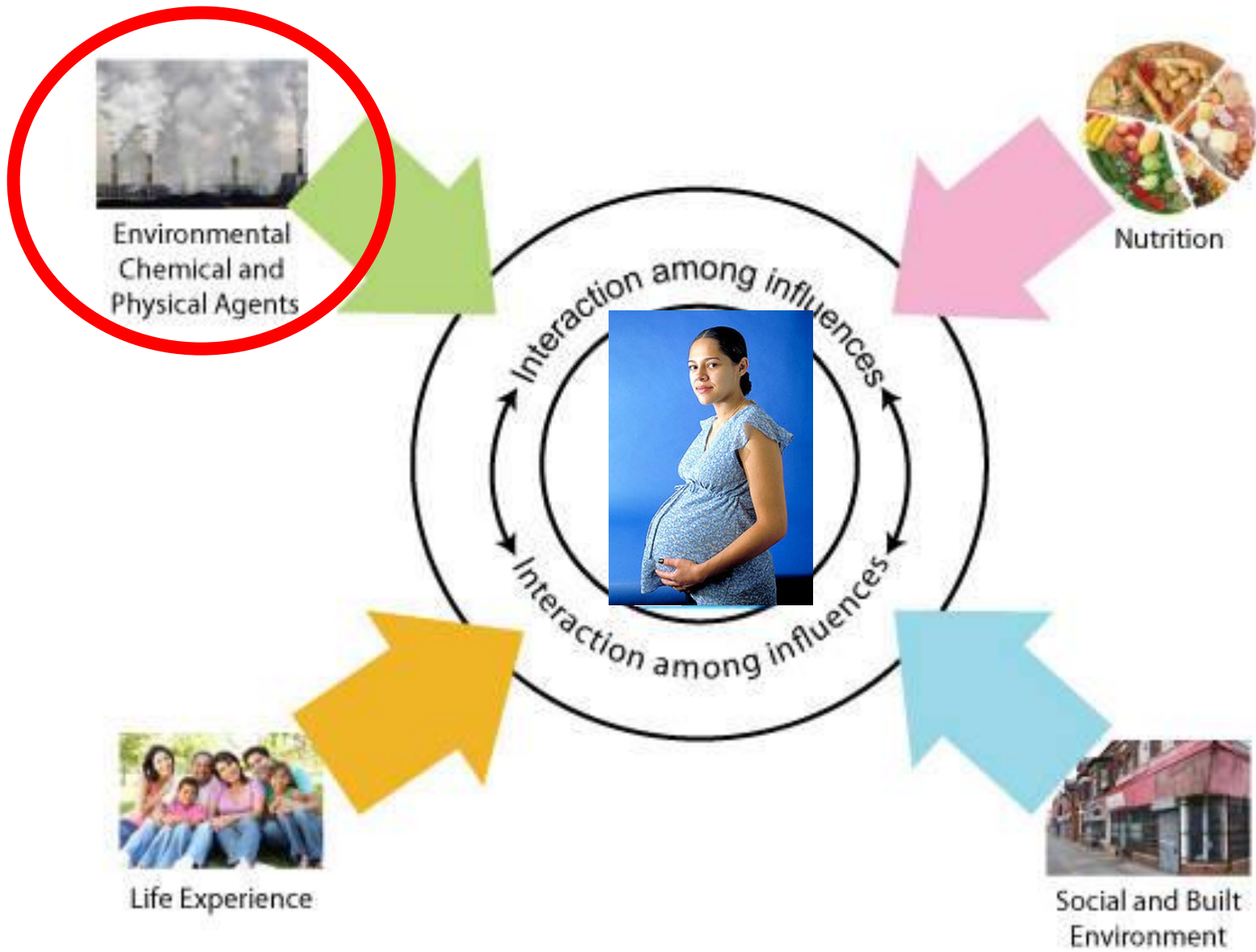
Rates in blacks over **twice** as high as whites

- crude rates: 10.3% vs 4.6%

Racial differences not explained by in socioeconomic status, infant sex, smoking, or maternal occupation

- adjusted rates: 9.8% vs. 4.6%





Racial/ethnic and socioeconomic disparities in the indoor environment



Fine particulate matter (PM2.5)

Nitrogen dioxide (NO2)

Secondhand tobacco smoke

1,4 dichlorobenzene

BTEX

Chloroform

Lead

Pesticides

PBDE flame retardants

Cockroach allergens



Racial/ethnic and socioeconomic disparities in the indoor environment



WHY?

- Fine particulate matter (PM_{2.5})
- Nitrogen dioxide
- Secondhand smoke
- Benzene
- BTEX
- Chloroform
- Lead
- Pesticides
- PBDE flame retardants
- Cockroach allergens



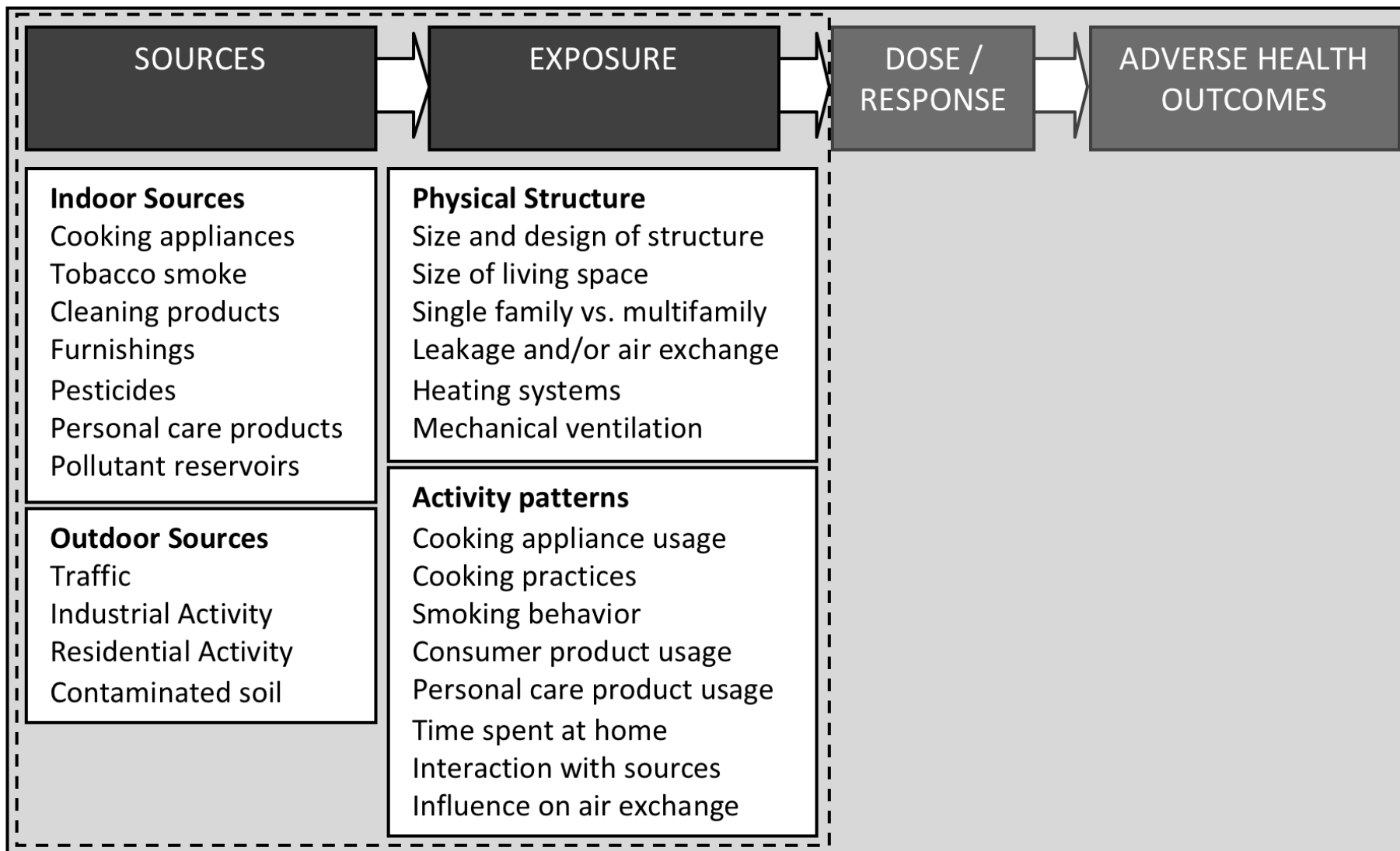
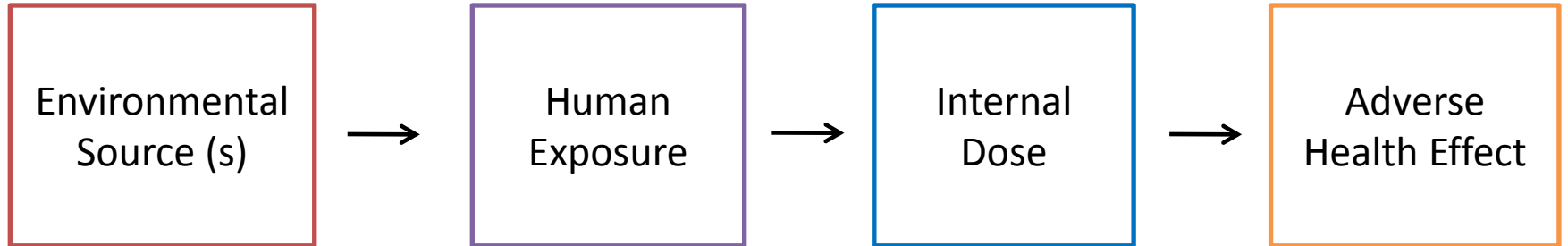


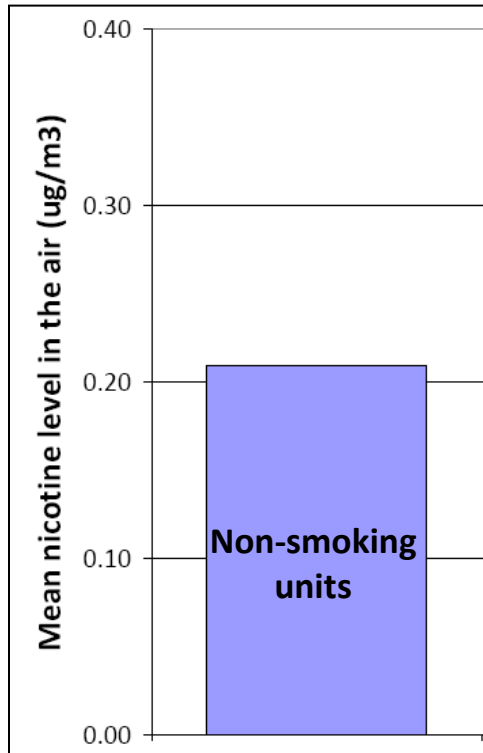
Figure 1: Conceptual framework: contributors to indoor environmental exposure

Basic Environmental Health Paradigm



Secondhand smoke (SHS) in Multifamily Buildings

Recent study: NCI-funded study of low-income housing in greater Boston area



Major findings

- Measurable levels of nicotine in all but one non-smoking unit
- In some units, equivalent to almost a cigarette per day
- Residents who reported smelling cigarettes smoke from other units frequently had higher levels of nicotine in the air

Potential racial/ethnic disparities in SHS exposure

Reproductive-aged women, NHANES 2001 - 2008 (N=2324)

	White	Black	Mexican American	
Current smokers (%)	29	20	12	$p < 0.001$
Serum cotinine (geometric mean ng/mL)	0.5 (0.11)	0.6 (0.12)	0.1 (0.01)	$p < 0.001$

SHS and Low Birth Weight

Meta-analysis: SHS exposure in non-smoking pregnant women associated with:

- Reduced mean birth weight by 33 grams
- Increased risk of low birth weight by 32%



The Health Consequences
of Involuntary Exposure
to Tobacco Smoke

A Report of the Surgeon General



Department of Health and Human Services

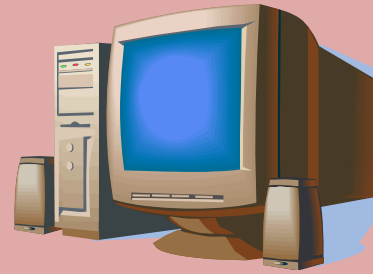
PBDEs

are ubiquitous in our environment

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Upholstered Furniture



Electronics



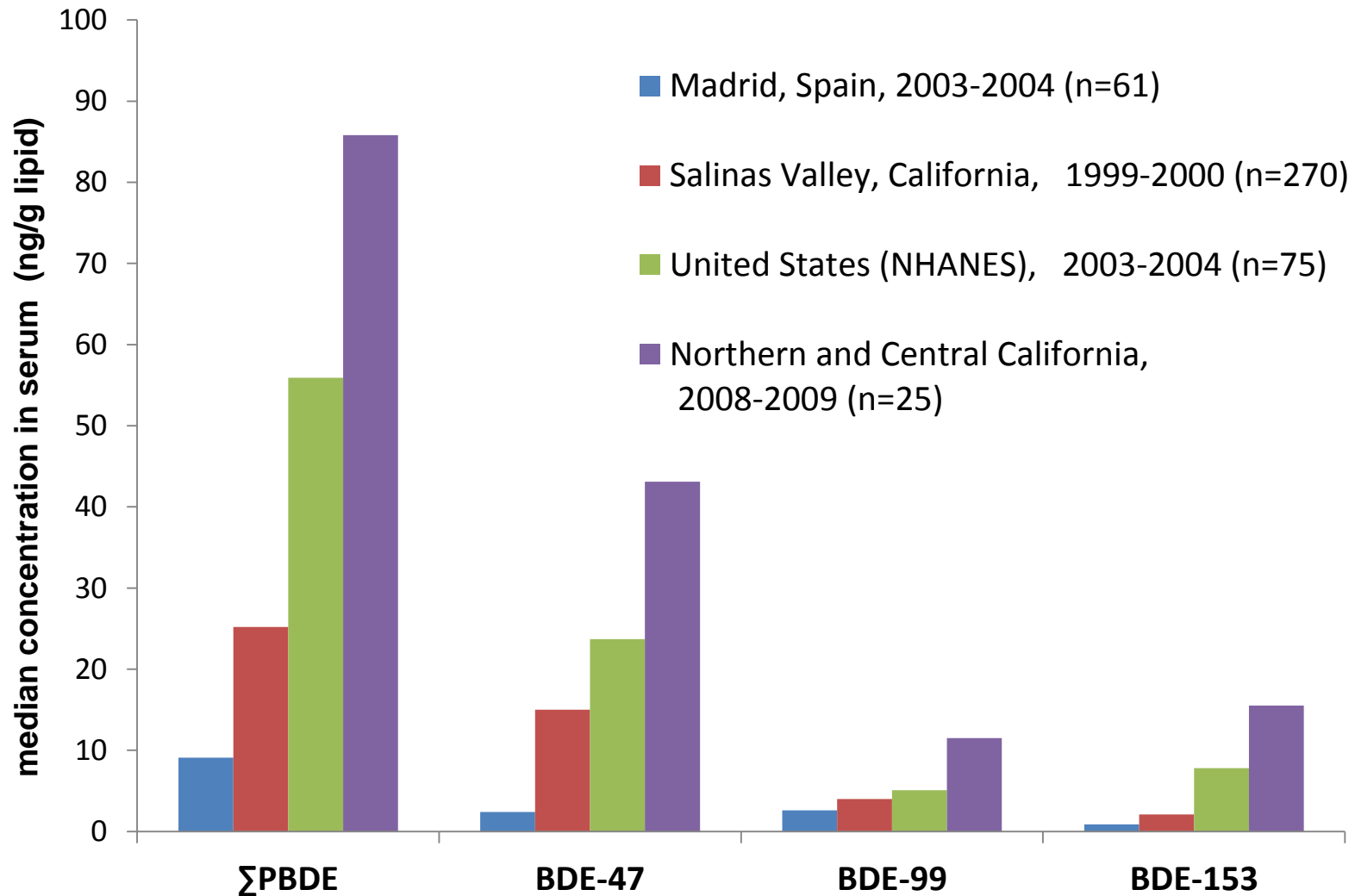
Domestic and Wild Animals



Food Supply



Penta-PBDEs in lower-income, ethnically diverse California pregnant women are highest reported to date among pregnant women



Zota AR, Park JS, Wang Y, Petreas M, Zoeller RT, Woodruff TJ. 2011. Polybrominated Diphenyl Ethers, Hydroxylated Polybrominated Diphenyl Ethers, and Measures of Thyroid Function in Second Trimester Pregnant Women in California. *Environ Sci Technol* 45(18): 7896-7905.

Vulnerable Populations: Lower-income communities and people of color



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- Higher PBDE body burdens found in lower-income populations
- Black adolescent girls have higher PBDEs compared to their White and Hispanic counterparts
- Highest PBDE dust levels in the world found in lower-income California homes from Richmond, Salinas, and Oakland

Zota AR, Adamkiewicz G, Morello-Frosch RA. 2010. Environmental Science & Technology;
Quiros-Alcala L, Bradman A, Nishioka M, et al. 2011. Environ Int

Prenatal PBDE exposure and low birth weight

Each 10-fold increase in concentrations of BDE-47, -99, and -100 was associated with an approximately 115-g decrease in birth weight



Harley et al., Association of Prenatal Exposure to Polybrominated Diphenyl Ethers and Infant Birth Weight. American Journal of Epidemiology. 2011

Conclusions

- Indoor environmental exposures has not been fully incorporated into the health disparities dialogue
- Outdoor sources, indoor sources, physical structure, and activity patterns are often socioeconomically patterned and can influence indoor pollutant levels
- Further work on cumulative impacts of multiple pollutants in the indoor and outdoor environments is needed

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