Indoor environments and environmental health disparities

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CHE Partnership Call
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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%

Teitler et al., Pediatrics, 2007
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

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Figure 1: Conceptual framework: contributors to indoor environmental exposure

Basic Environmental Health Paradigm

Environmental Source(s)  →  Human Exposure  →  Internal Dose  →  Adverse Health Effect
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)

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Black</th>
<th>Mexican American</th>
</tr>
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<tbody>
<tr>
<td>Current smokers (%)</td>
<td>29</td>
<td>20</td>
<td>12</td>
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<td></td>
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<tr>
<td>$p$</td>
<td>&lt;0.001</td>
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<tr>
<td>Serum cotinine</td>
<td>0.5 (0.11)</td>
<td>0.6 (0.12)</td>
<td>0.1 (0.01)</td>
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<tr>
<td>(geometric mean ng/mL)</td>
<td></td>
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<td>$p$&lt;0.001</td>
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Zota et al., in preparation
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%

**PBDEs** are ubiquitous in our environment

<table>
<thead>
<tr>
<th>Upholstered Furniture</th>
<th>Electronics</th>
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<tr>
<td>Domestic and Wild Animals</td>
<td>Food Supply</td>
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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

Vulnerable Populations: Lower-income communities and people of color

- 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

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.

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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