Synthesizing the Science of Cumulative Impacts: Implications for Policy

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Outline

- Environmental Justice and Cumulative Impacts
- Scientific Assertions
- Future research
- Implications for action

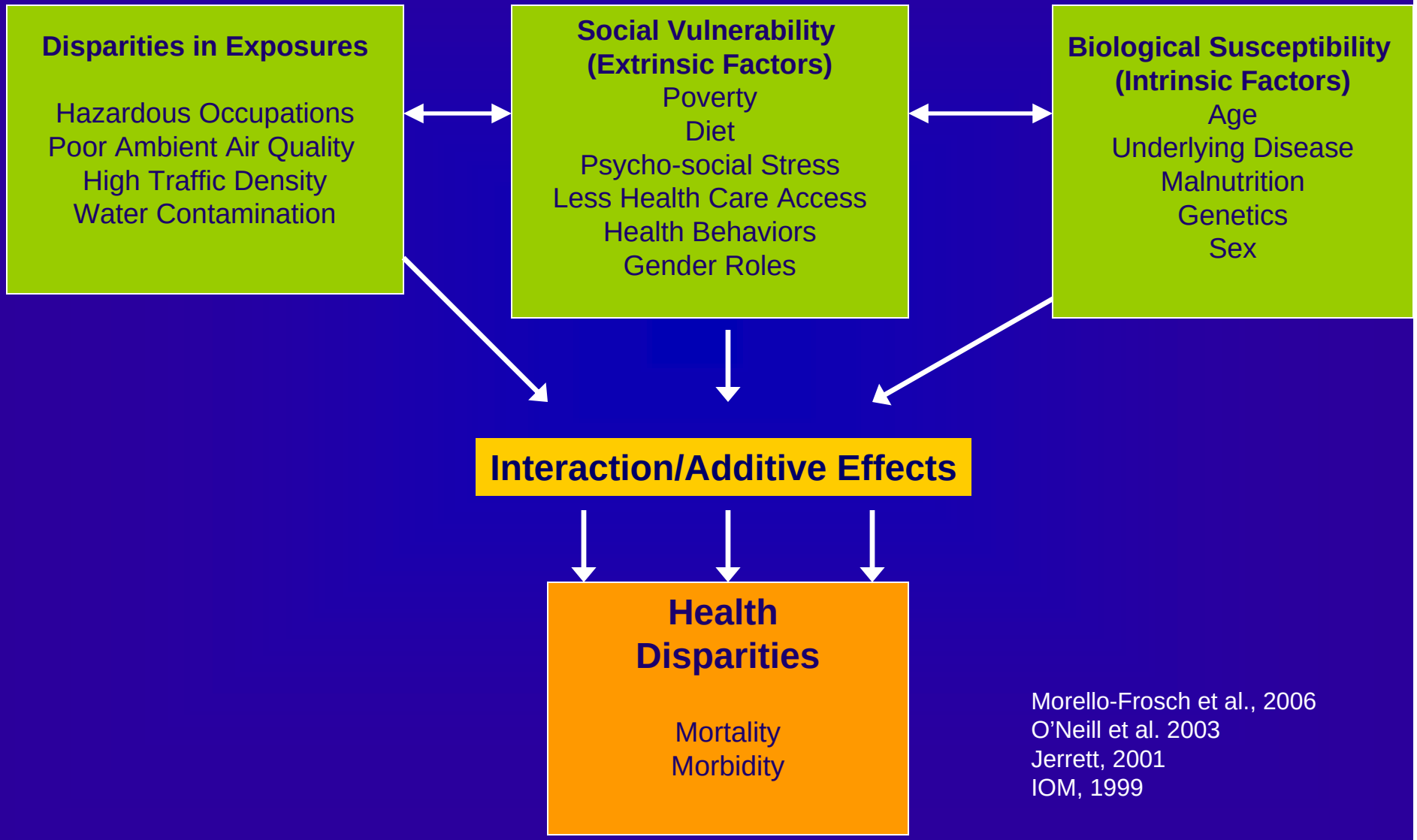
EJ advocacy improves regulatory science : Cumulative Impact

Encouraging researchers and regulators to address:

- ***Multiple*** hazards where communities live, work, and play
- ***Vulnerability*** due to social stressors
  - poverty, malnutrition, chronic health problems

Cumulative Impacts in Richmond, CA

Social Inequality and Triple Jeopardy



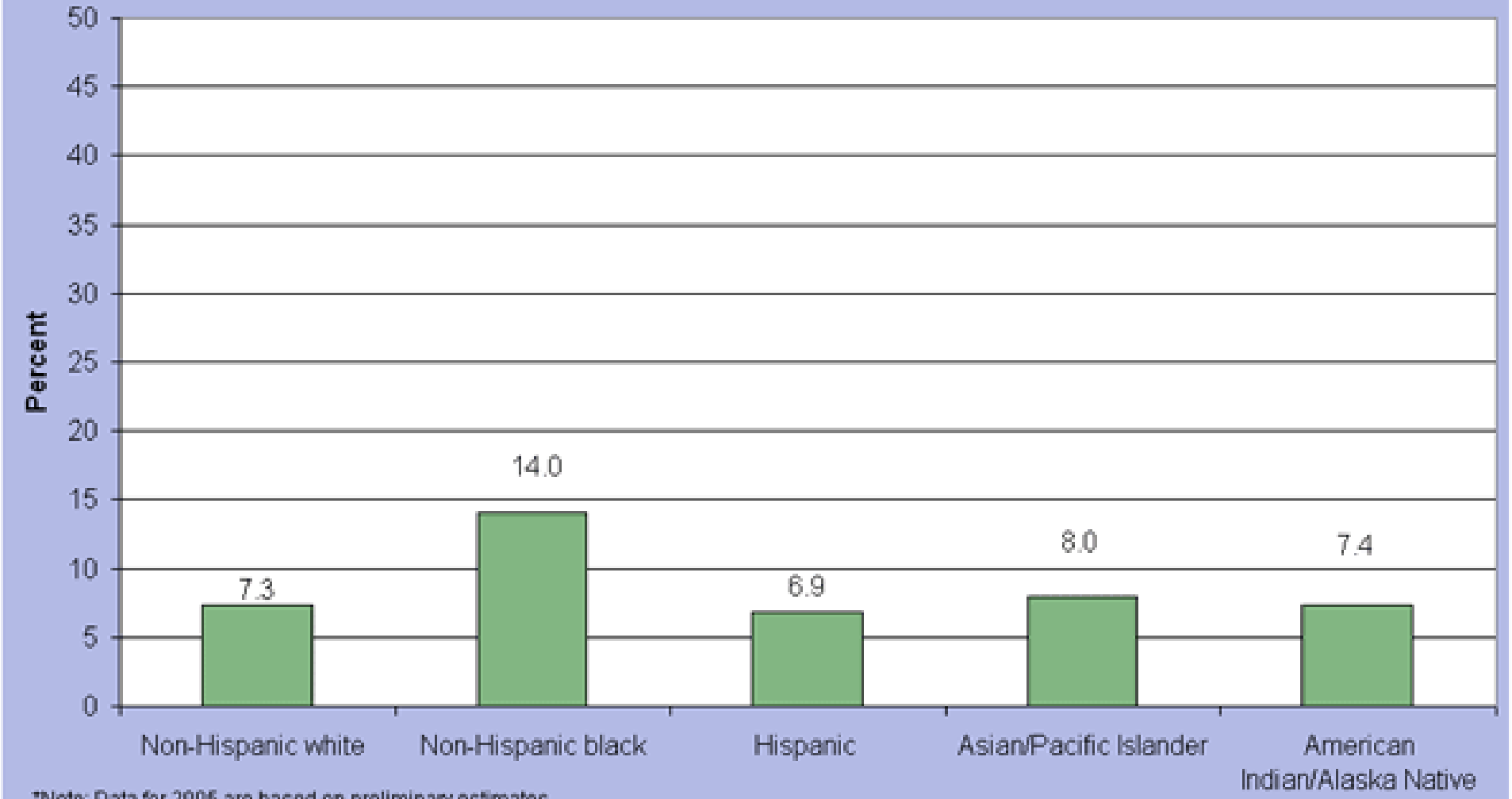
Morello-Frosch et al., 2006
O'Neill et al. 2003
Jerrett, 2001
IOM, 1999

Assertion 1

- Health disparities are significant and exist for diseases that are both socially and environmentally mediated

Figure 2

Percentage of Infants Born at a Low Birthweight, by Race and Hispanic Origin, 2005*

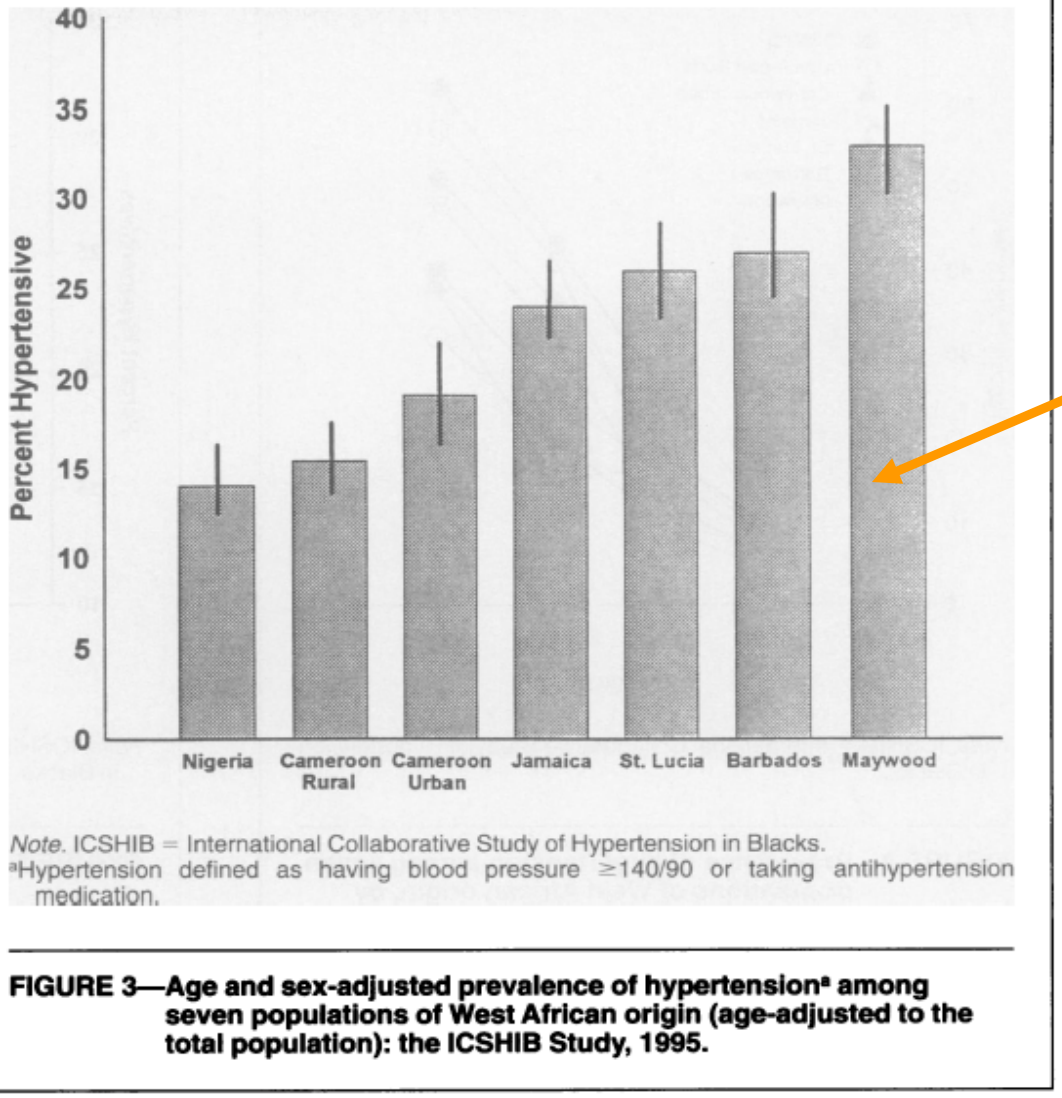


*Note: Data for 2005 are based on preliminary estimates.

Source: Hamilton BE, Martin JA, and Ventura SJ. (2006). "Births: Preliminary data for 2005." *National vital statistics reports*; vol 55. Hyattsville, MD: National Center for Health Statistics. Table 4. http://www.cdc.gov/nchs/products/pubs/pubd/hestats/prelimbirths05/prelimbirths05.htm#ref02.

Child TRENDS DATABANK

High blood pressure among blacks of West African origin—US and other locations



Note. ICSHIB = International Collaborative Study of Hypertension in Blacks.
[a]Hypertension defined as having blood pressure ≥140/90 or taking antihypertension medication.

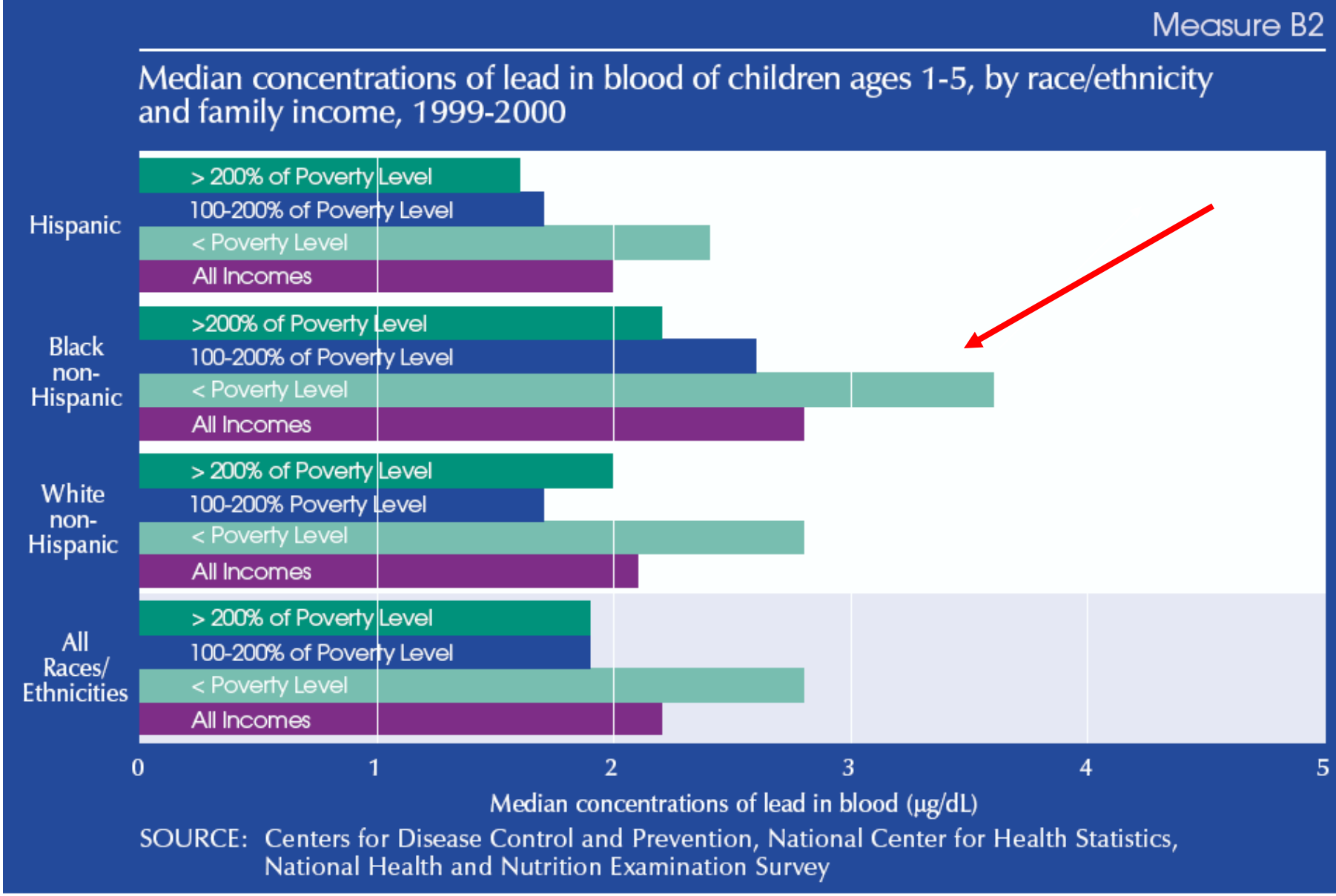
FIGURE 3—Age and sex-adjusted prevalence of hypertension[a] among seven populations of West African origin (age-adjusted to the total population): the ICSHIB Study, 1995.

Cooper et al. AJPH 1997

Assertion 2

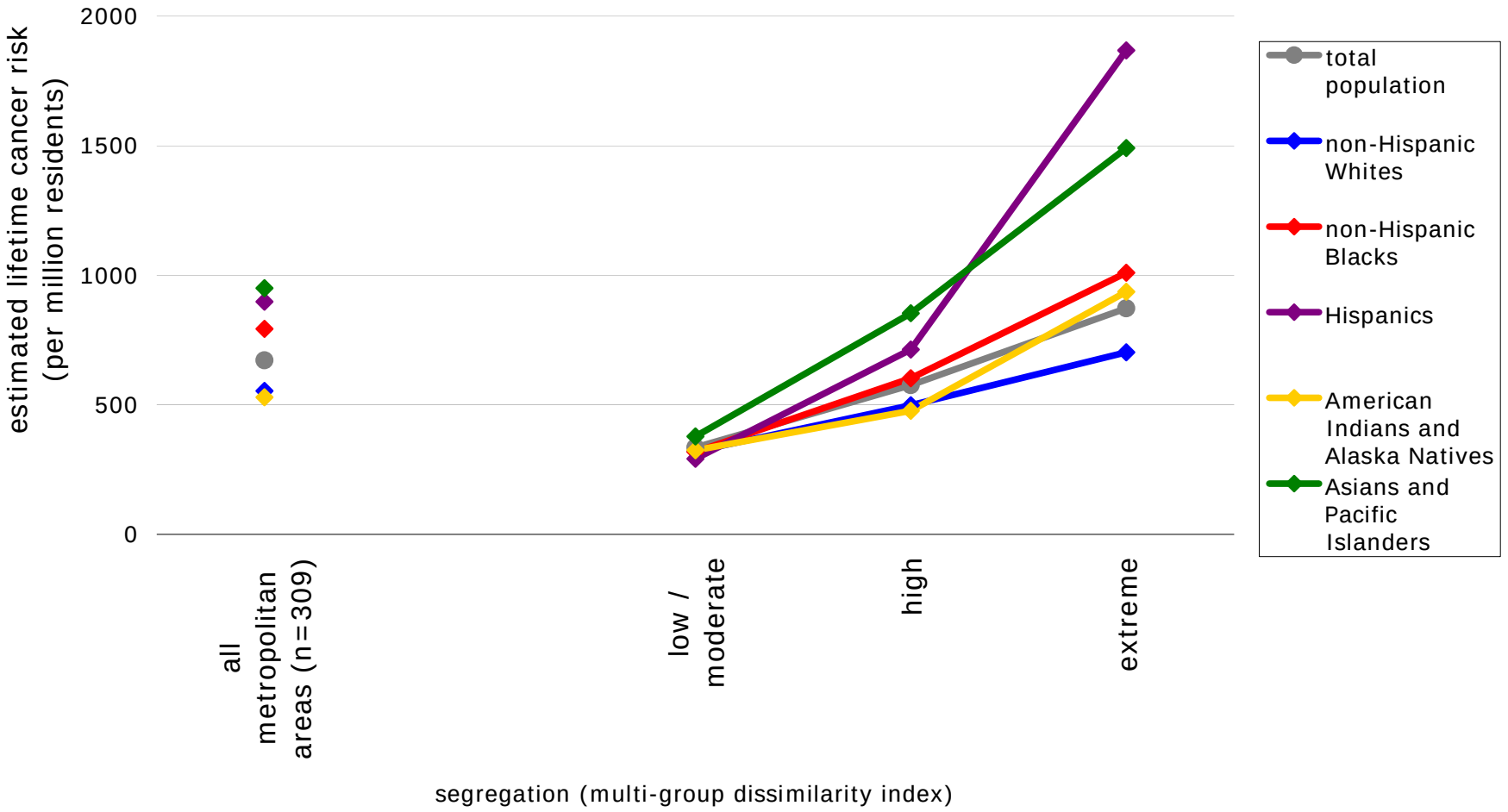
- Disparities in exposures to environmental hazards between racial and socioeconomic groups are significant and are linked to adverse health risks and outcomes

Surveillance – Lead
Who Bears the Burden?



Cumulative Impact

Estimated cancer risk associated with ambient air toxics by race/ethnicity and racial/ethnic residential segregation, continental United States metropolitan areas

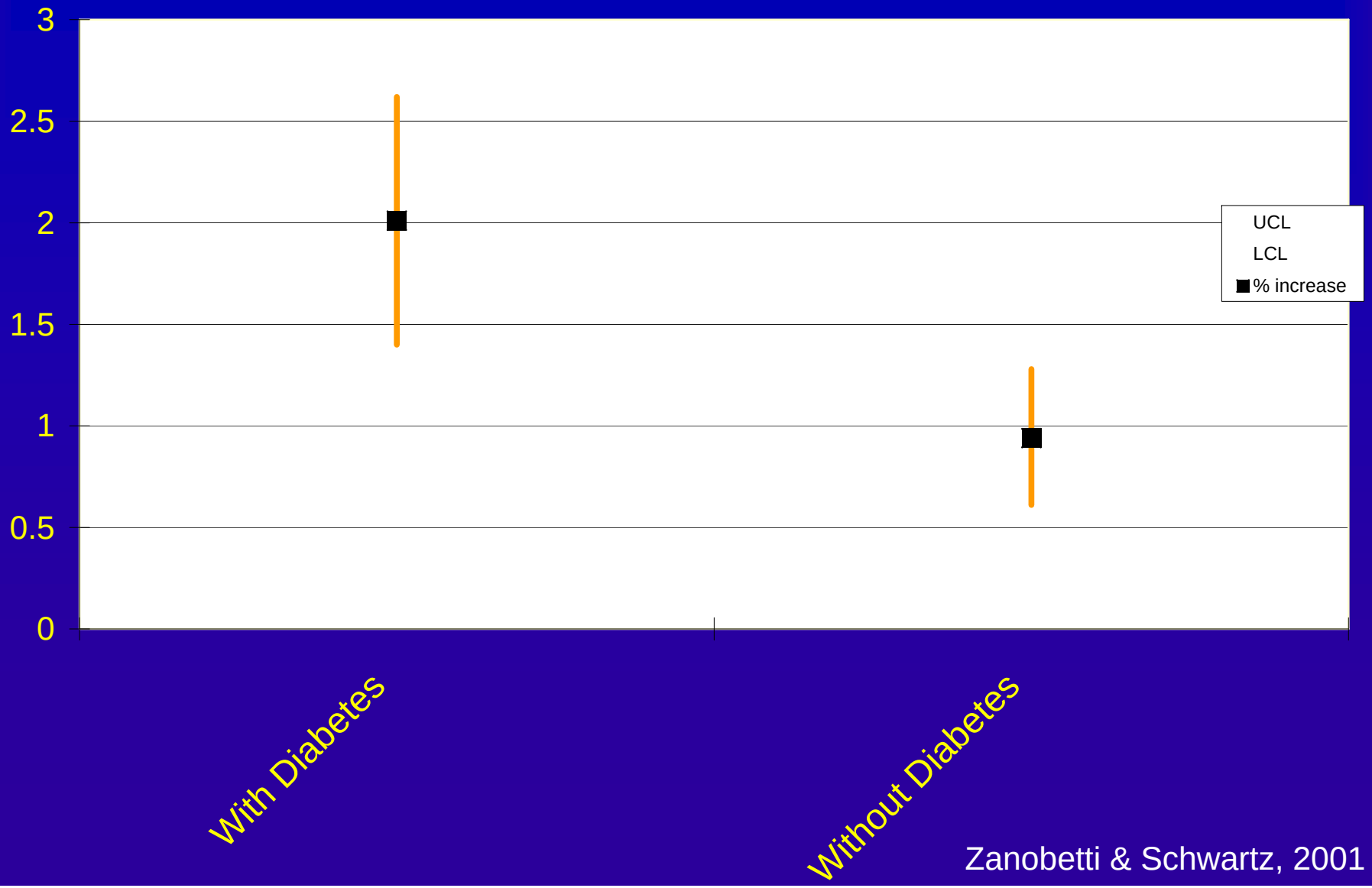


Morello-Frosch & Jesdale, EHP 2006

Assertion 3

- Intrinsic (biological and physiological) susceptibility contributes to differences in the frequency and severity of environmentally-mediated disease

% Increase in Daily Hospital Admissions for Cardiovascular Disease Associated with PM10 (per 10 ug/m3 increase)



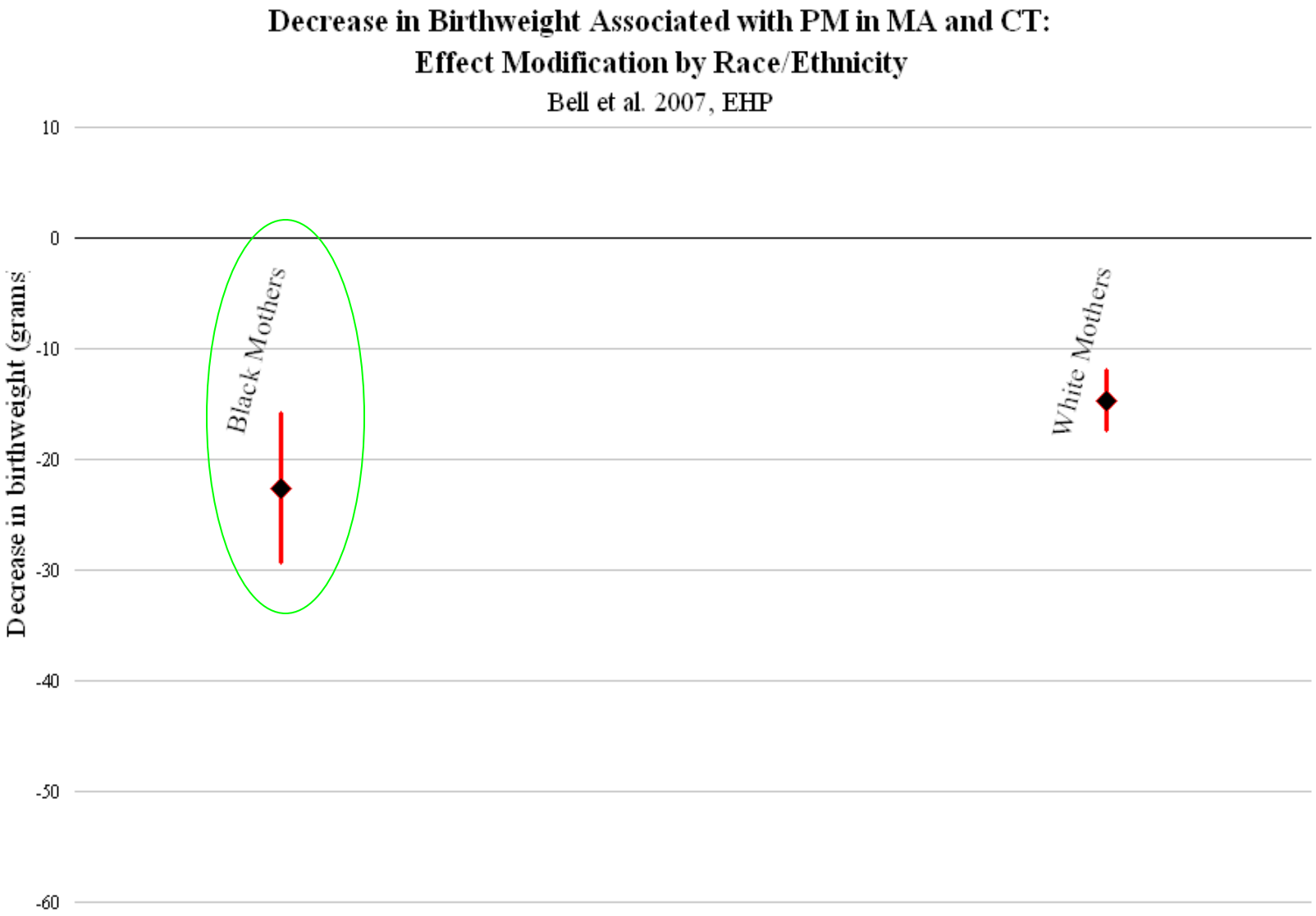
Zanobetti & Schwartz, 2001

Assertion 4

- Vulnerability from social factors amplify the effect of environmental agents on health and can contribute to health disparities
  - Includes community and individual-level factors

Individual vulnerability factors

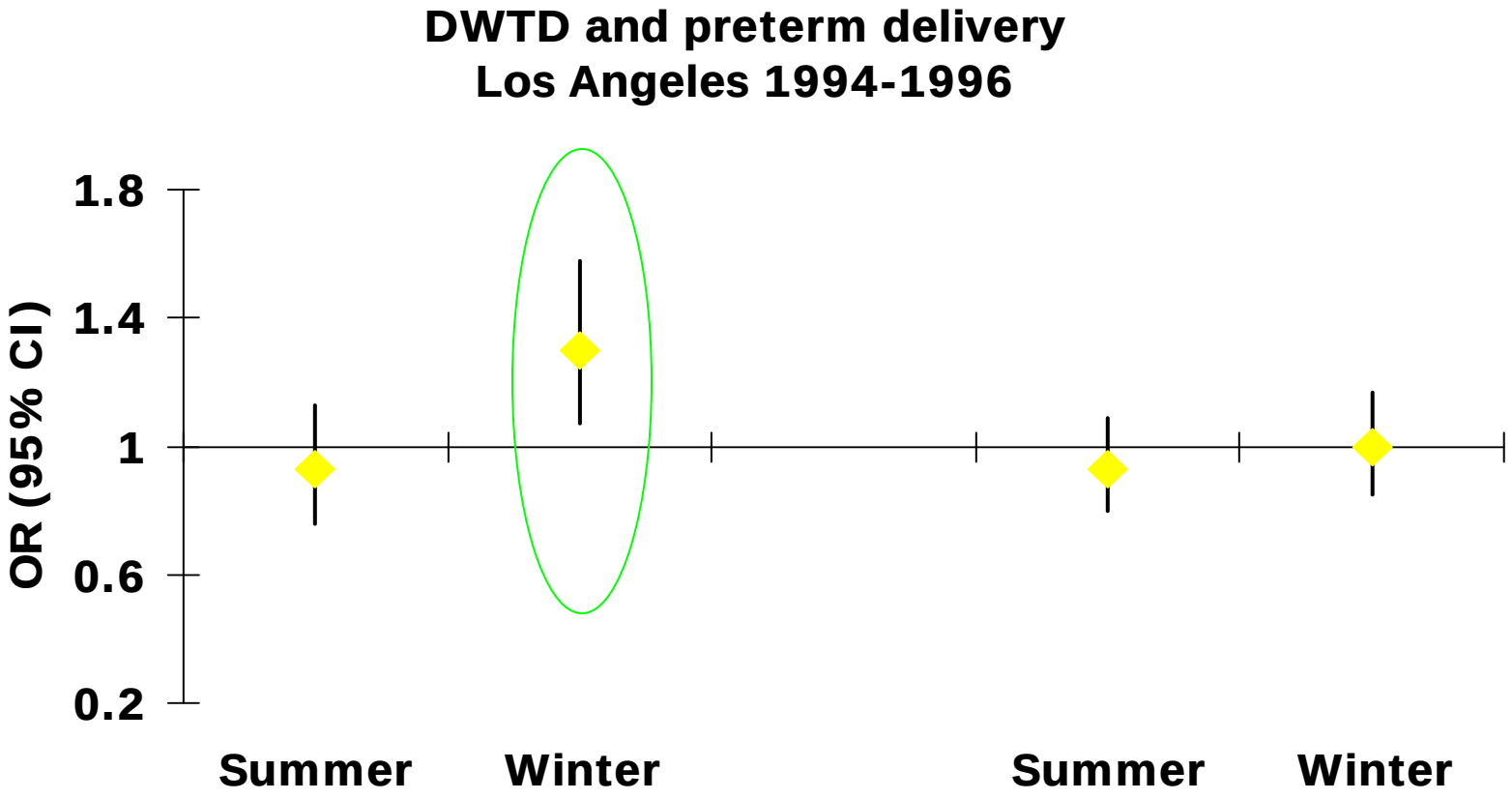
Vulnerability



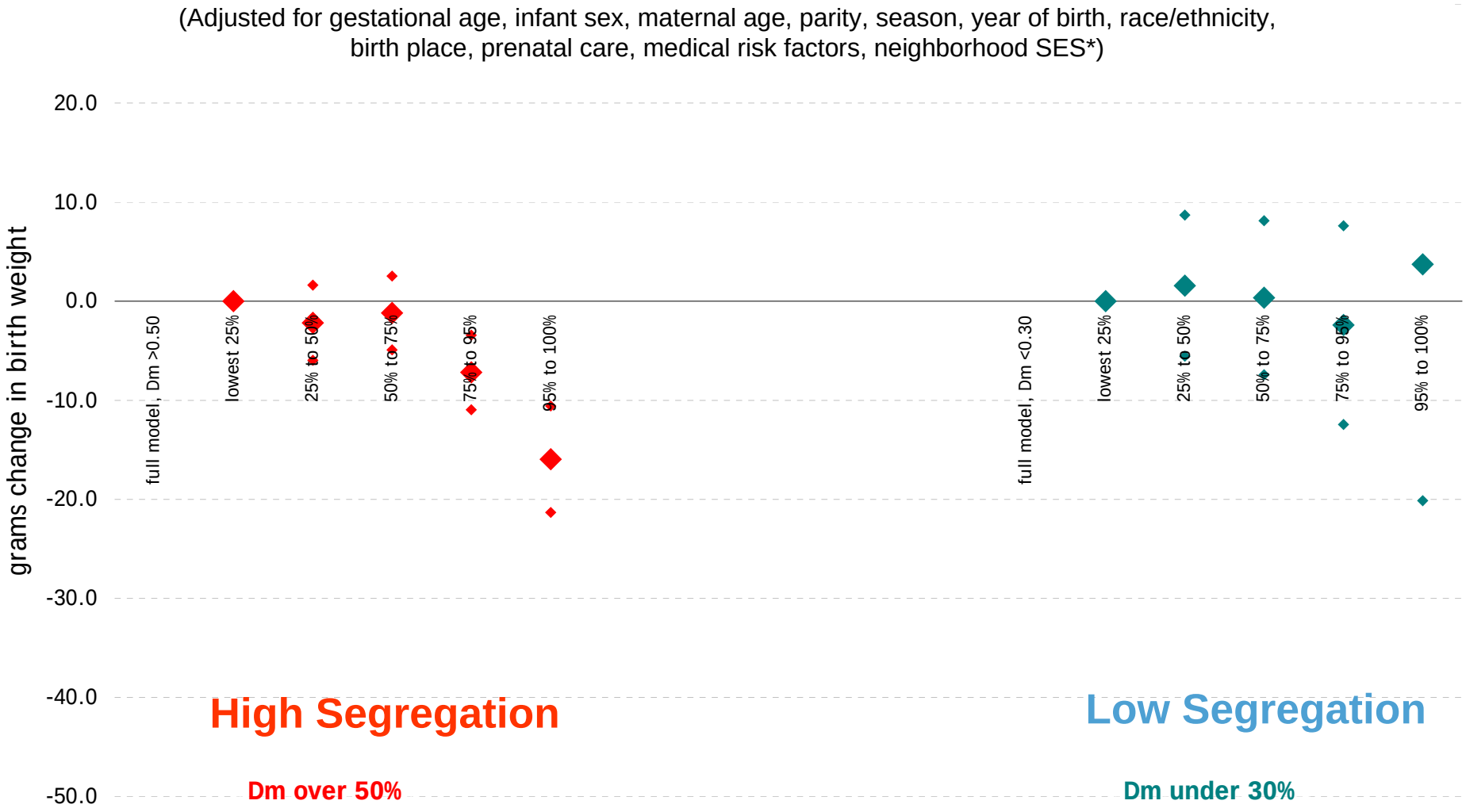
Place-based vulnerability factors

Vulnerability - Place:

Traffic Density and Risk of Preterm Delivery
is Amplified in Low Income Neighborhoods
(Ponce et al AJE 2005)

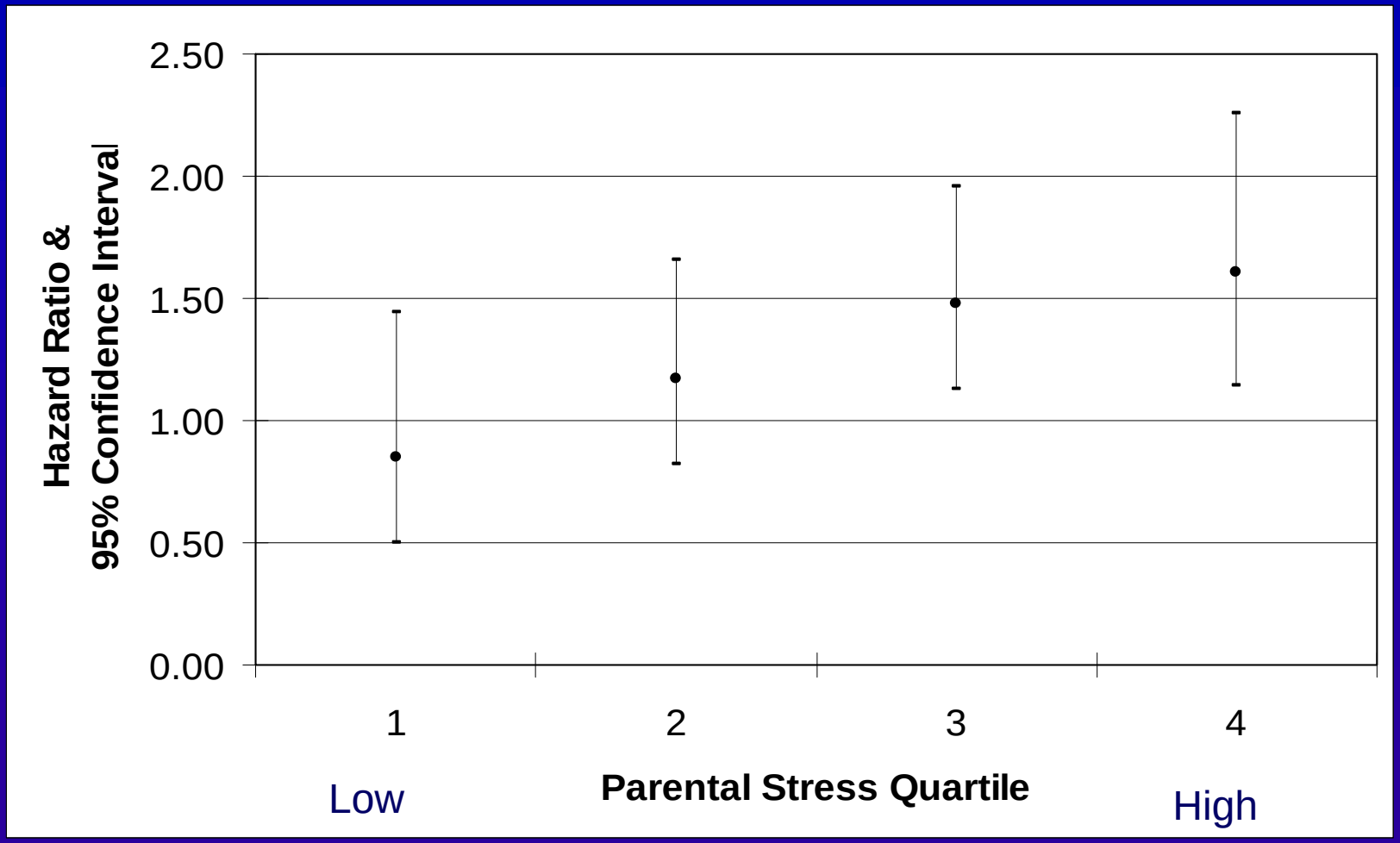


Decrease in birth weight associated with distance-weighted traffic density – Stratified by Level of Racial Segregation (CA 2001-2006)



(Morello-Frosch et al., in prep)

The Role of Stress: Effect of NOx on Incident Asthma



Shankardassa et al. PNAS, 2009

Future work

- Community and individual-level stressors amplify pollution/health outcome relationships

Methodological questions to consider:

- Need to integrate place – level measures of discrimination, poverty
  - Indicators for institutional processes
- Regulatory science needs to consider place-based stressors as drivers of vulnerability

Future work

More policy-relevant exposure measures needed

- E.g. traffic data as a surrogate for pollution exposures

Geographic scales of Cumulative Impact are important

- Regional and neighborhood differences
- Zoning and facility siting decisions to operate regionally
- Media-specific strategies still important (air, water, land)
- Intervention points must also include -- land use planning, industrial and transportation development

Thank you

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