PARKS, AIR POLLUTION, AND CHILDHOOD OBESITY

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Why We Care About Obesity

- Increases risk for diabetes, liver and heart disease and stroke
  - The increased risk starts as early as childhood

Causes for the Epidemic of Obesity and Diabetes

- Traditional explanation
  - More calories
  - Sedentary behavior and lack of exercise

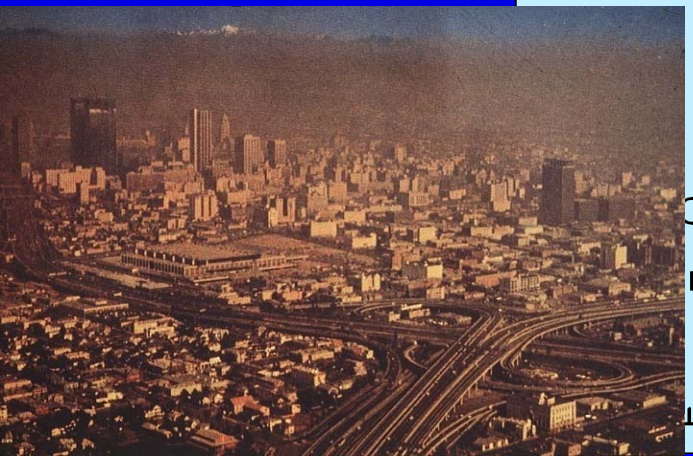
Other Risk Factors for Childhood Obesity

- **Emerging evidence indicating environmental exposures could act as "obesogens"**
  - **Chemicals that act like hormones at very low levels ("endocrine disrupting chemicals")**
    - **Present in common commercial products**
      - Food packaging, receipts (BPA)
      - Plastics (phthalates)
      - Flame retardants (PBDE)
  - **Nicotine exposure during gestation**
  - **Second hand tobacco smoke?**
  - **Air pollution?**

Sharma Am J Epidemiol. 2008; Trasande, JAMA 2012, Valvi EHP 2012, Verhulst EHP 2009,

SC CEHC

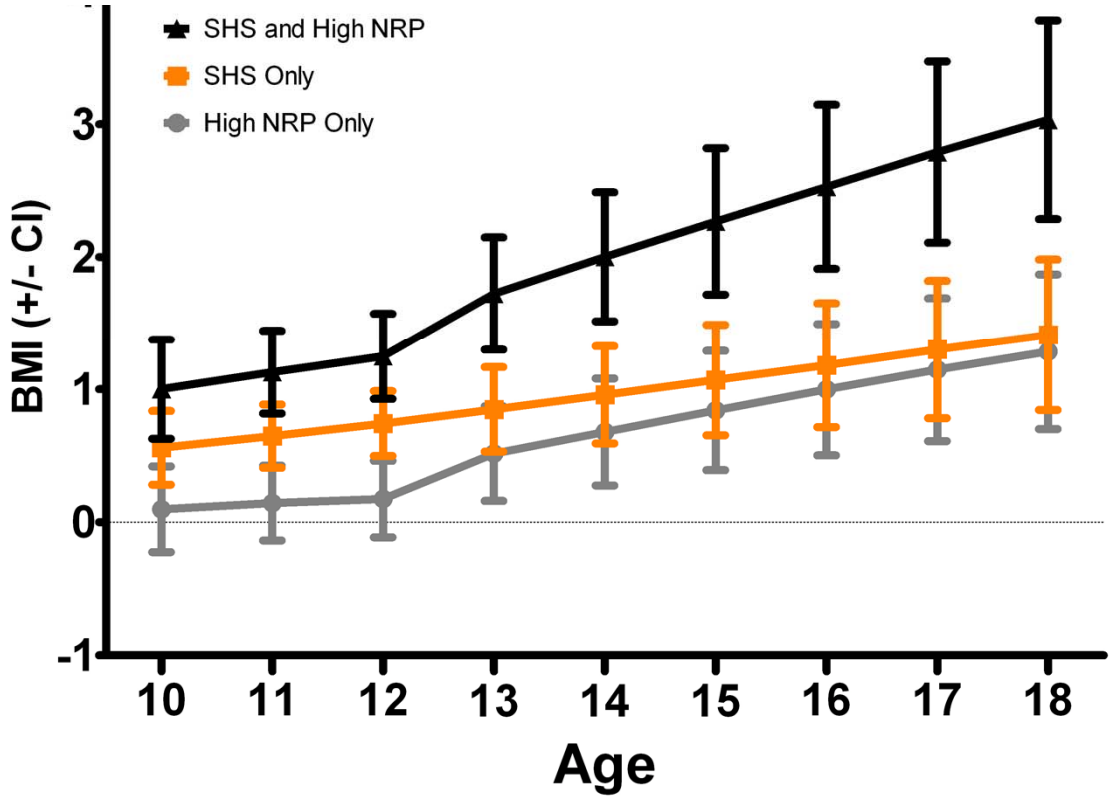
Results from Studies of Air Pollution and Obesity in the Children's Health Study



Results from Studies of Air Pollution and Obesity in the Children's Health Study

- **Only Near-Roadway Residential Exposures Were Consistently Associated With "Body Mass Index" or "BMI" (weight adjusted for height)**
  - **Multiple separate populations followed through childhood in strong study designs**
    - Jerrett M, McConnell R, et. al. Prev Med 2010; 50 Suppl 1: S50-8
    - Jerrett M, McConnell R, et. al. Environ Health 2014;13: 49.
    - McConnell R, Shen E, et. al. Environ Health Perspectives 2015;123: 360-6
- **Consistent with results from other recent studies of children and from animal experiments**

Main and Synergistic Effects of Secondhand Smoke and Near-roadway Pollution on Attained Body Mass Index at Age 18



Difference in mean BMI (95% confidence intervals) at each age was compared with reference exposure category of children with neither exposure (X-axis).

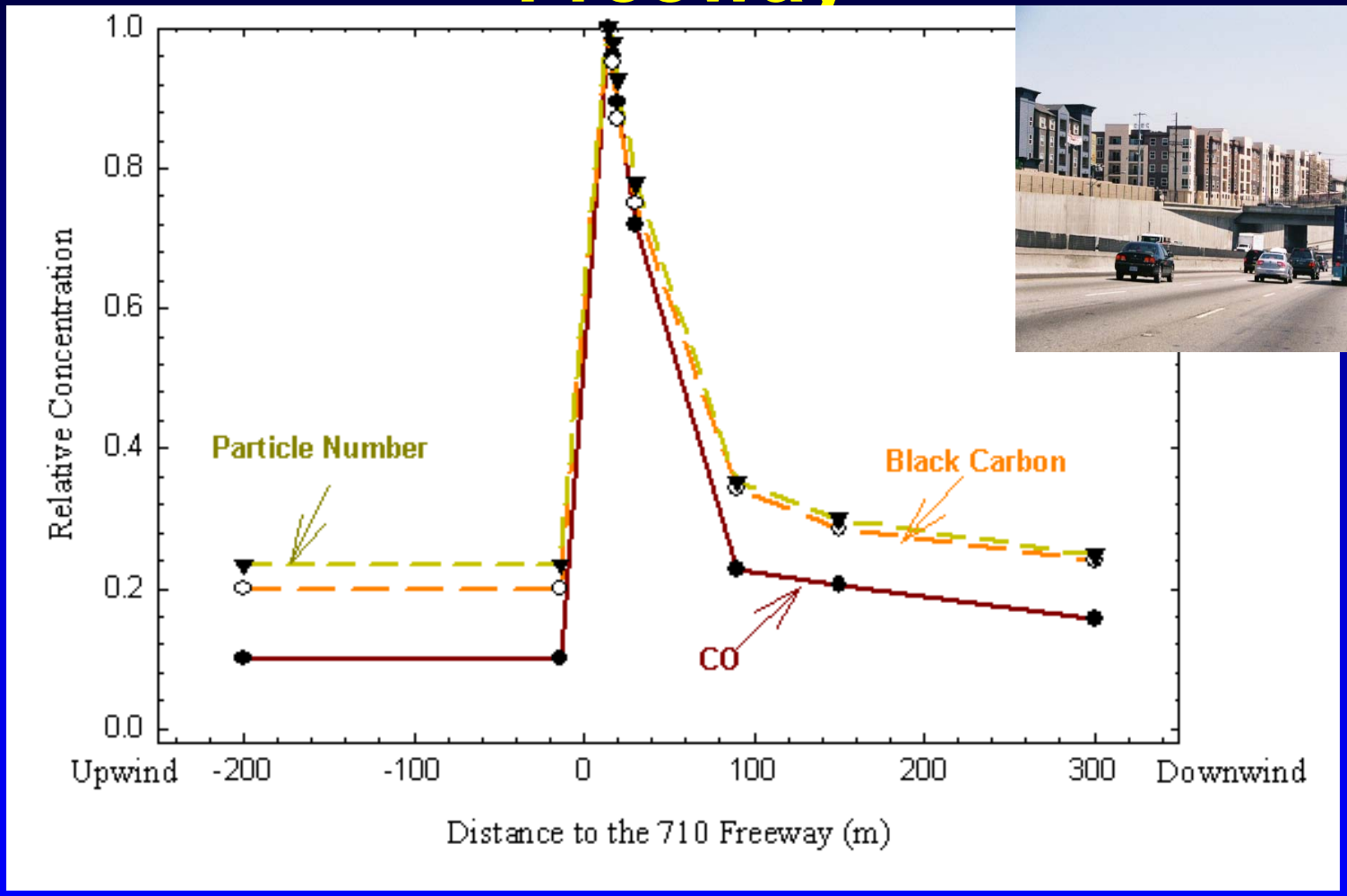
McConnell, et. al. *Environ Health Perspect* 2015;123:360-366

Implications

- **These are big effects, if causal**
  - **3 "body mass index" units in a 6' 1", 200 lb man is almost 20 lbs (10% of body weight)**
  - **Potentially large public health implications**
- **What Might Cause These Effects?**

Peds Obesity 2015

Air Quality is Worse Near a Freeway



Other pollutants are also high near freeway (e.g. NO2, benzene,…)

(Zhu et al., 2002, 2006)

Urban Design Solutions to the Obesity Epidemic

- Features of anti-obesity "built environments"
  - Neighborhood healthy food options
  - Exercise promotion
    - Walkable neighborhoods, including public transportation access
    - Bicycle lanes
    - *Access to parks with exercise facilities*
  - But…
    - Could time spent in heavy near-roadway pollution present a competing risk for obesity?

Exercise Increases Potential Dose of Near-road Pollution

- 5- to 15-fold increase in volume of inhaled air
- Markedly increased levels deep in the lung of some reactive pollutants
  - "Scrubbed" in the nose and upper airways during resting breathing

Carlisle. Br J Sports Med 2001;35:214-222
Sharman. QJ Med 2004;97:637-643

Benefits of Exercise

- Weight loss
- Heart, metabolic, respiratory and brain health
- Longevity

Questions

- Might the benefit of exercise be outweighed by the harm of near-roadway pollution?
  - Probably not at pollution levels present in the U.S., with possible narrow exceptions
    - Susceptible populations such as children with asthma or adults with heart disease
- Might the benefits of exercise be reduced in heavy near-roadway pollution plumes?
  - Much uncertainty
  - Likely depends on the outcome

California Air Resources Board. Physical Activity. December 2016

“Glendale Will Look at Dallas Freeway Idea”

Officials consider building a cap park over… the 134 Freeway

LA Times 3-7-16

Questions

- Would we prefer to have parks for our children that are more than 500 feet from a freeway?
- Should we have to choose between parks and near-roadway pollution exposure?

How do We Maximize the Health co-Benefits of Parks While Minimizing Risks?

- We shouldn't miss a historic opportunity to do so!
- Elements of a team to address this question
  - Community stakeholders
  - Obesity intervention community
  - Parks planners and policy makers
  - Urban design specialties
    - Architects and landscape architects, planners, policy makers
  - Transportation planners
  - Air pollution and health community
  - Economists
  - Developers
  - Others, eg crime and safety expertise