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?

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
    – 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?
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

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
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