EPA
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Environmental Protection
Agency

Why are we concerned with near-road air quality?

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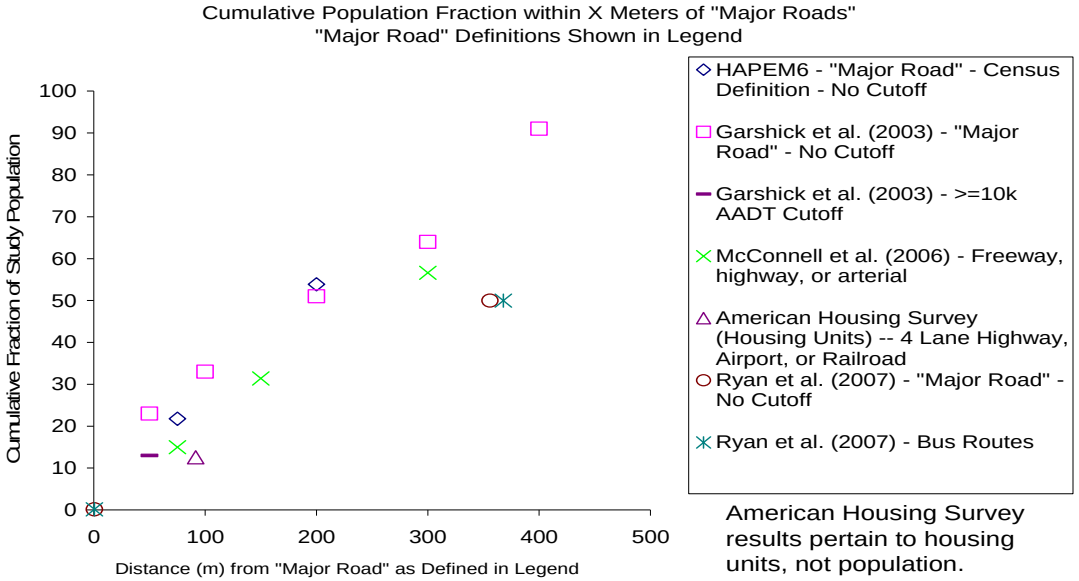
April 27, 2010

Why are we concerned? Adverse Health Effects

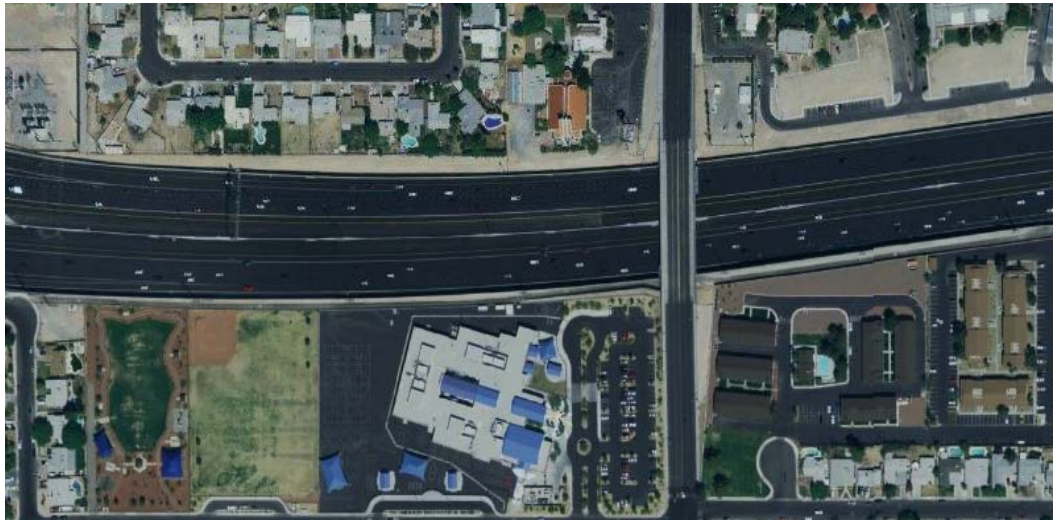
- Living, working, or going to school near major roadways has been associated with numerous adverse health endpoints
  - Respiratory effects (e.g., asthma, bronchitis)
  - Cardiovascular effects
  - Adverse birth outcomes/developmental effects
  - Premature mortality
  - Cancer
- Hundreds of studies published this decade
  - Account for varying fleets, engine technologies, etc.
  - Health Effects Institute (HEI) summarized these findings, concluding that exposures to traffic emissions near roads are a "public health concern." (http://pubs.healtheffects.org/)

Why are we concerned? Population Exposures

- Significant portion of U.S. population lives near large roads or transportation system
  - 2007 American Housing Survey estimates >45 million people
  - Additional portion of population works or goes to school near large roads
  - High density traffic residences and schools disproportionately lower income



American Housing Survey results pertain to housing units, not population.



US-95, Las Vegas, NV

Why are we concerned? Traffic Emissions

- More than 1,000 compounds have been identified in exhaust and evaporative emissions from mobile sources – many with known health implications
  - NAAQS Pollutants
  - Air Toxics
  - Particulate Matter
- Other air pollutant emissions from mobile sources
  - Tire wear
  - Brake wear
  - Resuspended road dust
  - Noise

Why are we concerned? Elevated Pollutant Concentrations

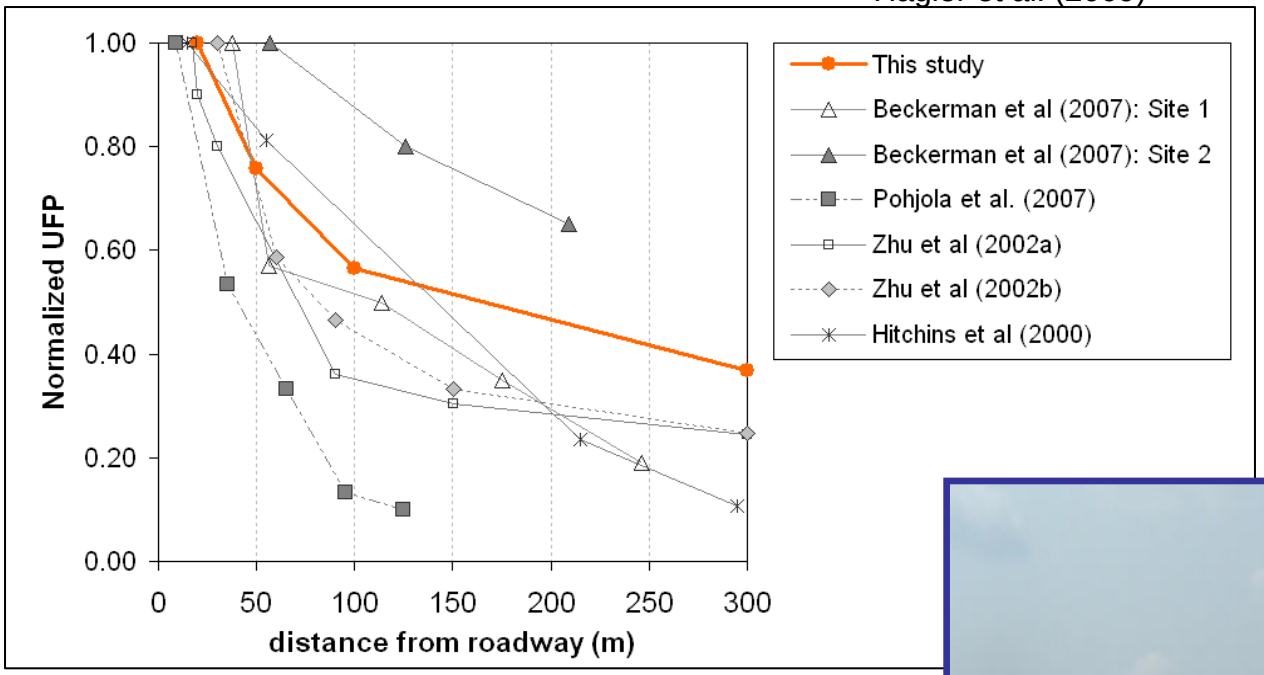
- Elevated concentrations of multiple pollutants have been measured near roads
  - Pollutants often identified include:
    - NAAQS pollutants
      - Carbon monoxide
      - Nitrogen oxides (NO/NO2/NOx)
      - Particulate Matter Mass (PM10, PM2.5)
    - Air Toxics
      - Benzene
      - Metals
    - PM constituents
      - Number/count (reflects ultrafine particles from combustion)
      - Black carbon (elemental carbon, soot)

Notable Recent Events

- EPA Mobile Source Air Toxics Rule (2001) raised near road exposure concerns
- American Academy of Pediatrics recommended siting schools and child care facilities away from high-traffic roadways (2004)
- FHWA/Sierra Club settlement agreement in Las Vegas (2005)
- California School Siting Legislation requiring environmental assessment for new schools to be located near large roads (2005)
- The Centers for Disease Control and Prevention (CDC) “Healthy People 2020” seeking to decrease the number of schools near large roadways (2009)
- HEI summary report “Traffic Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure and Health Effects” (2009)
- NO2 NAAQS requiring near road monitoring (2009)

Concentration Gradients

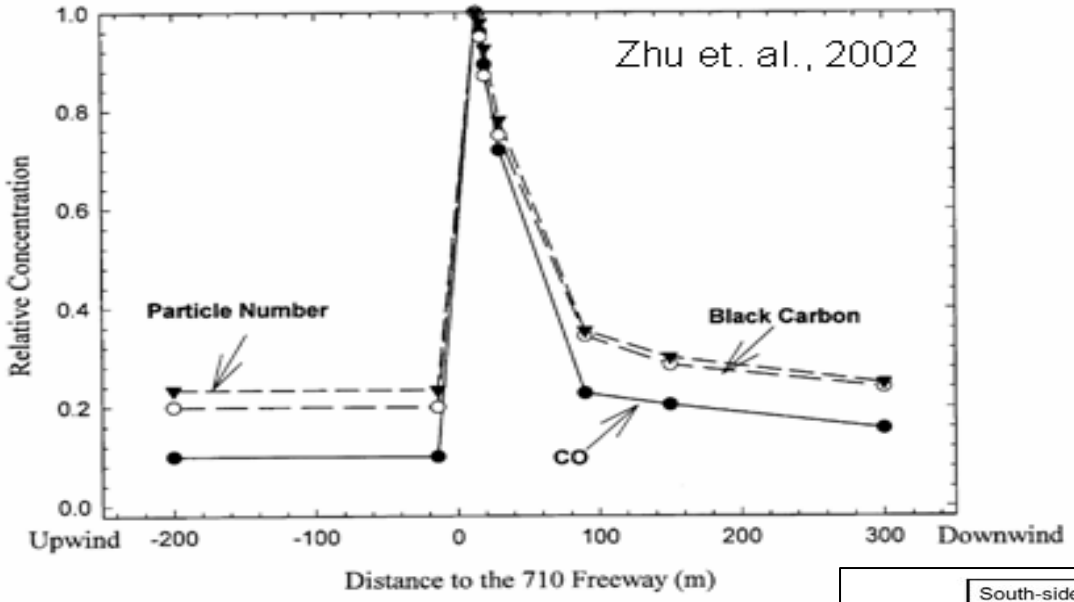
Hagler et al. (2009)



Studies in US and Canada show similar gradients for PM number concentrations

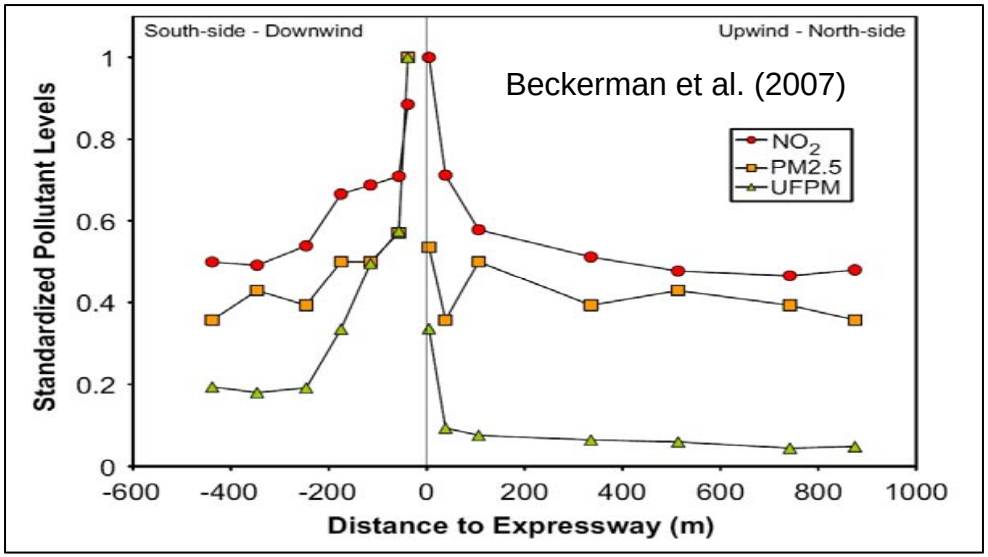
Studies conducted in mostly flat, open areas at-grade with the road measuring distance from the edge of the nearest travel lane

Concentration Gradients

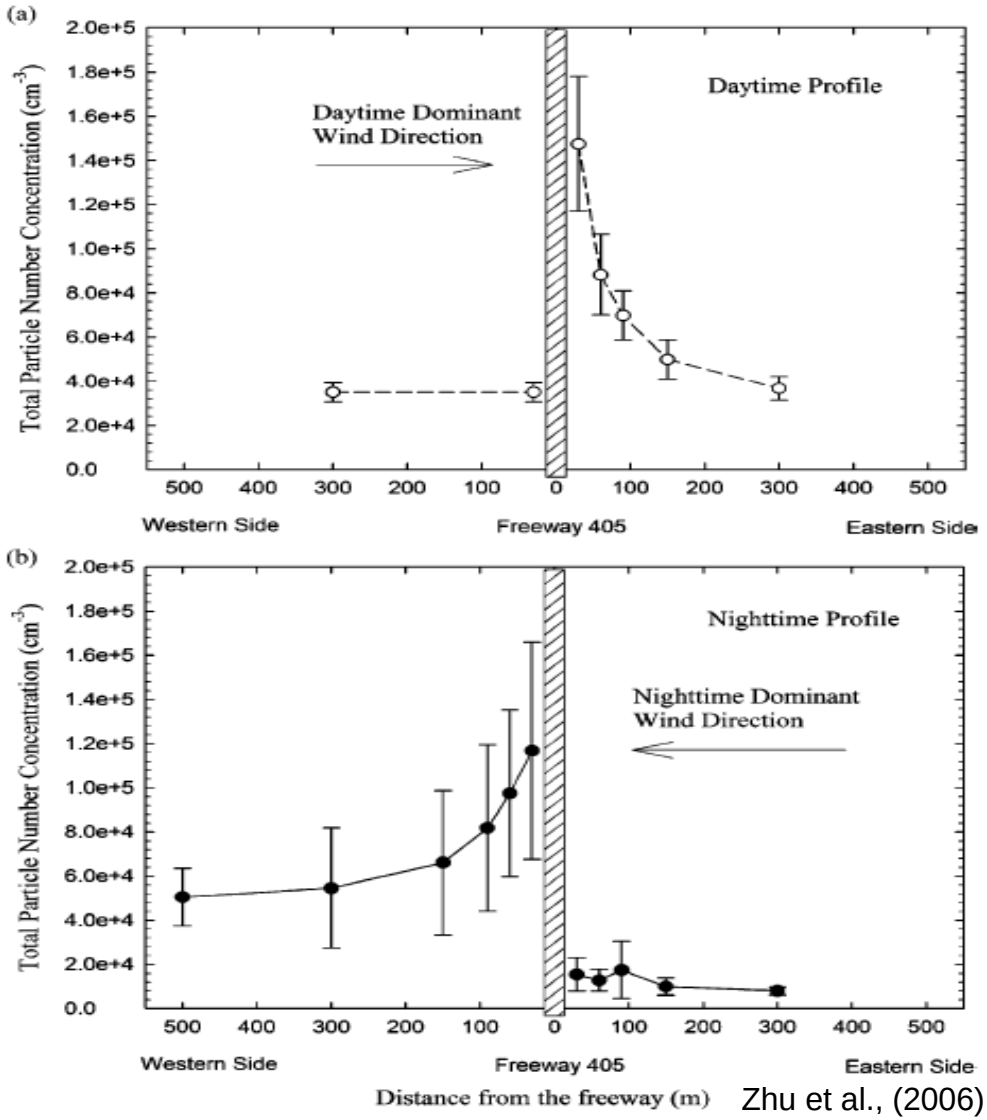


Similar gradients can exist for gaseous and PM pollutants

Gradients can exist over shorter (<1-hour) and longer (24+ hour) time averages



Concentration Gradients

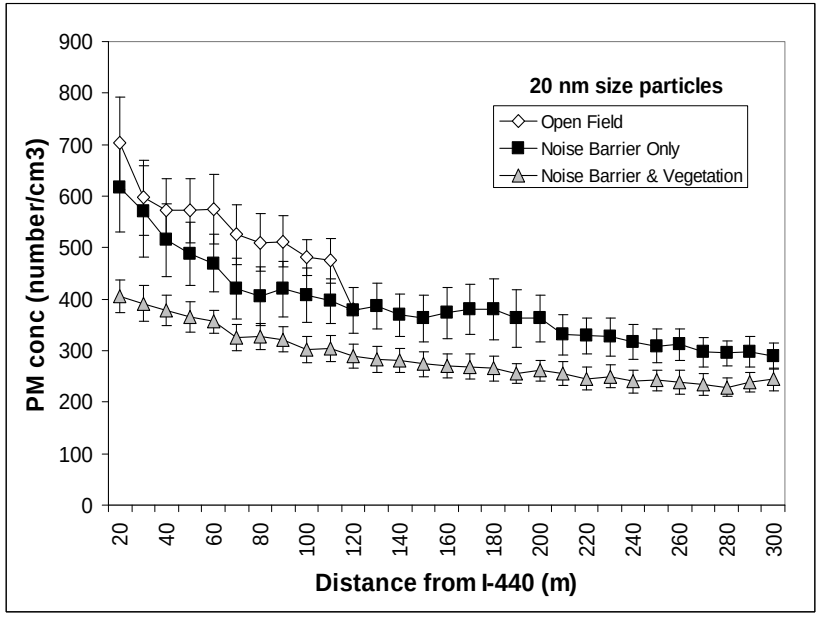


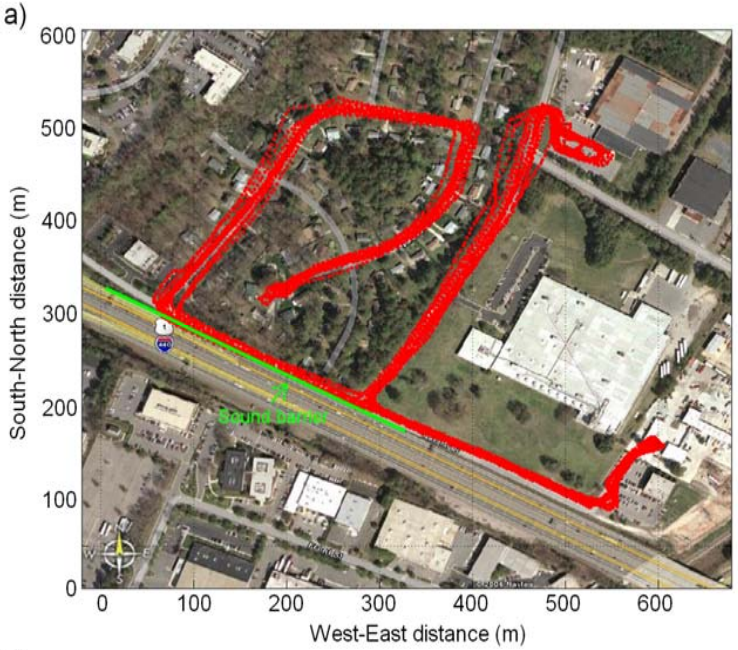
Zhu et al., (2006)

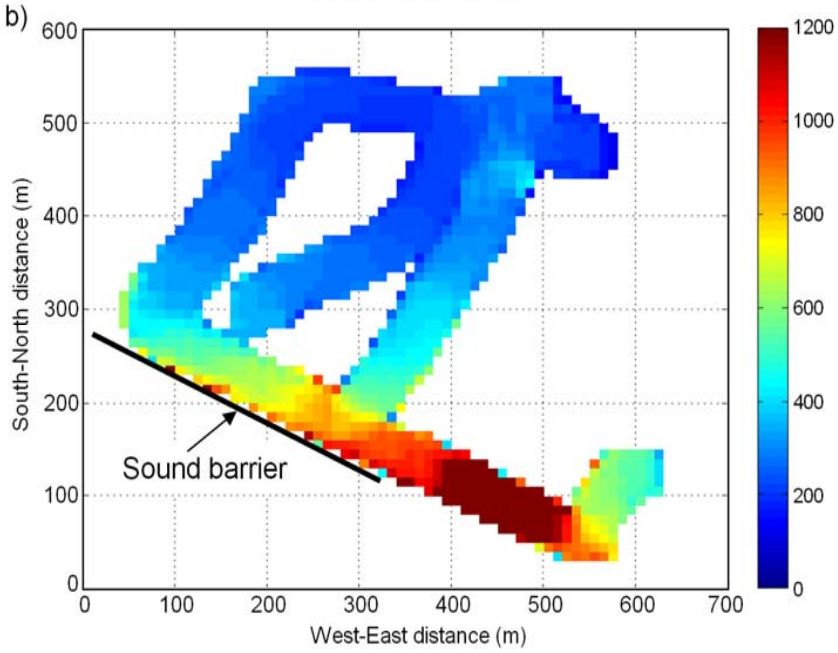
Gradients and the zone of influence from the road will be influenced by environmental conditions (wind direction, wind speed, time of day, etc.)

Vegetation's Potential Role

Field studies also show the influence of noise barriers and vegetation, affecting both pollutant concentrations and gradients







Baldauf et al., (2008)

Workshop Questions

- Where are there gaps in meeting research and policy needs?
  - Extensive research being conducted on near road impacts
  - Although the magnitude and extent of impacts may be debated, high level of concern highlights need for attention
- What promising new approaches have not been fully tested?
  - Use of vegetation near roads fits this category
  - Vegetation can be part of a number of options being explored by EPA and others including improved emission standards, VMT reduction strategies, other roadside features, etc.