Near Roadway Air Pollution (NRAP)
Special concerns near busy roads, highways and “hot spots”
(marine ports, freeways, rail yards, warehouses and NOW - airports)

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WHY PROXIMITY MATTERS
Air Quality is Worse Near a Freeway

Black carbon as diesel marker and other pollutants are high near freeway (e.g. NO2, benzene, ...)

(Zhu et al., 2002, 2006)
Proximity To Traffic Matters

Lungs of children who live in areas with bad regional air pollution and near freeway traffic are impacted the most.

<table>
<thead>
<tr>
<th>Lung Function Growth</th>
<th>Low PM$_{2.5}$ : Far from Fwy</th>
<th>Low PM$_{2.5}$ : Near Fwy</th>
<th>High PM$_{2.5}$ : Far from Fwy</th>
<th>High PM$_{2.5}$ : Near Fwy</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>96%</td>
<td>92%</td>
<td>88%</td>
<td>86%</td>
</tr>
</tbody>
</table>

Credit: Jim Gauderman, USC
PROXIMITY TO TRAFFIC POLLUTION - HEALTH OUTCOMES

• Children living near traffic-related pollution are more likely
  – to have reduced lung function
  – to get new cases of asthma
  – to have respiratory symptoms (bronchitis)

• Mothers are more likely
  – to have premature or low birth weight babies

• Adults are more likely to
  – die from stroke and heart disease (especially if they have diabetes) and from lung cancer
  – If near diesel exhaust emissions: lung cancer

• The elderly are more likely to
  – suffer accelerated cognitive decline

McConnell R et. al 2005, 2010
Gauderman WJ et al, 2007
Maheswaran R and Elliott P, 2003
Kan et al. 2003-4.

Gatto NM et al, 2013
Weuve J et al, 2012
Kan H et al, 2008

Wilhelm et al, 2011-2
Chen JC et al, 2009
Basu R et al, 2013
EMERGING RESEARCH FINDINGS
Emerging research findings... pregnancy

- Prenatal exposure to PAHs (polycyclic aromatic hydrocarbons) is associated with obesity in childhood
- Living near traffic pollution when pregnant may increase the risk of having a child who develops autism

Rundle et al, 2012
Volk H et al, 2012-13
Emerging research findings - diabetes

- 2-4 times as many mice exposed to air pollution and fed a high fat diet developed Type 2 diabetes than mice exposed to clean air and the same high fat diet

Sun et al, 2009, 2013
Rajapolalan, 2012
Liu, 2013
“HOT SPOTS” NEAR INTERNATIONAL TRADE FACILITIES
DISPROPORTIONATE IMPACTS
Who lives in close proximity to ports and rail yards?

• In 2003, U.S. EPA commissioned studies on:
  – the U.S. population living near
    • 47 selected marine ports and
    • 37 selected rail yards

• Results:
  – at least 13 million people live in the vicinity of these facilities and are exposed to diesel particulate matter
  – includes a disproportionate number of low-income households, African-Americans, and Hispanics

Office of the Inspector General, USEPA, 2009
Increased cancer risk found near rail yards – CARB HRAs
Global Trade, Local Impacts: Lessons from California on Health Impacts and Environmental Justice Concerns for Residents Living near Freight Rail Yards

Andrea Hricko, Glovioell Rowland, Sandrah Eckel, Angelo Logan, Maryam Taher and John Wilson
ONGOING CONCERN: SITING RAIL YARDS WITH DIESEL EXHAUST EMISSIONS NEXT TO SCHOOLS AND HOMES
BNSF rail yard – the “SCIG”

Proposed to be built in L.A. but next to West Long Beach neighborhood; lower-income & very diverse

Approved by Port of L.A. and City of L.A.

7 lawsuits
Environmental Justice Implications

- When we are talking about ports, rail yards and other goods movement facilities – we are talking about nearby communities that are more often working class/working poor communities of color
Costs of freight transport on children’s health
The health costs from living in “freight transport” communities with heavy traffic

- USC investigators
  - Studied children in Long Beach and Riverside CA
  - Heavy port-related truck traffic
  - LB also exposure to ship emissions

- Estimated burden of disease attributable to living near freeways and near the ports
  - Results
    - Approximately 9% of all childhood asthma cases in Long Beach and 6% in Riverside were attributed to traffic proximity
    - Ship emissions accounted for 21% of bronchitis episodes in Long Beach children with asthma
    - Costs to these two communities per year: $18 million

Perez L et al, 2009
Brandt S et al, 2012
WORKPLACE EXPOSURES
30-40 studies of long-term effects of exposure to diesel

- Studies of workers
  - Truckers
  - Railroad workers
  - Miners

- Most studies
  - Show an elevated risk of lung cancer among exposed workers

- IARC
  - 2012: Diesel exhaust causes lung cancer

Hart JE et al, 2006-2013
Attfield M et al, 2012
Garshick E et al, 2012
AIRPORTS…. THE NEW FRONTIER?
Primary Finding: Particle Number “Impact” Area is 23 Square Miles! *In a minority, lower income neighborhood of L.A.*

Hudda et al 2014
Our Outreach Program – last week: h.s. students measuring UFPs under the flight path
Conclusion

- Proximity to traffic pollution matters
- There are disproportionate impacts on working poor communities of color when it comes to international trade and “goods movement”
  - Impacts may increase as imports increase
    - Expanded ports
    - New or expanded rail yards
    - Expanded highways
    - More huge warehouses/distribution centers
- New study by USC shows pollution in airport flight paths higher than previously believed
  - Again, disproportionate impacts

THANK YOU
Some Key References


• Hu, S., Herner, J. D., Robertson, W., Kobayashi, R., Chang, M. C., Huang, S. M., et al. (2013). Emissions of polycyclic aromatic hydrocarbons (PAHs) and nitro-PAHs from heavy-duty diesel vehicles with DPF and SCR. *J Air Waste Manag Assoc, 63*(8), 984-996.


Living close to busy highways and sources of heavy traffic pollution linked to adverse health effects
More to Obesity than Exercise and Diet

- Emerging evidence indicating environmental exposures could act as “obesogens”
- Built environment and its role in exercise and food consumption
- Many chemicals are implicated
  - Organochlorines (PCBs, DDT)
  - Bisphenol A
  - Cigarette smoke
  - Air pollution