Assessing the Public Health Impacts of an Existing & Expanding Freight System

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We’re about to take a quick trip thru:
- ...the Goods Movement, as background;
- ...air pollution & health issues, as the focus;
- ...societal choices we are facing...
- ...things to remember, when facing them!
Millions of TEUs Handled at Top Ten US Container Ports, 2008 and 2009

Los Angeles
Long Beach
New York/New Jersey
Savannah
Oakland
Norfolk
Houston
Seattle
Charleston
Tacoma

2008 2009

Top Ten World Sea Ports - 2011

(POLA & POLB
13.96M TEUs in 2011)

(Six of the Top Ten are Chinese Ports)

...vehicle exhaust involves more than just cars...
Particle Number Concentration and Distance from Busy Roadways

Zhu et al. 2003
Near Freeway Area
(& one mile buffer)

Legend
- Freeway
- One Mile Buffer

Courtesy of Phil Fine, SCAQMD
What the health data show...
Diesel Exhaust Found to Pose Strong Cancer Risk

Air: State must decide whether to declare fumes a toxic threat requiring safeguards. Business leaders attack report.

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IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

Lyon, France, June 12, 2012 — After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as carcinogenic to humans (Group 1), based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

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International Agency for Research on Cancer
Research has linked air pollution with:

- Low birth weights
- Heart attacks
- Cancer
- Death
- Respiratory infections
- Asthma
- Pneumonia
- School absences
- Lung function
- Growth rate changes
- Symptoms
- Autism
- Neurological function
- Blood coagulation factors
- Hospital admissions
- Atherosclerosis
- Birth defects
- Heart rate variability
- Inflammatory markers
- Changes in blood pressure
- Changes in blood pressure
- Death
- Respiratory infections
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- Changes in blood pressure
- Changes in blood pressure
Children living closer to heavy traffic (vehicle exhaust) have more asthma, use more medication, are more wheezy, & have lower lung function

--assorted Children’s Health Study publications, since 2004
# 8-Yr Growth vs. Distance to Freeway

## Traffic Indicator Diff

<table>
<thead>
<tr>
<th>Traffic Indicator</th>
<th>FEV$_1$ (ml)</th>
<th>(95% C.I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway distance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 500 m</td>
<td>-80.6</td>
<td>(-143.3, -17.8) *</td>
</tr>
<tr>
<td>500 - 1,000 m</td>
<td>-41.0</td>
<td>(-98.9, 16.9)</td>
</tr>
<tr>
<td>1,000 - 1,500 m</td>
<td>-33.2</td>
<td>(-92.7, 26.3)</td>
</tr>
</tbody>
</table>

* p<0.05 relative to >1,500 m from a freeway

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Gauderman et al 2007
Combined Effects of Regional & Local Exposure on 8-yr FEV$_1$ Growth

Lung Function Growth

- Low PM$_{2.5}$ & Far from Fwy
- Low PM$_{2.5}$ & Near Fwy
- High PM$_{2.5}$ & Far from Fwy
- High PM$_{2.5}$ & Near Fwy

Regional PM$_{2.5}$ & Freeway Distance
Autism Risk based on Proximity to Freeways (living close to lots of traffic is associated with autism)

Volk, et al., 2012

OR: 1.86

OR: 1

Volk et al, 2012
Residential Proximity to Freeways and Autism in the CHARGE Study

Heather E. Volk¹, Irva Hertz-Picciotto², Lora Delwiche², Fred Lurmann³, Rob McConnell⁴

¹ Departments of Preventive Medicine and Pediatrics, Zilkha Neurogenetic Institute, Keck School of Medicine, Children’s Hospital Los Angeles, University of Southern California, Los Angeles, California, USA, ² Department of Public Health Sciences, University of California–Davis, Davis, California, USA, ³ Sonoma Technology Inc., Petaluma, California, USA, ⁴ Department of Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, California, USA


Neurobehavioral effects of exposure to traffic-related air pollution and transportation noise in primary schoolchildren.

van Kempen E, Fischer P, Janssen N, Houthuijs D, van Kamp L, Stansfeld S, Cassee F.

Centre for Environmental Health, National Institute for Public Health and the Environment (RIVM), PO Box 1, 3720BA Bilthoven, The Netherlands. Elise.van.Kempen@rivm.nl


Association of Traffic-Related Air Pollution with Children’s Neurobehavioral Functions in Quanzhou, China

Shunqin Wang,¹,² Jinliang Zhang,¹,³ Xiaodong Zeng,⁴ Yimin Zeng,⁵ Shengchun Wang,¹ and Shuyun Chen⁶

¹Department of Occupational and Environmental Health Science, School of Public Health, Peking University, Beijing, People’s Republic of China; ²Xiamen Municipal Health Bureau, Xiamen, Fujian Province, People’s Republic of China; ³Division of Environmental Pollution and Health, Chinese Research Academy of Environmental Sciences, Beijing, People’s Republic of China; ⁴Division of Environmental Pollution and Health, Chinese Research Academy of Environmental Sciences, Beijing, People’s Republic of China; ⁵Quanzhou Municipal Health Inspection Station, ⁶Quanzhou Municipal Health Bureau, and ⁷Licheng District Center for Disease Control and Prevention, Quanzhou, Fujian Province, People’s Republic of China
### Proximity to Freeway Truck Traffic and Preterm & LBW babies

Infants born between 1997-2000 in Los Angeles County

Ritz et al, 2002

<table>
<thead>
<tr>
<th>Number of Freeway trucks passing within 750ft (~225m) of home per day</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 13,290 trucks</td>
<td>1.23 (1.06-1.43)</td>
</tr>
<tr>
<td>&gt; 8,684 HD diesel trucks</td>
<td>1.18 (1.02-1.37)</td>
</tr>
</tbody>
</table>
PM$_{2.5}$ affects artery wall thickness (CIMT) in women, age 60yrs+

Künzli et al, 2005
Conclusions: Long-term exposure to fine particulate air pollution is associated with the incidence of cardiovascular disease and death among postmenopausal women.
Traffic-Related Air Pollution and Cognitive Function in a Cohort of Older Men

Melinda C. Power,1,2 Marc G. Weisskopf,1,2 Stacey E. Alexeiff,1 Brent A. Coull,3 Avron Spiro III,4,5 and Joel Schwartz1,2

1Department of Environmental Health, 2Department of Epidemiology, and 3Department of Biostatistics, Harvard School of Public Health, Boston, Massachusetts, USA; 4Veterans Affairs Boston Healthcare System, Boston, Massachusetts, USA; 5Department of Epidemiology, Boston University School of Public Health, Boston, Massachusetts, USA

Environ Health Perspect, 2011; 119:682-687, Epub Dec 20

Postmenopausal Breast Cancer Is Associated with Exposure to Traffic-Related Air Pollution in Montreal, Canada: A Case–Control Study

Dan L. Crouse,1 Mark S. Goldberg,2,3 Nancy A. Ross,1 Hong Chen,4 and France Labrèche5

1Department of Geography, and 2Department of Medicine, McGill University, Montreal, Quebec, Canada; 3Division of Clinical Epidemiology, McGill University Health Centre, Montreal, Quebec, Canada; 4Department of Epidemiology, Biostatistics, and Occupational Health, McGill University, Montreal, Quebec, Canada; 5Département de médecine sociale et préventive et Département de santé environnementale et santé au travail, Université de Montréal, Montreal, Quebec, Canada

Environ Health Perspect, 2010; 118:1578-1583, Epub Oct 6

Association of long-term exposure to community noise and traffic-related air pollution with coronary heart disease mortality.

Gan WQ, Davies HW, Koehoorn M, Brauer M

School of Population and Public Health, The University of British Columbia, Vancouver, Canada.

At-Risk Populations

Are there sub-groups at \textit{increased risk} (due to biology or exposure)?
Can they be identified?
Environmental Injustice?

M. Taher, USC Spatial Sciences Institute
The Interstate 710 corridor project is working on a plan to modernize and possibly extend the highway on its northern end.

Regional Transport & Freeway Expansions

I-710 Freeway Construction Alternatives

- **ALTERNATIVE 5A**: Widen I-710 from 8 to 10 lanes
- **ALTERNATIVE 6A/6B**: Widen I-710 from 8 to 10 lanes
  * Build adjacent 4 lane elevated freight corridor
  * Include zero emissions requirements, automated guidance
- **ALTERNATIVE 6C**: Widen I-710 from 8 to 10 lanes
  * Build adjacent 4 lane elevated freight corridor
  * Include zero emissions requirements with automated guidance and add tolling feature to freight corridor

Note: Alternative 1 is to have no expansion

Paul Penzella Staff Artist
Goods Movement Expansions

Existing rail yard owned by Union Pacific

Hudson K-8 School

Community Park

Cabrillo H.S. sports fields

Transitional (homeless) daycare center

Villages at Cabrillo housing for homeless veterans

Long established & stable West LB neighborhood – very ethnically diverse
Climate Change

Diesel PM: > 50% US carbon emissions
~ 30% worldwide

Black Carbon: strong absorber of solar radiation
2nd biggest contributor to global warming (after CO$_2$)

http://www.arb.ca.gov/research/diesel/dpm_draft_3-01-06.pdf
So What’s the “Bottom Line”?  

Regional Air Quality  

Climate Change  

Land Use / Quality of Life  

Public Health
One Possible Summary, **Goods Movement-Oriented**

- The movement of freight through our communities involves local, regional, and global issues of air quality and public health.

- *The Goods Movement has major impacts* on environmental health, air quality, public health, ...and global health!

- Poor air quality has been associated with a wide variety of negative health outcomes, of varying severity, across the life course (young, old, men, women,...)
“Goods Movement” is not just local, not just about ports...
IT’S REGIONAL
Choices we make regarding the growth and nature of existing and future freight movement will affect (and is affecting) public health.