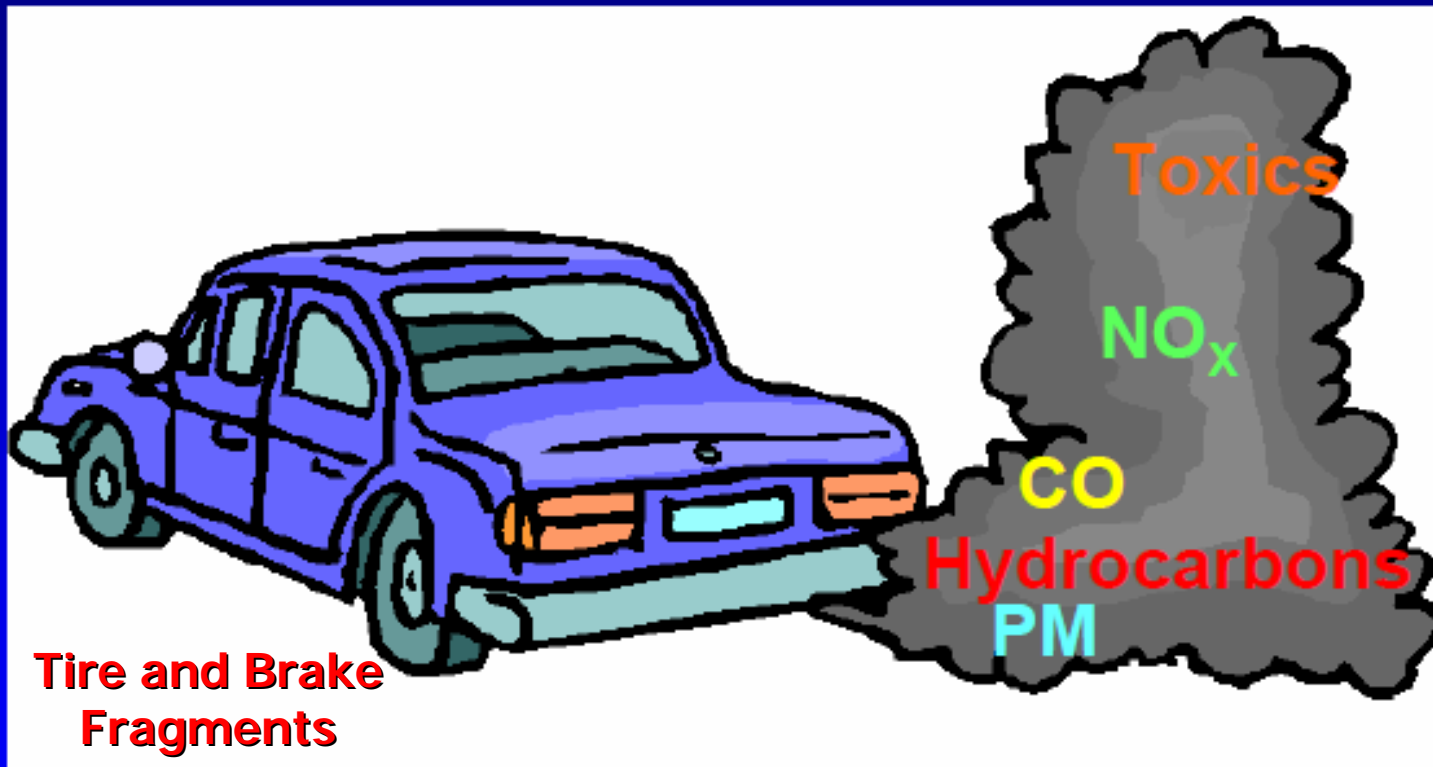


Health Effects and Traffic-Related Air Pollution



Ira B. Tager, M.D., M.P.H.
Division of Epidemiology
School of Public Health
University of California, Berkeley

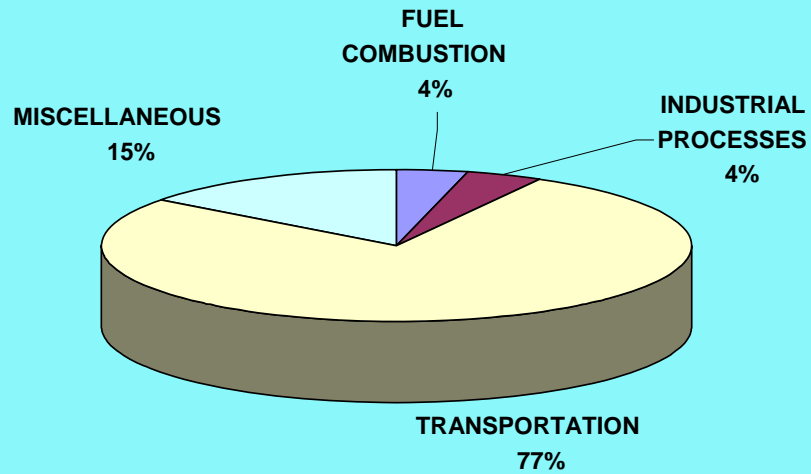
Hazards of Traffic



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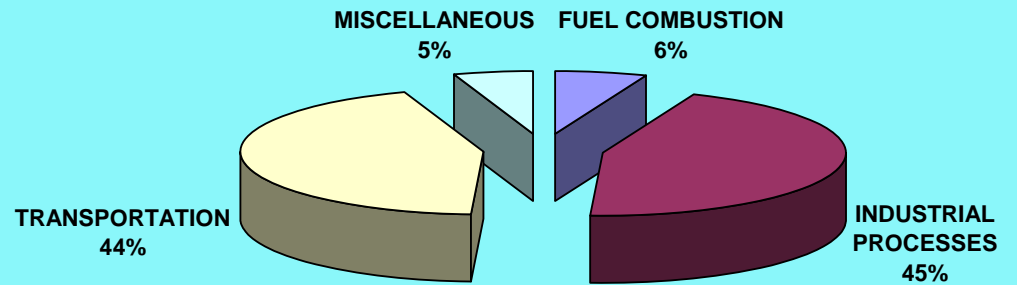
Annual US National Emissions of CO in 2002



TOTAL CO Annual Emission = $112,049 \times 10^3$ short tons

Source: US EPA National Trends Update 7/18/2005

Annual US National Emissions of VOC in 2002



TOTAL VOC Annual Emission = $16,544 \times 10^3$

Source: US EPA National Trends Update 7/18/2005

Methods to Measure Exposure to Traffic



- Measurements of traffic-related pollutants
- Freeways/Major Road Exposure:
 - Distance
 - Traffic volume and/or type
 - Traffic-modeled exposure
- In-vehicle studies



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Southern California Children's Health Study

- 10+ year study followed ~ 5,500 children's chronic exposures to air pollution – ARB funded
- Landmark study on children's health effects
- Adverse effects on lung function growth, asthma, school attendance
- 100+ publications



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Traffic and Children's Health

“Effect of exposure to traffic on lung development from 10 to 18 years of age: a cohort study”. Gauderman WJ et al. Lancet, February 2007; 369 (9561): 571-7.



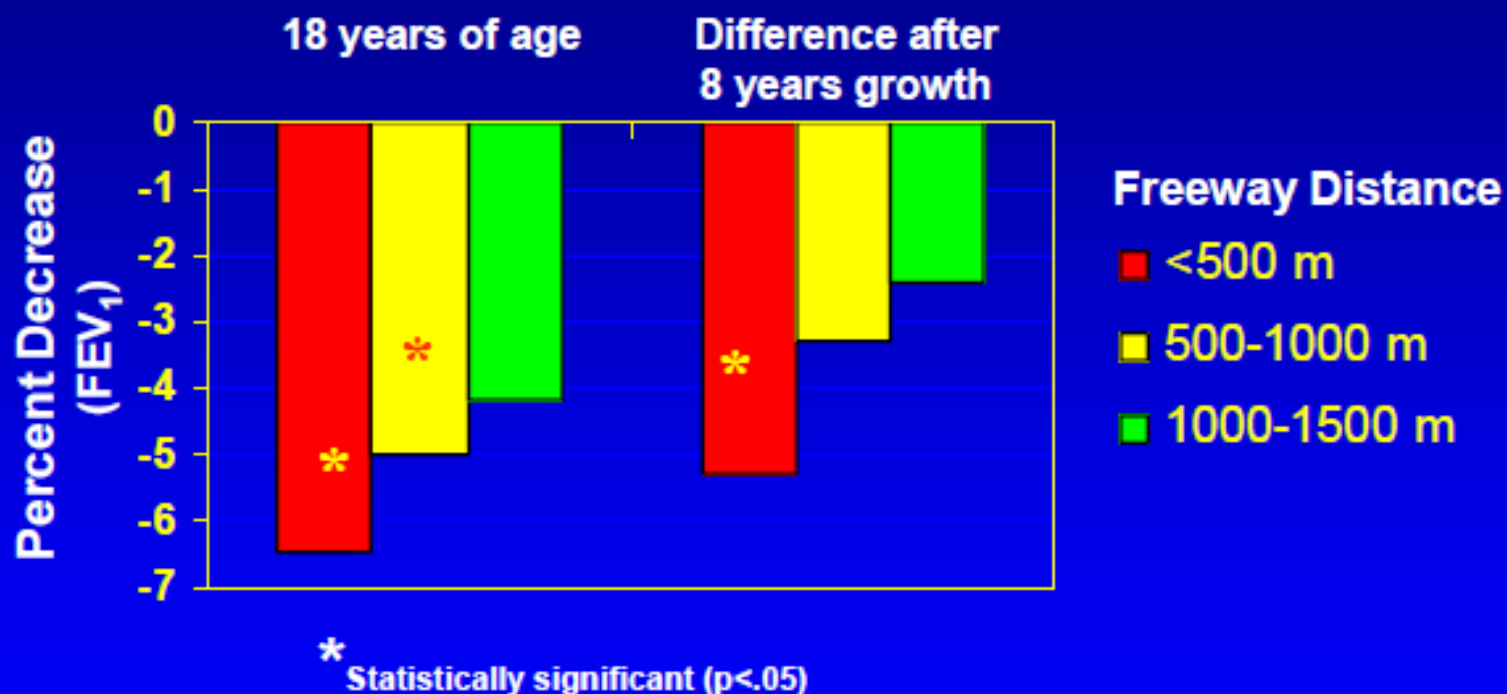
- **Subset of 1,500 Southern California Children**
- **Followed for 8 years**
- **Traffic exposure on Lung Function Growth**
 - **Residential distance to freeways**



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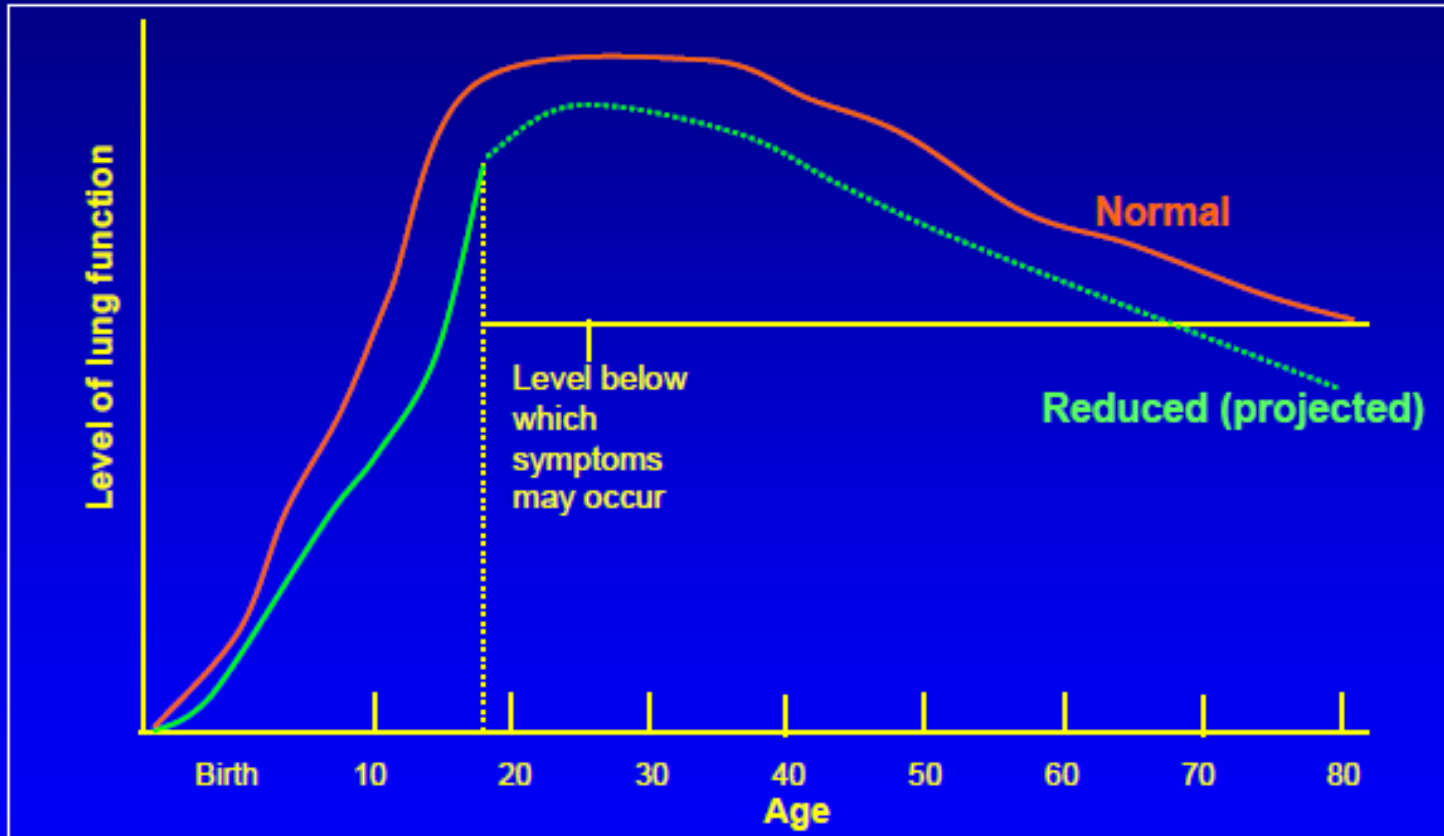
4

Traffic Associated Decreases in Lung Function at 18 Years and 8 Year Development



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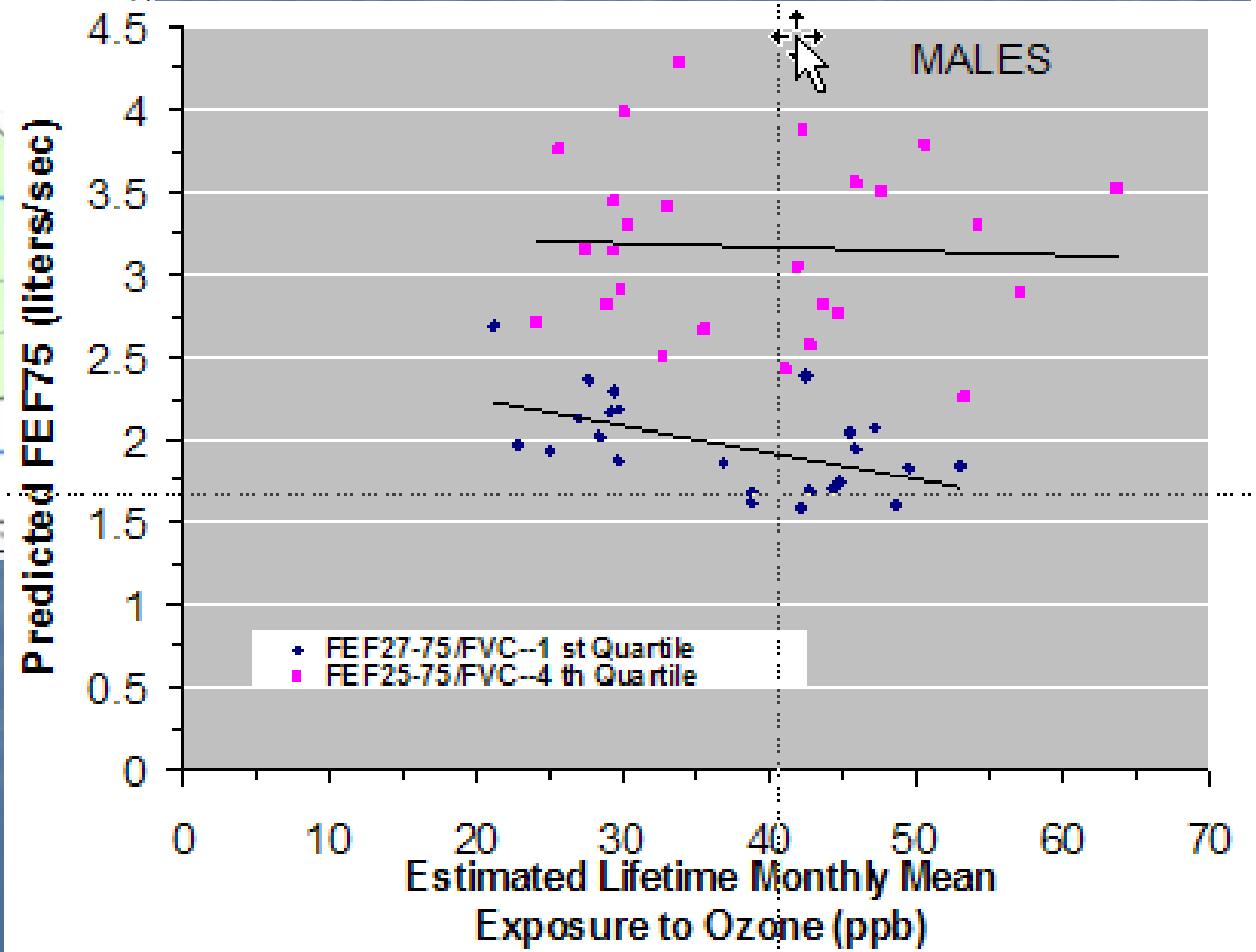
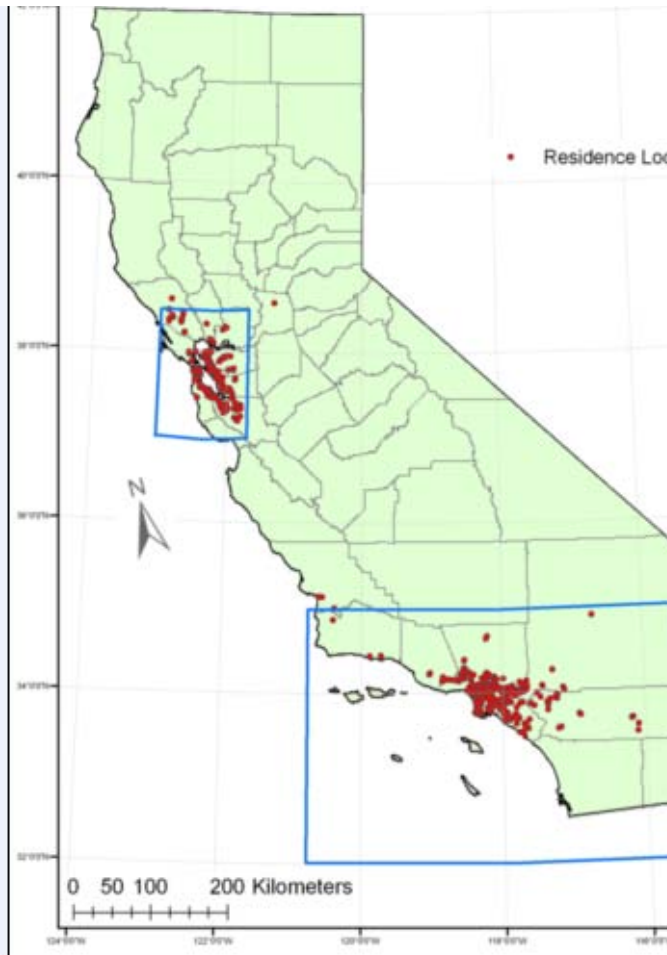
Development of Lung Function

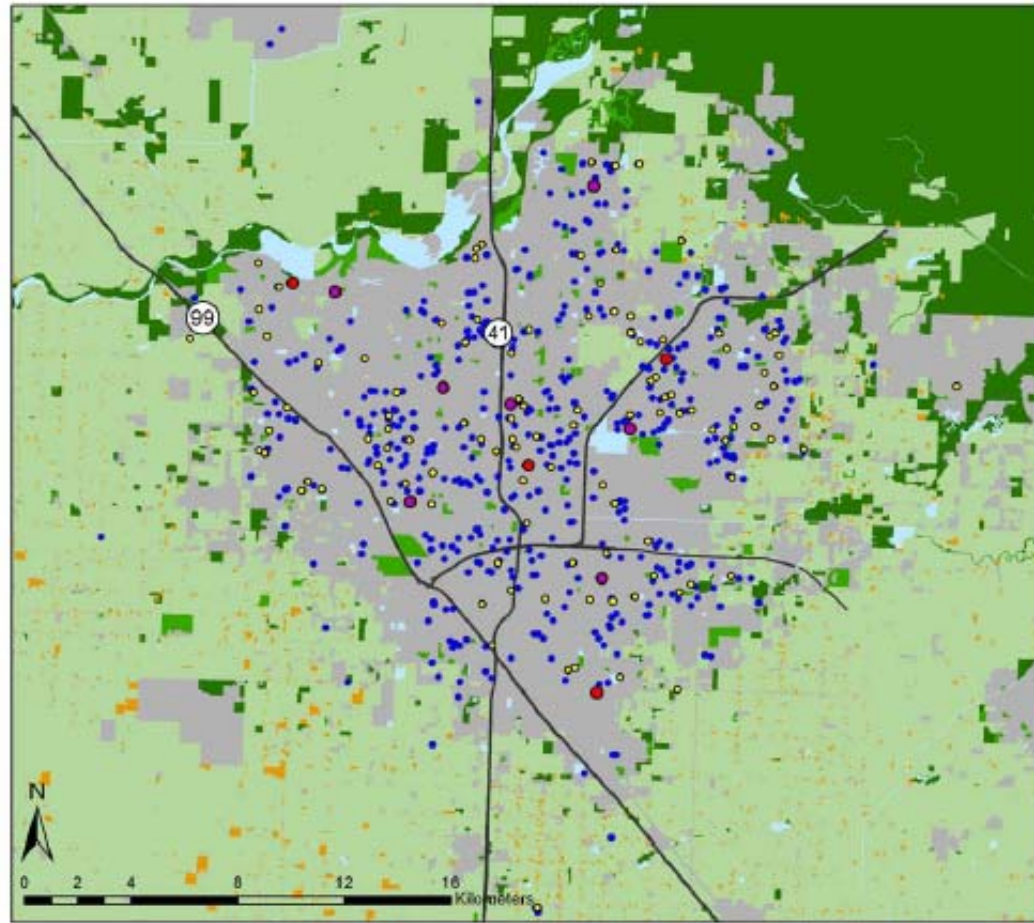


Adapted from Strachan et al 1997; Courtesy of USC

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GIRLS
Coefficient

BOYS
coefficient

FEV1

IDWT

(FEF25-75/FVC * IDWT)

-7.92 (-13.54, -2.31)

11.12 (3.82, 18.43)

-6.75 (-10.71, -2.79)

9.49 (3.91, 15.06)

Health Effects Seen in the Infant (Pre- and Post-Natal)

- Low birth weight: 36% increase in prevalence among those with traffic exposure and high CO ¹
- Premature birth: 27% increase in prevalence among those with traffic exposure and high CO ¹
- Cardiac birth defects: Up to 3X increase in risk with traffic-related pollutants ²



1. Wilhelm M, et al. 2005. Local variations in CO and particulate air pollution and adverse birth outcomes in Los Angeles County, California, USA.. Environ Health Perspect. 113(9) 212-21

2. Ritz B, et al. 2002 Ambient air pollution and risk of birth defects in Southern California. Am J Epidemiol, 155:17-25



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Health Effects Seen in Children and Adolescents

- **Asthma: 89% increase in risk with close residence to freeway ¹**
- **With long-term close residence to traffic ²**
 - **Ever had asthma: 85% increase in risk**
 - **Current treatment for asthma: ~2.5X increase in risk**
 - **Wheezing: ~2.7X increase in risk**
- **Acute respiratory symptoms: 5-8% increase in risk with schools close to traffic ³**



1. Gauderman WJ, et al. 2005. Childhood Asthma and Exposure to Traffic and Nitrogen Dioxide. *Epidemiology*, 16:737-743

2. McConnell R, et al. 2006. Traffic, susceptibility, and childhood asthma. *Environ Health Perspect*. 114(5):766-72

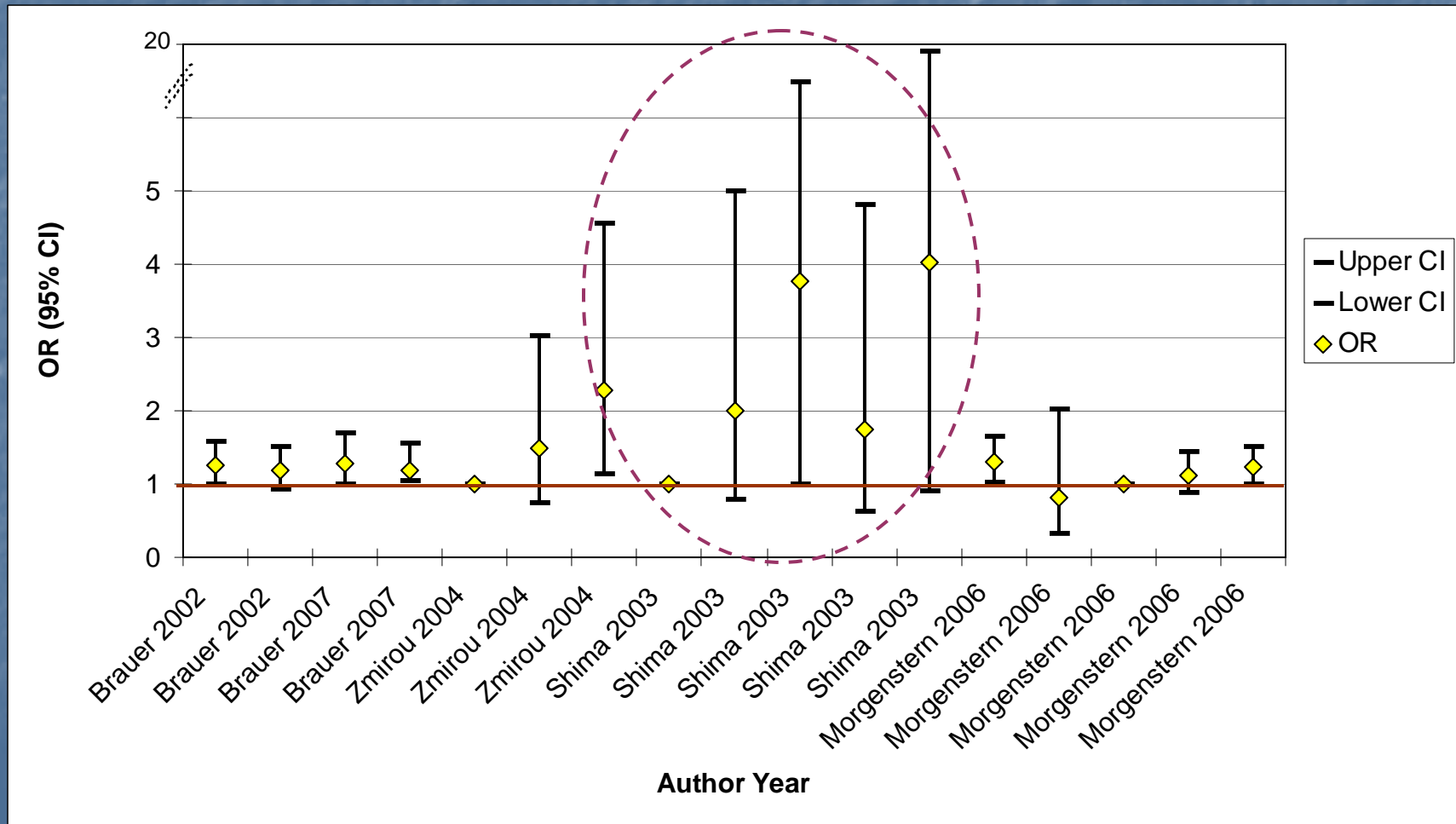


3. Kim, et al. 2004. Traffic-related Air Pollution near Busy Roads, The East Bay Children's respiratory Health Study. *Am J Respir Crit Care Med*. 170(5):520-6

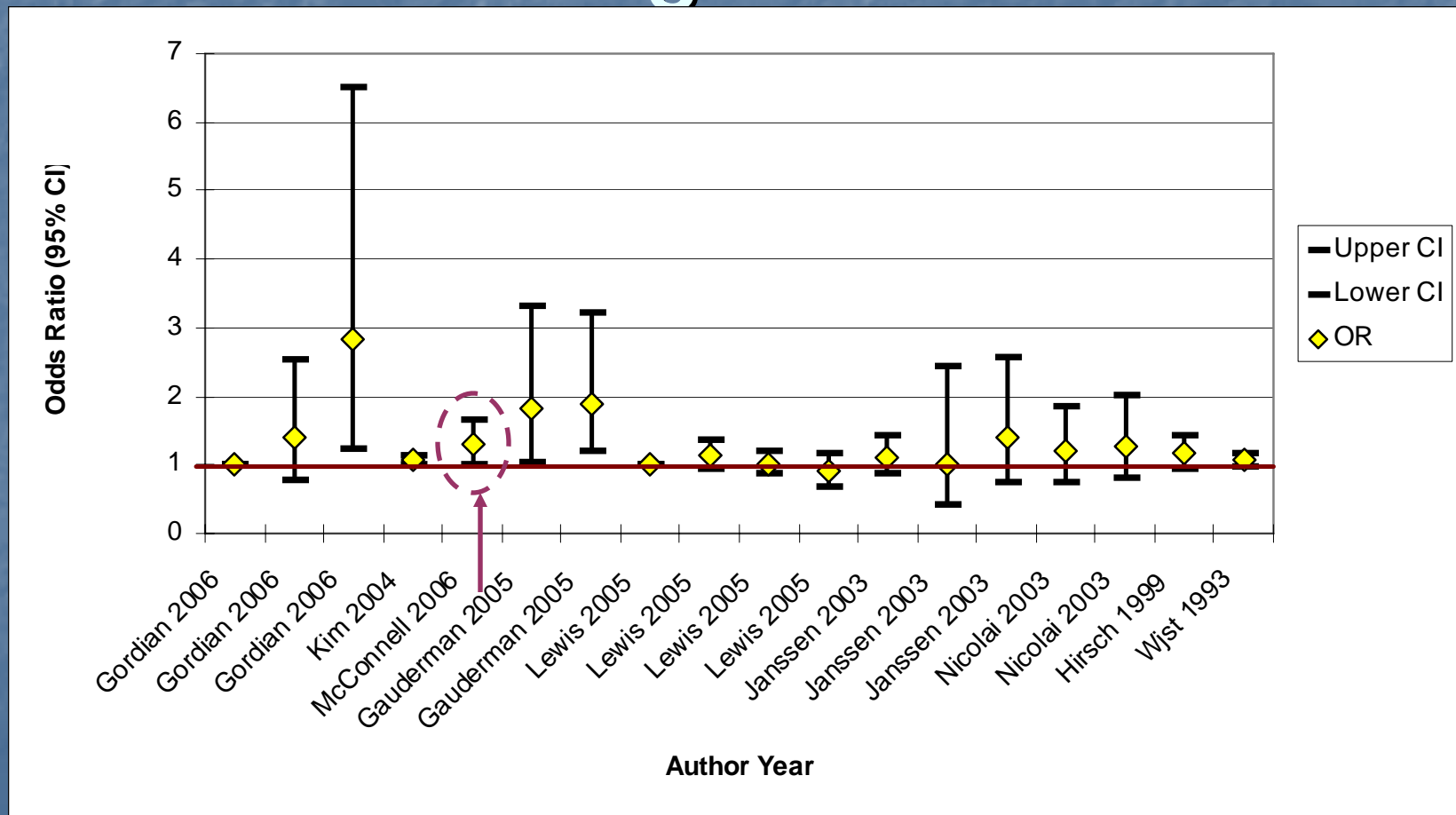
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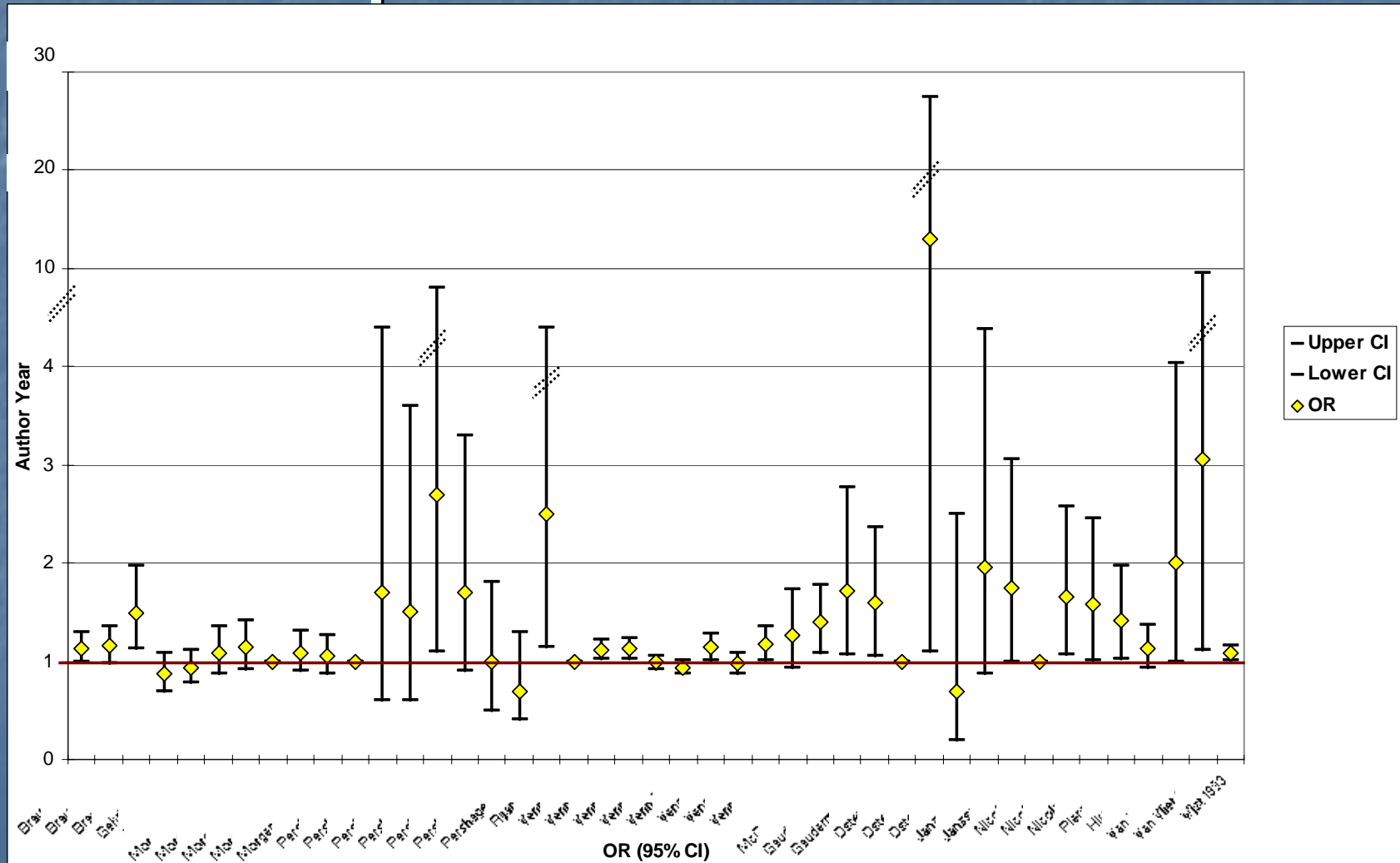
Summary of Association of Exposure to Traffic-Related Pollution and Onset of Asthma



Summary of Association of Exposure to Traffic-Related Pollution and Reported Doctor-Diagnosed Asthma



Summary of Association of Exposure to Traffic-Related Pollution and Reported Wheeze in Children



Summary of Association of Exposure to Traffic-Related Pollution and All-Cause Mortality

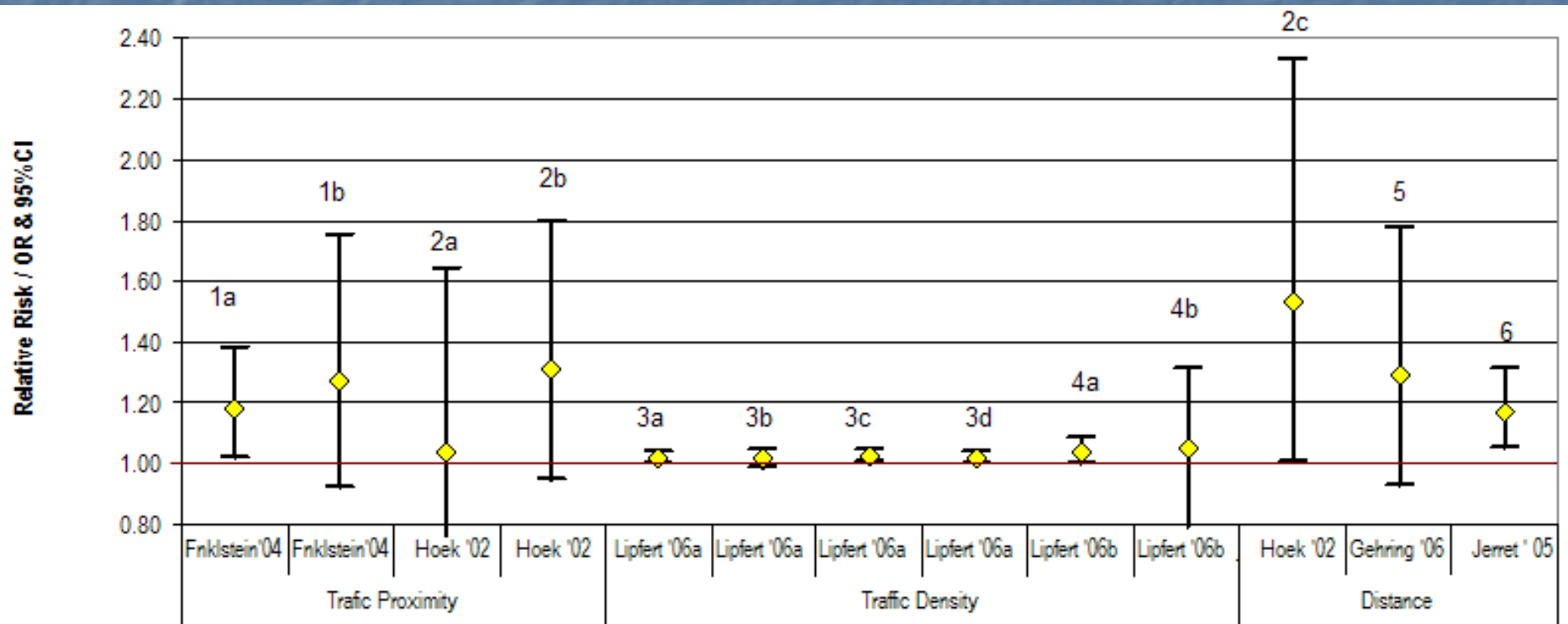


TABLE 3. Rate advancement period for mortality from all natural causes in relation to residence close to a major road and common chronic diseases, Hamilton, Ontario, Canada, 1992–2001

Risk factor	RAP ^{*,†} (years)	95% CI [*]
Residence within a road/highway buffer	2.5	0.2, 4.8
Diagnosis of chronic pulmonary disease (excluding asthma)	3.4	0.8, 6.0
Diagnosis of chronic ischemic heart disease	3.1	0.8, 5.4
Diagnosis of diabetes mellitus	4.4	1.8, 7.0

* RAP, rate advancement period; CI, confidence interval.

† The rate advancement period is the number of years older the comparison subjects would have to be in order to have the same attrition rates as subjects with the indicated risk factor exposure.

Finkelstein MW, et al. Amer J Epidemiol, 2004

Mitigation

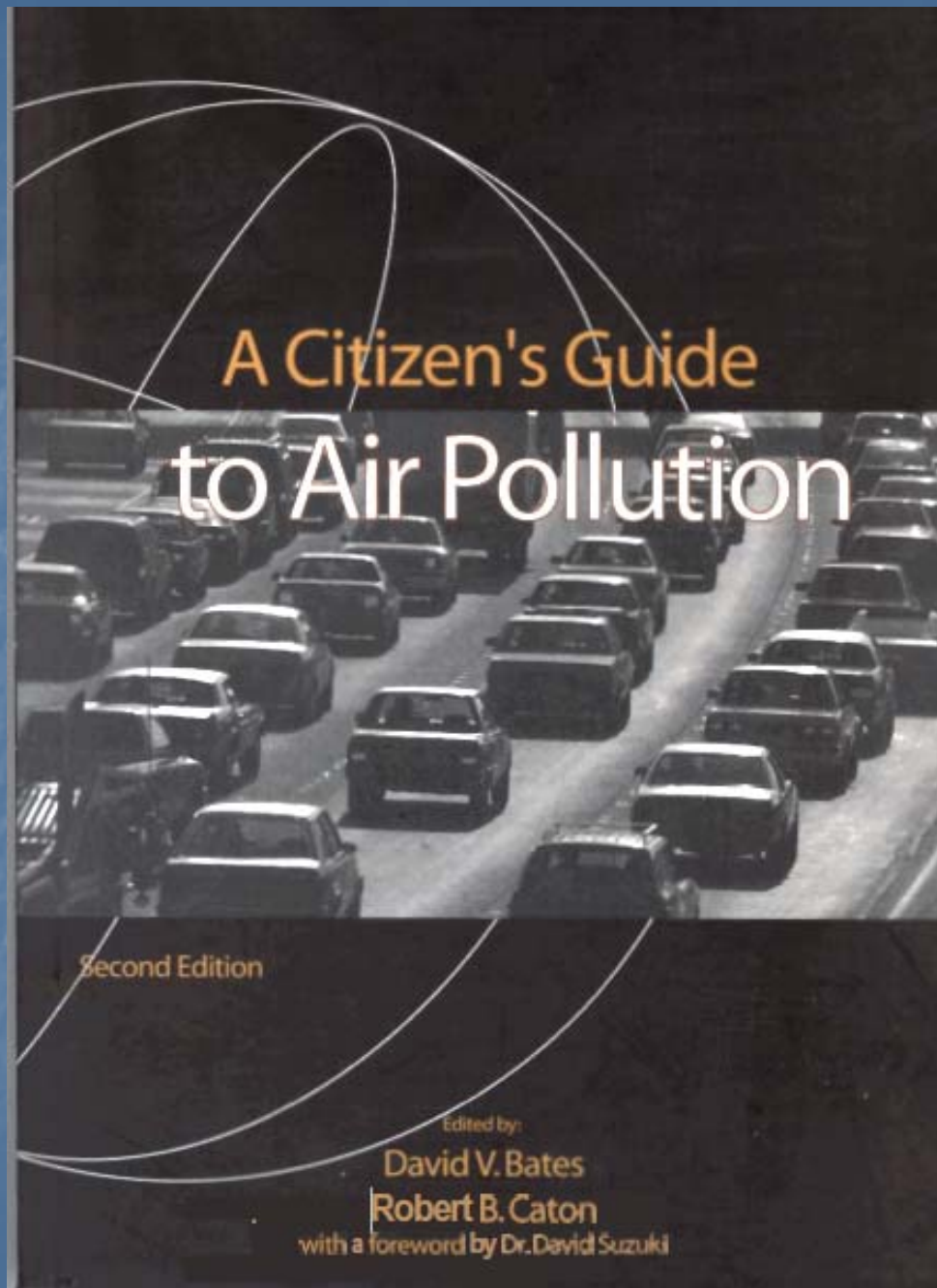


- **California's Diesel Risk Reduction Plan**
 - Emission standards for heavy duty vehicles
 - Carl Moyer Program
- **Motor vehicle standards for cars/light trucks**
- **Goods Movement Emission Reduction Plan**
- **Land use guidelines**
- **No new schools within 500 feet from freeways (SB 352, Escutia, 2003)**



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Sept. 18, 2008

Benicia Forum

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