Air Pollution and Atherosclerosis in the Los Angeles Basin

September 15, 2005

Air Resources Board

California Environmental Protection Agency

Background and Hypothesis

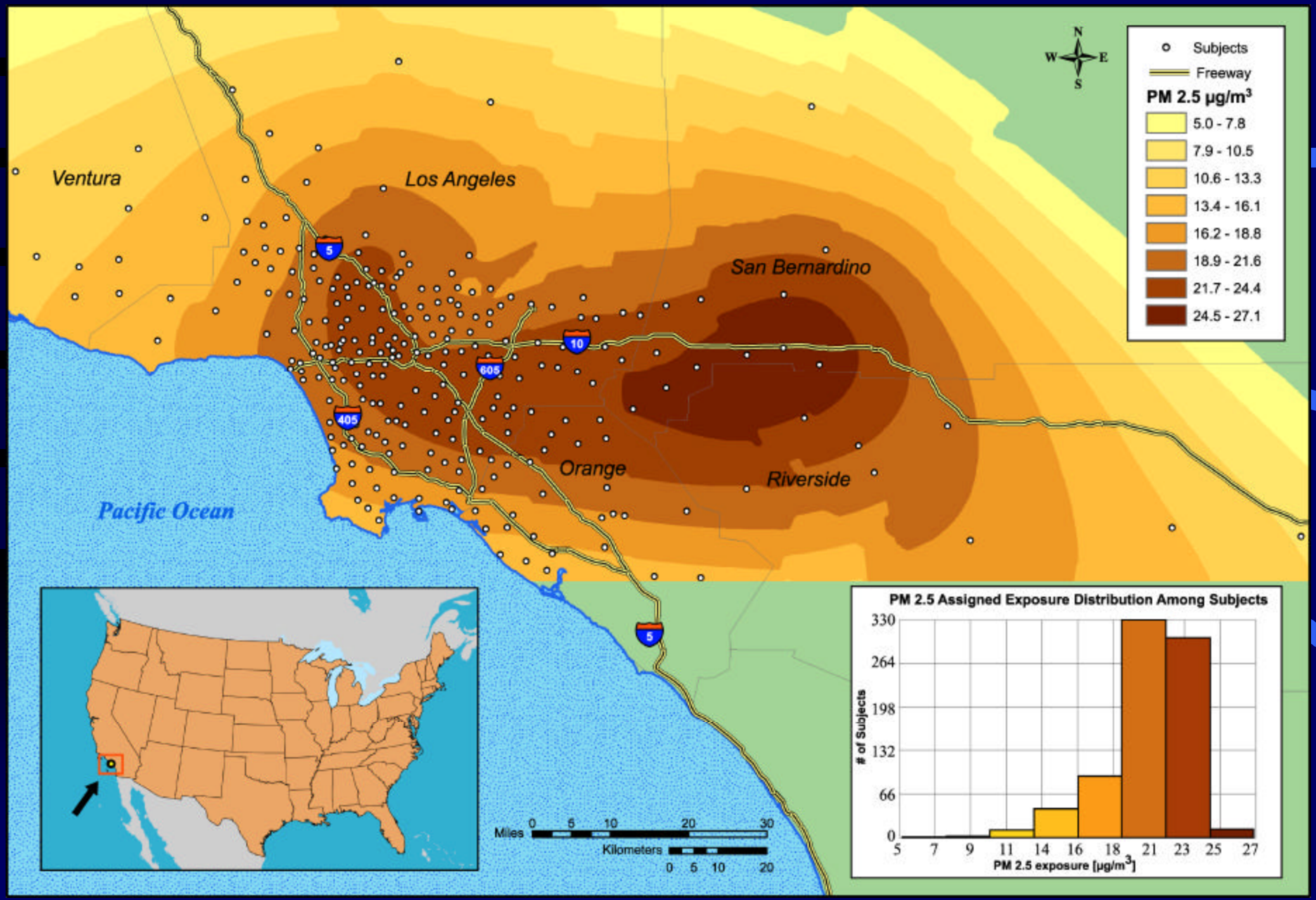
- Cardiovascular disease (heart disease and stroke)
  - Leading cause of death in US
  - Heart disease kills 30% of Californians
- Atherosclerosis is the primary cause of heart disease and stroke
- Atherosclerosis is an inflammatory disease
  - High LDL cholesterol responsible for 50% of the disease risk
  - Other harmful components interact with lipids to create inflammatory response
- Ambient levels of particle pollution (PM2.5) may contribute to atherosclerosis through an inflammatory response

Study Design*

- Baseline health data from two USC clinical trials on atherosclerosis (798 healthy adults >40 years)
- Baseline Carotid Intima-media Thickness (CIMT) and other clinical data (LDL cholesterol, blood pressure)
- Questionnaires on risk factors (lifestyle and demographics)
- Exposure assignment: ambient concentration of PM2.5 assigned to the ZIP code area of each subject's residential address

* Kunzli, N.; Jerrett, M.; Mack, W. J.; Beckerman, B.; LaBree, L.; Gilliland, F.; Thomas, D.; Peters, J., and Hodis, H. N. Ambient air pollution and atherosclerosis in Los Angeles. Environ Health Perspect. 2005 Feb; 113(2):201-6.

Exposure Surface PM2.5



Results

% Difference in CIMT per 10 µg/m^3 PM2.5 (95% CI)

Total sample N=798	4.4 (0-9.0)
Lipid lowering medication, N=109	13.3 (0-28.5)
Women >60, N=186	15.7 (5.7-26.6)

% Difference in CIMT per 20 µg/m^3 PM2.5 (95% CI)

Lowest to highest exposure	12.1 (2.0-23.1)*

Statistically significant increase in CIMT with increasing pollutant levels (dose-response).

* unadjusted value

Research Implications

- Evidence is accumulating that…
  - "air pollution may accelerate the development of coronary atherosclerosis and worsen its sequelae."
    - (American Heart Association)
- Increase in CIMT corresponds to 3-6% long-term increase risk for heart attack
- To account for short- and long-term effects of PM on health, prospective cohort studies will be needed
- Atherosclerosis results from a complex process and this response may be the result of a combination of various urban pollutants interacting with host factors