Evidence for Mechanisms of Particulate Matter Cardiovascular Mortality Observations

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Air Resources Board
California Environmental Protection Agency

Introduction

- There is clear evidence that brief and prolonged exposures to particles harm people with respiratory and cardiovascular disease
  - hospitalizations
  - increased deaths
  - suggestions of contributions to disease
- The mechanisms to explain these effects observations remain elusive

Today's Study

"Cardiovascular Mortality and Long-Term Exposure to Particulate Air Pollution"

Investigators: Arden Pope III, Richard Burnett, George Thurston, Michael Thun, Eugenia Calle, Daniel Krewski and John Godleski

Journal: Circulation, 2004; 109; 71-77

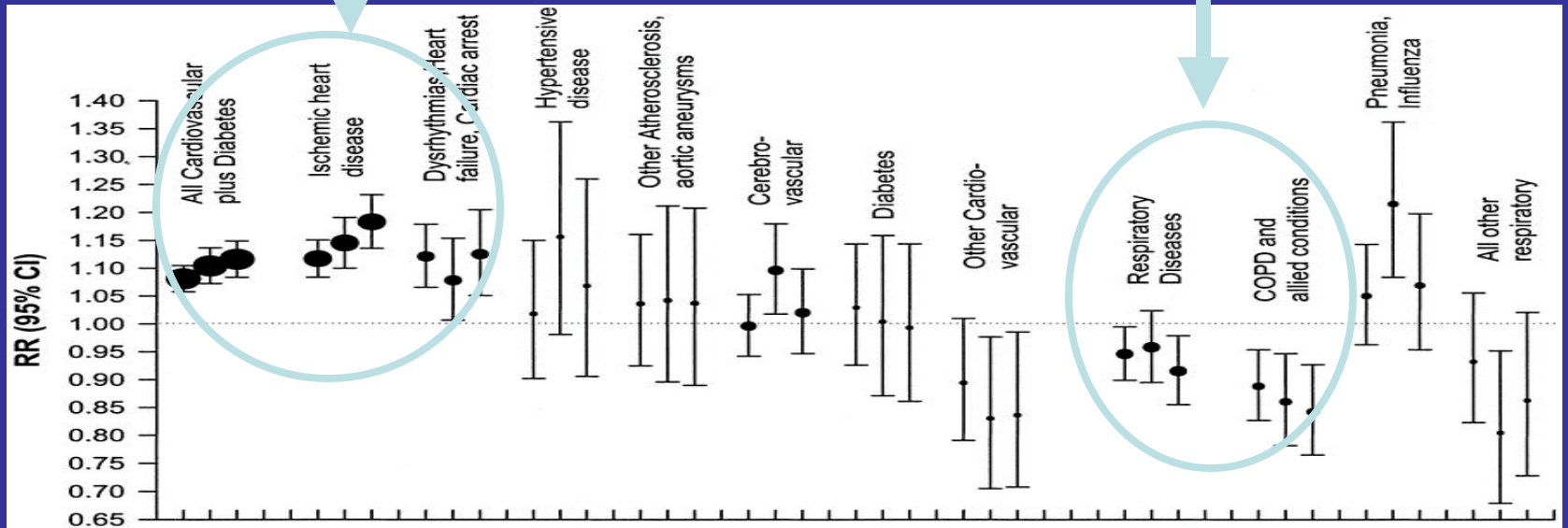
Objective: To determine whether observations of long-term cause - specific mortality suggest mechanisms of PM effect

Research Protocol

- Epidemiological study based on the American Cancer Society Cancer Prevention Study II
- As many as 500,000 participants US - wide
- Subjects enrolled in 1982 and followed for 16 years
- Subject information gathered at start of study
  - Smoking, race, education, occupation, etc
- Vital status checked periodically, cause of death determined from death certificates
- PM2.5 exposure histories generated for each death
- Protocol imposed limitations

Findings

- 23% of participants died during study
  - 45% from cardiovascular disease, 8% from respiratory
- Clear increased risk associations of PM2.5 for <u>cardiovascular</u> diseases -- Not for <u>respiratory</u> disease
  - largest for ischemic heart disease, less for other cardiac causes



Findings II

- Smoking influenced cardiovascular and respiratory death rates, more than PM2.5 alone
- PM2.5 and smoking interact to enhance mortality

Implications and Applications

- Findings of ischemic heart disease deaths suggest inflammatory and atherosclerosis mechanisms
- Findings of dysrhythmia and cardiac failure suggest changes in neural control of heart
- Smokers at special risk when PM 2.5 is high
- Mechanistic information strengthens regulatory utility of epidemiological studies
- Findings are consistent with earlier studies that served as basis for PM Standards adopted by Board in 2002