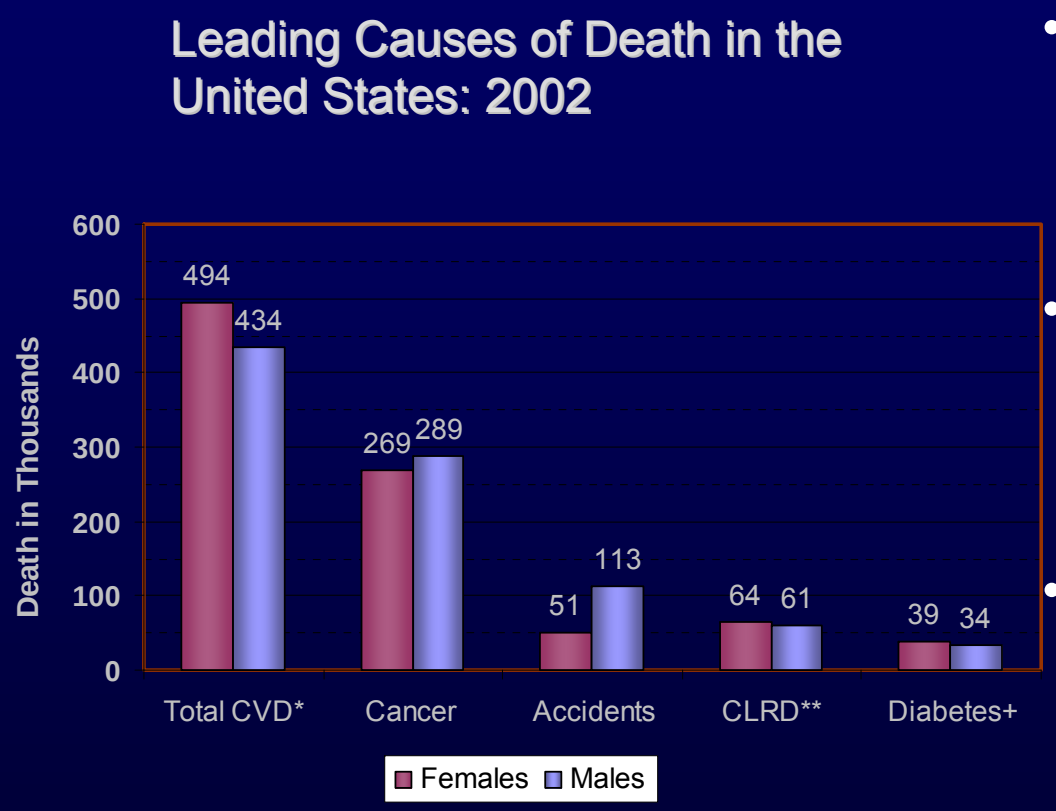
Women and Long-Term Air Pollution Impacts

Air Resources Board

California Environmental Protection Agency

Women & Cardiovascular Disease

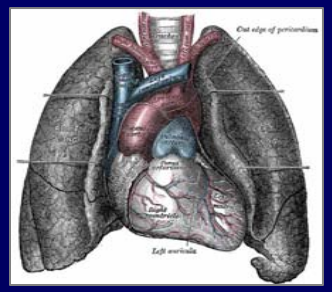


Cardiovascular Deaths (CVD)
Chronic Lower Respiratory Diseases (CLRD),
Diabetes Mellitus (Diabetes)

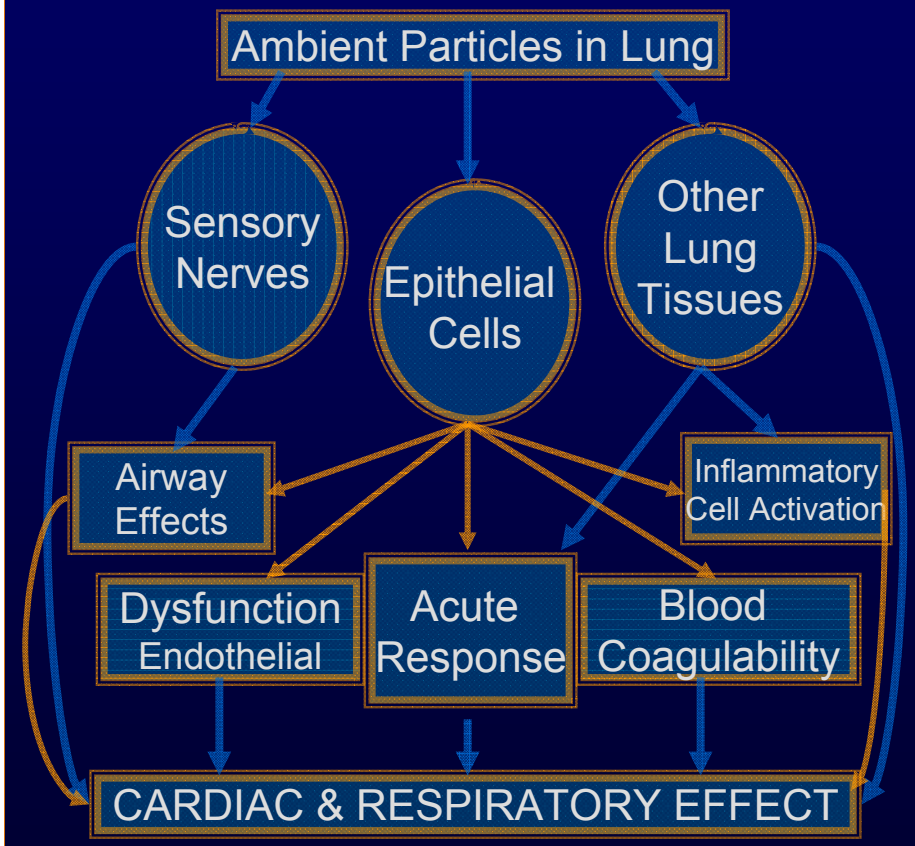
Source: CDC/NCHS

- Almost 1 in 2 women die of CVD vs. 1 in 25 women who die of breast cancer
- CVD kills ~500,000 American women each year (60,000 more than men)
- Studies suggest women are more at risk
  - Kunzli et al., Air Pollution and Atherosclerosis in LA, 2005 (Univ. of Southern CA)
  - Chen et al., Fatal CHD & Air Pollution, 2005 (Loma Linda Univ.)

Biological Mechanisms of PM Health Effects

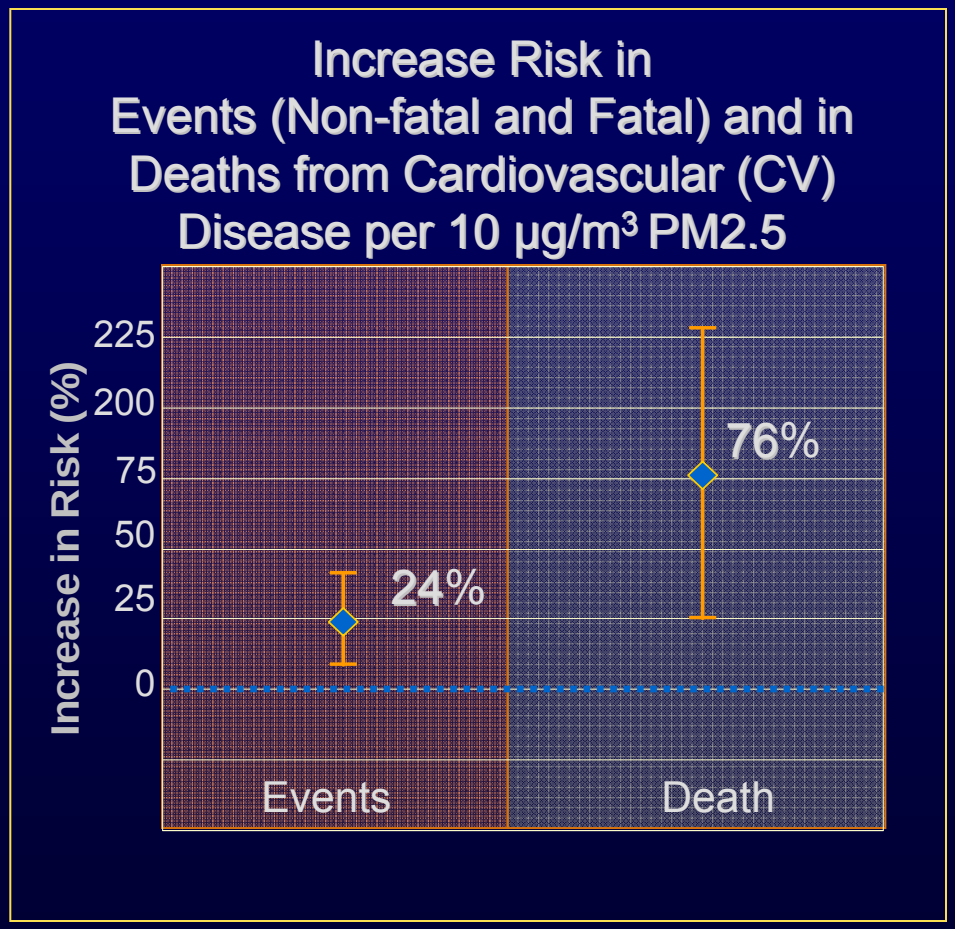


Possible Mechanism for PM Health Effects



- Women may be more susceptible to coronary disease than men due to life style and other factors
- Mechanisms may involve a number of pathways
- US EPA's PM Centers and others are currently investigating mechanisms

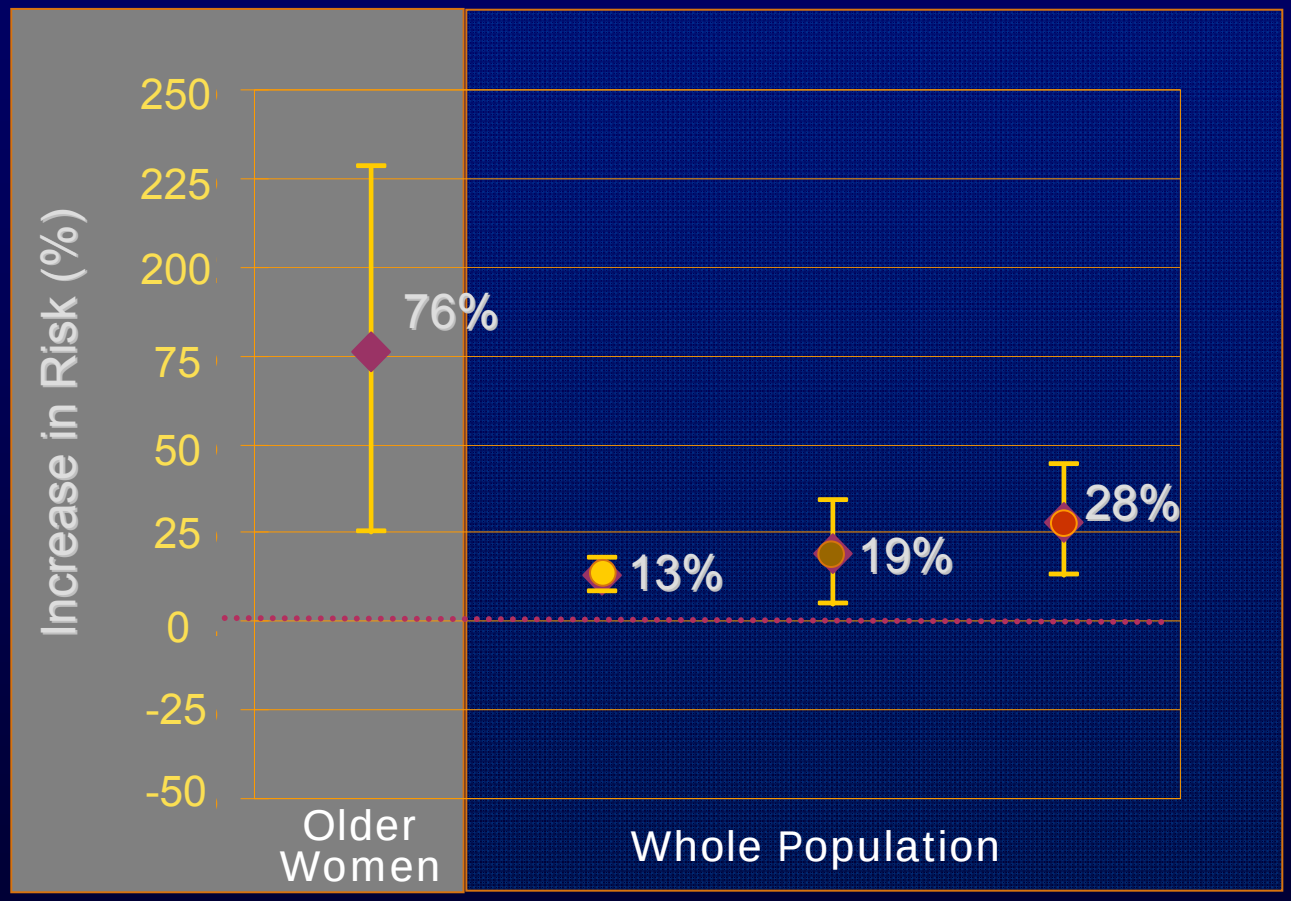
Women's Health Initiative Study of PM2.5



- ~65,000 older women from 36 US cities
- PM2.5 measurements for the year 2000
- Risk estimated for first CV event
- Results: for a 10 µg/m^3 increase in PM2.5
  - 24% increase risk in CV events
  - 76% increase risk in death from CV disease

Miller et al.,*"Long-Term Exposure to Air Pollution and Incidence of Cardiovascular Events in Women", The New England Journal of Medicine*," vol. 356 no. 5, February 2007

Risk for Death from Cardiovascular Disease per 10 μg/m^3 Increase in PM2.5



- *Miller et al. 2007, Women's Health Initiative Study*
- *Krewski et al. 2000, American Cancer Society's Study*
- *Krewski et al. 2000, Six Cities Study*
- *Laden et al. 2006, Harvard Six Cities Study*

Conclusion

- Women's Health Initiative study is especially relevant because it found a stronger effect from PM2.5 on premature cardiovascular death, one of the leading causes of women's mortality in the US
- ARB's California Teachers Cohort Study will further our understanding of women's susceptibility to PM2.5
  - Preliminary results show a high association between PM2.5 and CVD
  - Additional analysis will include exposure timeframes, never smokers, and PM2.5 constituents
- The WHI study supports the Board's future regulatory and policy decisions that affect the health of California's women