

Attachment

Supporting information for the California Air Resources Board's health risk assessment of mortality associated with ambient particulate matter and diesel particulate matter exposures

California's approach for assessing the health risk associated with fine airborne particulate matter (PM_{2.5}) exposures is consistent with methodologies used by the U.S. Environmental Protection Agency (U.S. EPA) and the World Health Organization.

Hundreds of studies conducted around the world provide strong evidence for the influence of PM_{2.5} on premature death. This strong link was further supported by an independent panel of experts elicited by U.S. EPA in 2006. However, only a subset of these studies is suitable for assessing the relative risk applicable to California's general population and for regulatory impact analyses.

The California Air Resources Board (CARB) reviewed an extensive amount of peer-reviewed literature in concluding that a strongly positive association exists between long-term exposures to PM_{2.5} and the increased risk of premature death. While there may be a few studies that suggest a lack of evidence for the relationship, the overwhelming evidence suggests the relationship is positive.

In developing the Goods Movement Emission Reduction Plan (2006), CARB staff included a health risk assessment methodology. This methodology underwent a rigorous peer review process by the following experts, all of whom agree with CARB's analysis on diesel PM health impacts:

- 1) John Froines, UCLA
- 2) Jane V. Hall, CSU Fullerton
- 3) Aaron Hallberg, Abt Associates
- 4) Michael Jerrett, USC (now UC Berkeley)
- 5) Melanie Marty, Cal/EPA - OEHHA
- 6) Constantinos Sioutas, USC
- 7) Akula Venkatram, UC Riverside.

Since developing the Goods Movement Plan, CARB further reviewed the most recent literature to evaluate the latest findings on the PM-premature death relationship. Over 20 publications in peer-reviewed journals published since 2002 were reviewed. It was concluded that the evidence linking long-term PM_{2.5} exposure and premature death is even stronger than previously estimated. This conclusion was supported by CARB's advisors for this effort (Arden Pope, Brigham Young University; Jonathon Levy, Harvard University; and Bart Ostro, Cal/EPA - OEHHA) and also by an independent peer review

panel organized by the University of California, Berkeley, Institute for the Environment. The panel was composed of the following experts:

- 1) Jeffery Brook, Environment Canada
- 2) Mark D. Eisner, UC San Francisco
- 3) Richard C. Flagan, Cal Tech
- 4) Alan Hubbard, UC Berkeley
- 5) Joel Kaufman, University of Washington
- 6) Joel Schwartz, Harvard University

Finally, an informal symposium was convened in March 2008 by CARB and Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) to solicit input from several well-known researchers in the field of air pollution. The participants in the symposium all agreed with CARB's conclusion on the PM-mortality relationship. Symposium participants included:

- 1) John Balmes, UC San Francisco
- 2) Bert Brunekreef, Utrecht University
- 3) John R. Froines, University of California, Los Angeles
- 4) Daniel S. Greenbaum, Health Effects Institute
- 5) Michael Jerrett, UC Berkeley
- 6) Michael Kleinman, UC Irvine;
- 7) Daniel Krewski, University of Ottawa
- 8) Michal Krzyzanowski, World Health Organization
- 9) Kent Pinkerton, UC Davis
- 10) C. Arden Pope III, Brigham Young University
- 11) Bart Ostro, OEHHA