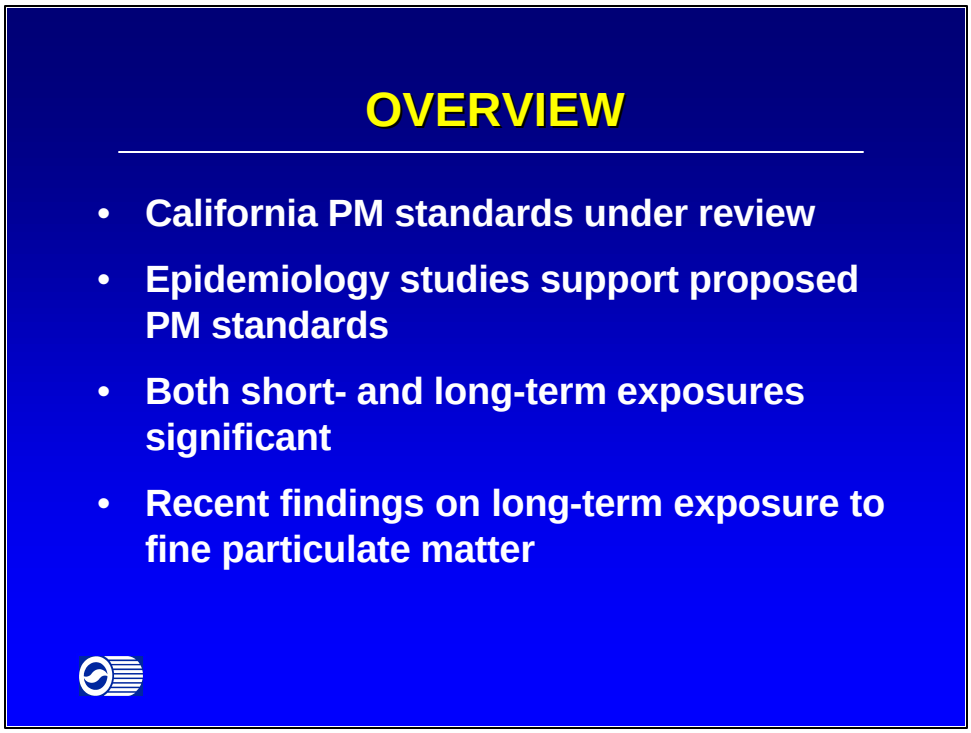
LONG-TERM HEALTH EFFECTS OF PM2.5: RECENT FINDINGS

May 16, 2002

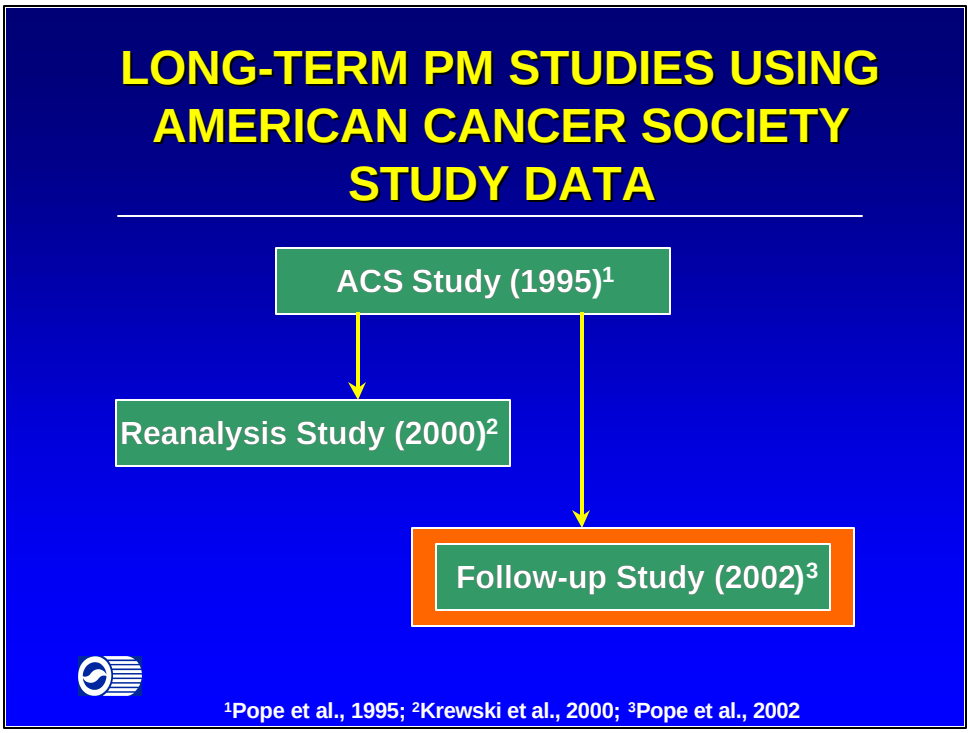
Air Resources Board

California Environmental Protection Agency

Thank you Mr. Kenny. Good morning Chairman Lloyd and members of the Board. Today I will present the results of a recent study regarding long-term exposure to fine particulate matter and associated mortality effects.



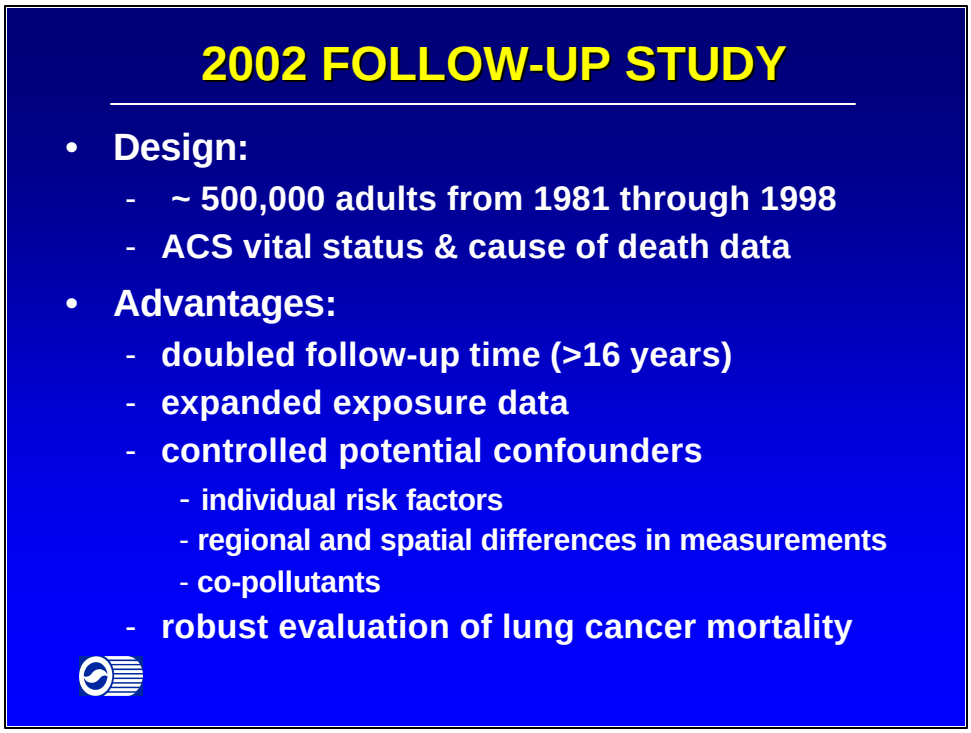
As you are aware, staff have been reviewing the California air quality standards for particulate matter and will bring proposed recommendations to the Board in June. One of the key elements supporting the proposed recommendations are the results from epidemiology studies, which provide the link between exposure to particulate air pollution and adverse health effects. As you recall, you were briefed in March on a recent study on short-term exposure to fine particulate matter (defined as particulate matter of 2.5 micrometers or less) and heart disease, thus conveying the significance of short-term standards in protecting public health. Today I would like to present the results of a recent study on long-term exposure to fine particulate matter and associated mortality from cardiopulmonary disease and lung cancer.



Over the past decade, several studies have evidenced the link between exposure to fine particulate matter and adverse health effects. One study, the 1995 American Cancer Society sponsored study or "ACS" study, concluded that annual mortality due to cardiopulmonary disease and lung cancer increased in association with an increase in fine particulate matter concentrations.

Results from the 1995 ACS study came under intense scrutiny in 1997 when U.S. Environmental Protection Agency used it in support of new National Ambient Air Quality Standards for PM2.5. This study was labeled "controversial" because of uncertainty in the methodologies used in the analysis. As a result, and due to its significance in the standard setting process, an independent reanalysis was performed in 2000 which assured the quality of the data set and validated the findings of the 1995 ACS study.

In March of this year, the primary authors of the 1995 ACS study published a follow-up study entitled "Lung Cancer, Cardiopulmonary Mortality, and long-term Exposure to Fine Particulate Air Pollution." The findings of this follow-up study are the focus of this health update.



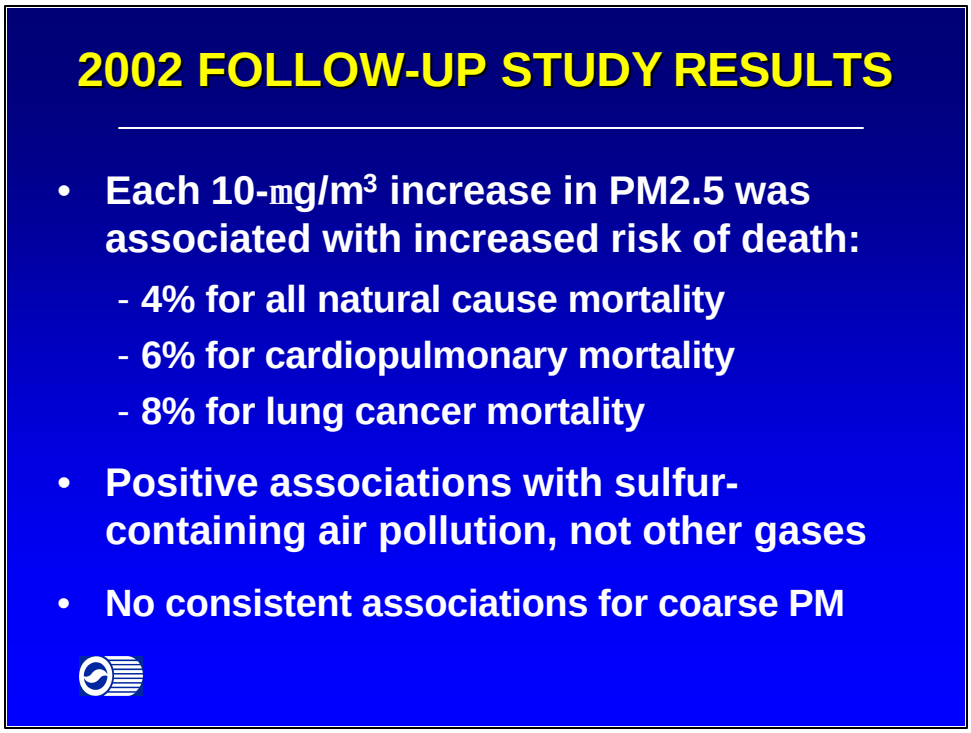
The 2002 follow-up study evaluated approximately 500,000 adults, linking air pollution data from numerous metropolitan areas around the U.S. to vital statistics and death data from the American Cancer Society study database. It also had the following important advantages over its predecessor:

1) it doubled the follow-up time of the individuals being monitored to more than 16 years;

2) the exposure data was substantially expanded, including new PM2.5 data and gaseous co-pollutant data;

3) the analysis used advanced techniques for controlling potential "confounding" to ensure that reported associations were indeed due to exposure to fine particulate matter and not unduly influenced by individual risk factors, like smoking, alcohol consumption, body weight, diet, education and marital status; as well as potential differences in fine particulate matter concentrations within a region that may affect underlying exposure assumptions; and exposure to co-pollutants like coarse particles or gases;

4) Finally, the 2002 follow-up study had a better, more robust ability than the earlier study to evaluate mortality from lung cancer due to the increased follow-up time and number of deaths.



The results of the 2002 follow-up study showed significant associations between PM2.5 and elevated risks for cardiopulmonary and lung cancer mortality. The study found that each 10-microgram per-cubic-meter increase in long-term average PM2.5 concentrations was associated with approximately a 4% increased risk of death from all natural causes, a 6% increased risk of death from cardiopulmonary disease, and an 8% increased risk of death from lung cancer. Associations were also found with sulfur-containing air pollution but not other gaseous pollutants. On the other hand, measures of coarse particles were not consistently associated with mortality.

As the study researchers indicated in the press release for this study, the lung cancer risk associated with exposure to fine particulate matter is comparable to that faced by nonsmokers who live with smokers, and are exposed long term to secondhand cigarette smoke.

CONCLUSIONS

- **Significant associations between PM2.5 and elevated risks for cardiopulmonary and lung cancer mortality**
- **Unprecedented opportunity to evaluate PM2.5 exposure and associated lung cancer mortality**
- **Results validate those of previous studies and support a need for annual PM2.5 standard**

In summary, this recent study provides the strongest evidence to date that long-term exposure to fine particulate matter or PM2.5 is an important risk factor in cardiopulmonary and lung cancer mortality. Also, the extended follow-up period provided the opportunity to determine, with greater confidence than the original study, a positive association between fine particulate matter air pollution and lung cancer related deaths. Of equal importance, the results of this recent validate results from earlier studies as well as supports the need for an annual or “long-term” PM2.5 standard.

This concludes our presentation. Thank you--we will be glad to answer any questions.

Reference:

Pope, C., R. Burnett, M. Thun, E. Calle, D. Krewski, K. Ito, and G. Thurston, 2002. Lung Cancer, Cardiopulmonary Mortality, and long-term Exposure to Fine Particulate Air Pollution, Journal of the American Medical Association, 28(9):1132-1141.