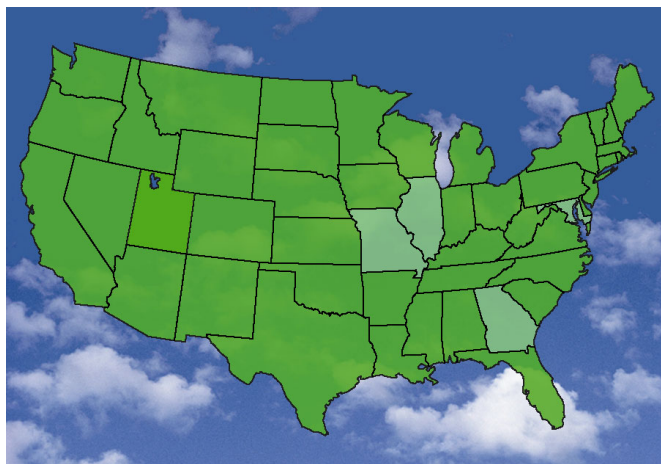


## Air Pollution and Health Effects Research at EPRI: The ARIES Program



Air pollution, especially particulate matter (PM), has been linked with adverse health effects at levels currently observed in the United States. However, most epidemiological studies have not included sufficiently comprehensive air quality monitoring to allow identification of many of the components that may be associated with a particular health endpoint. This is a critical piece of missing information. Knowledge of the true causative agents would enable us to better protect public health by regulating those sources that produce harmful pollutants. Indeed, health effects drive the regulatory agenda for the proposed multi-pollutant legislation and air quality standards. This underscores the importance of determining the components of air pollution responsible for health effects.

The Aerosol Research and Inhalation Epidemiology Study (ARIES) was designed to address the issue of air pollution components by coupling an extensive air quality monitoring effort with 5 health studies. To date, no statistically significant associations with sulfates and nitrates -- pollutants most commonly associated with coal combustion -- have been identified.

ARIES-type studies are critical because they add unique information to the existing body of literature regarding the health effects of specific components of air pollution. ARIES has received broad acceptance from regulatory and scientific bodies. The study has been cited by the White House OMB as an archetype of air pollution studies. Dr. John Graham of OMB has asked EPA to conduct similar types of studies. DOE is planning on initiating similar ARIES-type studies in the Pittsburgh area with EPRI consultation. The National Research Council (NRC) Committee on Research Priorities for Airborne Particulate Matter has emphasized the need to understand the toxicological composition of PM.

ARIES has been successful. However, one study alone cannot definitively answer all the questions. It is critical that epidemiological findings be replicated in other geographical areas with different air pollution profiles and different study populations. To this end, EPRI's long-term plan is to conduct ARIES-type studies in 5-6 other cities across the U.S., evaluating similar health endpoints to allow comparison across studies. EPRI currently has limited ARIES-type efforts in Baltimore and St. Louis. In the latter effort, hospital emergency room admissions are being examined in relation to air pollution, and the St. Louis Bus Study is underway to examine cardiac function and air pollution exposure in a group of senior citizens during scripted activities.

As part of this overall strategy for replication of ARIES-type studies elsewhere, the Chicago Aerosol Research and Aerosol Epidemiology Study (CHARIES) is in the planning stages. Chicago was selected because a large-scale air pollution epidemiological study has not been conducted there, and Chicago has a different air pollution profile than Atlanta. CHARIES will consist of extensive air quality monitoring at a site in south-central Chicago, coupled with a mortality study, a hospital admissions study, and two panel studies in sensitive populations: asthmatic children and patients with implanted defibrillators. In addition to these epidemiological studies, a unique exposure study will be coupled to the two panel studies to provide information on patterns and sources of particle exposures, and the toxicities of particles from different microenvironments.

The long-term plan for the ARIES Program would include 3-4 cities in addition to Chicago. Cities under consideration include Pittsburgh, PA, and Houston, TX. At least one city in each of the Northeast and West regions of the U.S. would also be included. Carrying out a study in a Canadian city is a possibility as well. There are some basic criteria that must be satisfied for the city selection process. The city must be large enough that there is sufficient statistical power for the health studies to detect effects. The city should also have a moderate level of air pollution, and, importantly, have temporal variation in pollution levels. Finally, to optimize research dollars and avoid replication, it would be better to conduct an ARIES-type study in a city in which an extensive air pollution epidemiology study has not yet been conducted.

The strategic value of the overall ARIES Program is high. Since ARIES-Atlanta is currently the only epidemiology study of this scope and breadth being carried out, the need is great for additional large-scale, comprehensive studies to more fully elucidate the components of air pollution that are responsible for adverse health effects. Replication of findings from Atlanta will increase confidence in the results and facilitate consideration and incorporation of results into regulatory activities. Specifically, on the federal level, findings from the ARIES Program will inform the reissuing of the National Ambient Air Quality Standards for PM and other pollutants. Assuming that the NAAQS are issued in 2004, there will be reviews of the standards in 2009 and 2014, with possible reissuing of the standards at these times. ARIES Program findings will feed into this process. On a state level, findings for a specific region will help states in the development of SIPs and management strategies for attainment of the standard.

In terms of specific benefits of funding the ARIES Program, these studies will provide input into the federal regulatory process, which is driven by health issues. Findings will inform the development of SIPs and appropriate management strategies. Participating in these kinds of studies demonstrates industry concern over important public health issues, and is an opportunity for a collaborative effort between public and private sectors. Participation in the ARIES study puts the electric power industry clearly on the proactive side, asking questions to which we will need answers to protect public health and welfare.

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