

Cost and Health Consequences of Air Pollution in California

Breathing polluted air is bad for us. The adverse health effects are well established, ranging from minor restrictions in activity to emergency room (ER) visits for asthma, hospitalizations for respiratory and cardiovascular causes, and premature mortality. Many studies have assessed how air pollution harms health, but little is known about who pays for pollution-related medical care. If this care imposes substantial burdens on private insurers, employers, or public programs such as Medicare, then all of these payers have substantial stakes in improving air quality.

To investigate this issue, a RAND team led by John Romley estimated how failing to meet federal and state standards for particulate matter and ozone would affect private and public insurer spending on hospital admissions for respiratory and cardiovascular causes and ER visits for asthma throughout California from 2005 to 2007. California is an appropriate choice for such a study: More people in California live in areas that do not meet federal air quality standards than in any other state in the country. In addition, California gathers detailed information on hospital spending according to the type of insurer or program that pays for care.

The analysts took a rigorous approach. To measure hospital spending on dirty air, they drew on peer-reviewed epidemiological studies widely accepted for regulatory purposes by the Environmental Protection Agency and the California Air Resources Board and on actual pollution patterns based on levels established by these two agencies. They applied actual patterns of hospital care to estimate pollution-related care delivered at spe-

Key findings:

- Failing to meet federal air quality standards led to nearly 30,000 hospital admissions and emergency room visits in California over the period 2005–2007.
- Resulting spending was about \$193 million.
- Public insurers such as Medicare and Medi-Cal spent the most, but private insurers, employers, and employees also ultimately paid for dirty air.
- Health and cost effects of pollution varied across the state.

Detailed maps showing the distribution of health effects by zip code and by congressional district are available at <http://health.rand.org/ca-air-pollution/>

cific hospitals and used actual spending patterns to estimate the spending on this care for different types of insurers.

RAND's estimates of the costs of dirty air are conservative: The analysis focused on hospital admissions for respiratory and cardiovascular causes and ER visits for asthma within specific age groups because very reliable information was available for these events. Comparable data were not available for outpatient care. In addition, the study did not include many other well-known adverse health effects associated with particulate matter and ozone, including chronic and acute

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Romley JA, Hackbarth A, and Goldman, DP, *The Impact of Air Quality on Hospital Spending*, Santa Monica, Calif.: RAND Corporation, TR-777-WFHF, 2010 (http://www.rand.org/pubs/technical_reports/TR777/).

bronchitis, heart attacks, lost work and school days, restricted activity, and premature mortality.

How Many Adverse Health Events Were Caused by Dirty Air?

RAND estimated that, overall, failing to meet federal clean air standards caused nearly 30,000 hospital admissions and ER visits throughout California over 2005-2007. Nearly three-quarters of these events were attributable to high ambient levels of fine particulate matter (particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers). The rest of the events were attributable to high ozone levels.

These adverse health events were concentrated in the San Joaquin Valley and South Coast Air Basins. And most of them involved public insurers: Overall, Medicare and Medi-Cal (Medicaid in California) paid for about two-thirds of the estimated ER visits and hospital admissions. Visit <http://health.rand.org/ca-air-pollution/> for detailed maps of pollution-related ER visits and hospital admissions across California.

How Much Did Dirty Air Cost?

Failing to meet air quality standards resulted in overall spending on hospital care in California of slightly more than \$193 million over the period 2005–2007. To put this number in perspective, the annual costs would be sufficient to pay for pediatric influenza vaccinations for 85% of California’s under-15 population.

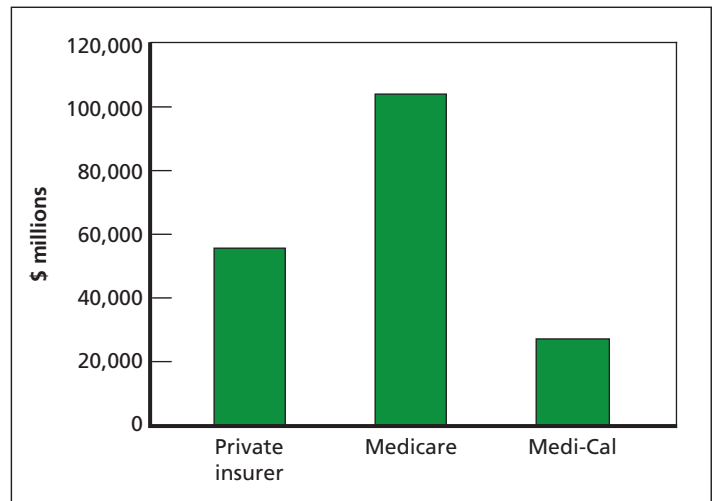
Not surprisingly, since so many pollution-related hospital events involved public insurers, they spent the most. Medicare spent an estimated \$104 million on hospital care because California failed to meet federal clean air standards during 2005–2007. Medi-Cal spent about \$28 million. Private health insurers spent about \$56 million (Figure 1).

How Do Health and Cost Effects of Pollution Vary Across the State?

To illustrate the types and range of outcomes, the RAND team also examined how improved air quality would have affected five specific hospitals: St. Agnes Medical Center in Fresno (in the San Joaquin Valley Air Basin); St. Francis Medical Center in Lynnwood and Riverside Community Hospital in Riverside (both in the South Coast Air Basin); University of California–Davis (UC-Davis) Medical Center in Sacramento; and Stanford University Hospital in the San Francisco metropolitan area.

In addition to their geographical variation, these hospitals also varied substantially in terms of the population served, the number of pollution-related hospital events, the insurers who paid for those events, and the amount spent.

Figure 1
Public Insurers Spent the Most on Pollution-Related Health Care



For example, at Stanford University Hospital, more than three-quarters of patients were white, fewer than 10% had incomes below the federal poverty level, and private insurers would have paid the bill for about half of the events caused by pollution. In contrast, at St. Francis, Hispanics constituted 77% of the population, and African Americans another 20%; one-quarter of patients were poor; and Medi-Cal was the primary payer for more than half of the pollution-related events.

The socioeconomic diversity of the hospitals is reflected in the estimated effects of improved air quality standards in each location.

Failing to meet federal air standards had the greatest effects at *St. Agnes Medical Center* in Fresno (Figure 2). At St. Agnes, 384 pollution-related adverse health events led to spending of about \$3 million. More than half of the events were paid for by Medicare, consistent with its above-average importance at this hospital. Medicare also spent the most.

Pollution-related adverse health events and resulting costs were also substantial at the two hospitals in the South Coast Air Basin—*Riverside Community Hospital* and *St. Francis Medical Center*. At the former, 329 hospital admissions and ER visits were due to air pollution in excess of federal standards (Figure 3). Private insurers paid most of the bills for this care. But Medicare spent the most because elderly patients are more likely to have longer hospital stays, which are more expensive than ER visits.

At *St. Francis Medical Center*, 295 hospital admissions and ER visits resulted from polluted air. Medi-Cal was the primary payer for more than half of these events. But as at Riverside Community Hospital, Medicare spent the most, in this case partly because Medi-Cal tends to pay less for hospital care.

Cost and Health Consequences of Air Pollution in California: Examples from Three Hospitals

Figure 2—St. Agnes Medical Center

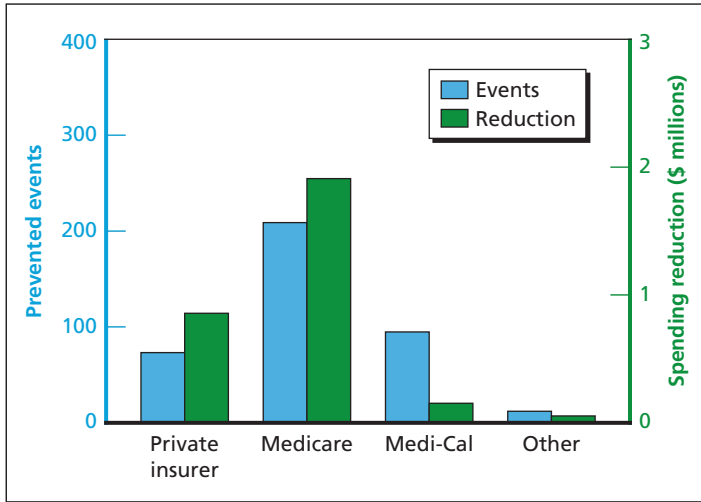


Figure 3—Riverside Community Hospital

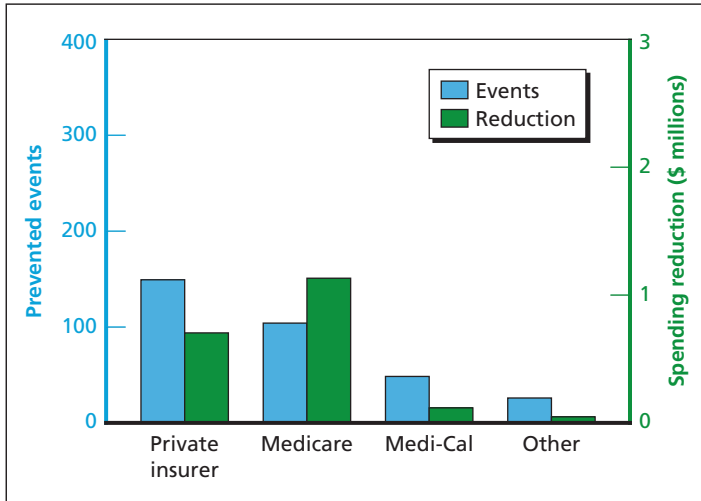
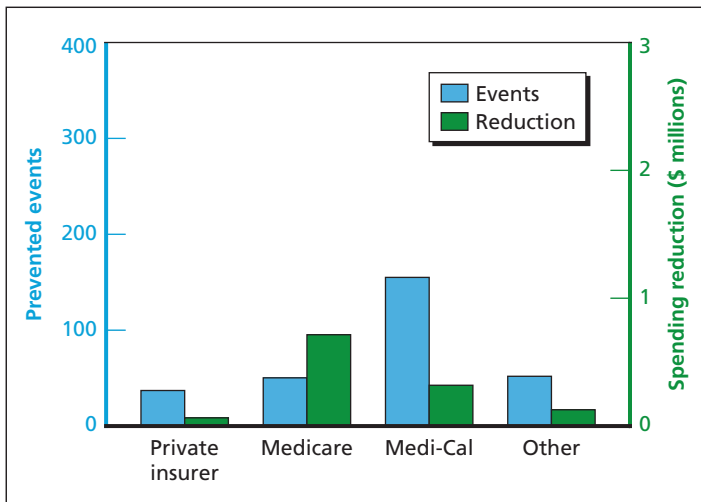


Figure 4—St. Francis Medical Center



Overall, not meeting federal clean air standards led to \$1.2 million in health care spending at St. Francis (Figure 4).

Health and cost effects of polluted air were less extensive at *UC Davis Medical Center* in Sacramento: 182 events resulted from pollution and spending was about \$1.9 million. At *Stanford University Hospital*, 30 hospital admissions and ER visits resulted from pollution—fewer than in other parts of the state. The resulting spending was also the lowest.

Who Ultimately Pays for Dirty Air?

RAND's findings suggest that public insurers such as Medicare and Medi-Cal have a lot to gain from cleaner air. But employers and private insurers also have substantial financial stakes in reducing air pollution. Pollution-related health care costs can drive up employees' health insurance premiums, increasing costs for the many employers who contribute to those premiums. Workers may also pay directly for pollution because higher insurance premiums often translate into lower wages. And if health insurance premiums do not increase as much as medical spending does due to dirty air, insurers will make lower profits. Everyone benefits from cleaner air. ■

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