Air Pollution and Bronchitic Symptoms in Southern California Children with Asthma

(See McConnell et al. p. 757)

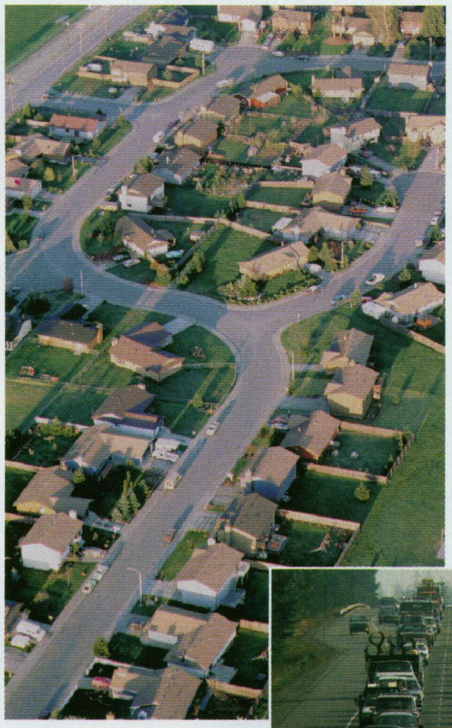
People who live in cities with dirty air have blacker lungs than people who live in rural areas with less air pollution. This is because, although particulates larger than 10 µm are filtered out when inhaled air passes through the nose, smaller particulates reach the lower airways. The particulates that reach the alveoli (the terminal air pockets of the lungs) stay there permanently. This accounts for the fact that a person who has lived in a polluted city for many years has blacker lungs than one who has lived in a polluted city for a shorter time.

Let's stop here to define what we mean by particulates. "Particulate" is a generic term for a variety of materials with many different characteristics. Both solid particles and liquid droplets are included, and the particle or droplet size can range from slightly above the molecular level (invisible to the naked eye) to large dust particles several hundred microns in diameter.

Research to determine the health hazards from particulates had its origins in a large body of research on the health effects of breathing polluted outdoor air. In the United States, outdoor air pollution research got its start in Southern California. The first city in the United States to experience problems with photochemical air pollution (also known as smog) was Los Angeles, which had become highly industrialized and heavily populated during World War II. The number of motor vehicles was increasing more than twice as rapidly as the population. Smog first appeared in Los Angeles in the 1940s, and air pollution research began shortly thereafter. Meteorologic and topographic factors undoubtedly aggravated the outdoor air pollution problems in Los Angeles.

The fact that exposure to high levels of air pollution could be fatal became well known in the 1950s. In 1952, an inversion causing several weeks of stagnant air pollution in London resulted in over 4,000 deaths. In 1953 in New York City, over 200 excess deaths and numerous cases of increased illness were recorded during a period when air pollution levels were high.

Because these disastrous events occurred when outdoor levels of both particulates and sulfur dioxide (SO_2) were elevated, scientists did not know whether SO_2 or particulates were the more dangerous air pollution component. Los Angeles was an ideal place to sort out this question because it has high outdoor levels of particulates but does not have high outdoor levels of SO_2. In the cross-sectional study in this issue of *EHP*, McConnell and colleagues from the University of California at Los Angeles show that living in communities with higher levels of particulates is associated with parental reports of bronchitis among children with a doctor diagnosis of asthma.



The study took place in 12 middle-class suburban communities in Southern California. The study investigators recruited 150 fourth graders, 75 seventh graders, and 75 tenth graders from each of the 12 communities to participate in the study. During 1993, the parents of each child were asked to fill out a questionnaire about their child's chest symptoms in the past 12 months. The parents were also asked questions about their home environment, including the presence of smokers in the home, cockroaches, pets, gas stoves, bedroom carpets, and mildew. Many of these can bring on attacks of asthma. During 1994, measurements of particulate matter less than 10 µm in aerodynamic diameter (PM_{10}), ozone, NO_2, and acid were collected from outdoor air monitoring instruments in each of the communities.

McConnell et al. found that children with asthma who lived in Southern California communities with high levels of particulates were more likely to have bronchitis. This was not true for children without asthma or wheezing who lived in the same communities. McConnell et al. also discovered that indoor environmental factors seemed to be associated with asthma and wheezing. In this middle-class group, parents of children with asthma or wheezing were more likely to report the presence of mildew and pets in the home. These indoor air pollutants may be harmful to children with hyperresponsive airways.

The bottom line of this research is that children with asthma really are more affected by severe air pollution than other children. Children with asthma are a special group who should receive specific guidance regarding their activities on days when the air quality is poor.

Public health authorities in Southern California have taken action to prevent problems in children with asthma. They have suggested a variety of steps to be taken by parents and teachers to reduce the exposure of children with asthma to severe air pollution. For example, in March of 1999, the South Coast Air Quality Management District started a pilot project to distribute pagers to coaches and parents of children with asthma. When air pollution alerts occur, a message is sent by e-mail to pager companies. During periods of heavy air pollution, coaches may choose not to take their students outside. Parents may ask teachers to excuse children with asthma from vigorous outdoor activities during periods of severe air pollution.

In his 1962 Surgeon General's report on motor vehicles, air pollution, and health (*1*), Luther Terry stated

> As in other problems affecting the public health, it is important that, as needed research proceeds on the problem of pollution emissions from motor vehicles, all practicable steps be taken to minimize such pollution rather than waiting until the results of all the needed research are available.

This remains as true in 1999 as it was 37 years ago.

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References and Notes

1. United States Division of Air Pollution. Motor Vehicles, Air Pollution and Health; A Report of the Surgeon General to the U.S. Congress. Washington, DC:U.S. Public Health Service, Division of Air Pollution, 1962.