

## Children's Activity Patterns and Inhalation Rates: Determinants of Exposure and Dose

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The California Air Resources Board (ARB) has previously sponsored two studies<sup>1,2</sup> that have provided unique data on children's activity patterns and on the amount of air they inhale at different activity levels. This information is critical to accurate estimates of children's exposures to air pollutants and the inhaled dose they receive. The activity study utilized 24-hour recall diaries completed by older children and by a parent or guardian for younger children. The breathing study involved measurement of the air inhaled by children during typical daily activities. California's children spend about 85 percent of their time indoors, 11 percent outdoors, and 4 percent inside cars and buses. Important differences in activity patterns and time spent near indoor sources of pollutants were found between toddlers and older children, and between boys and girls. These differences are important because some population subgroups are more highly susceptible to the toxic effects of pollutants. Therefore, such differences should be incorporated into exposure calculations in order to provide accurate exposure and risk estimates.

Accurate estimates of the inhaled dose of pollutants also are needed to understand and effectively reduce the health risk from air pollution. Inhaled dose is based on three core factors: the concentration of a pollutant in the air, the amount of time a person spends in the polluted environment, and the amount of air the person breathes while in the environment. ARB's breathing study documented that children inhale more air than do adults, relative to body surface area, during similar activities. It provided the first measurements of the actual amount of air breathed for a sample of children of different ages and backgrounds. The investigators also found that children generally self-regulate--they play at moderate exercise levels, taking breaks as they become winded. The study discerned small but important differences in the volume of air breathed during seemingly similar activities. The U. S. Environmental Protection Agency, California Office of Environmental Health Hazard Assessment (OEHHA), the ARB, and many others have used the results of these studies to improve exposure and dose estimation for children in air pollution exposure and risk assessment analyses.

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- (1) Wiley JA, Robinson JP, Cheng YT, Piazza T, Stork L, Pladsen K (1991). *Study of Children's Activity Patterns*. Prepared for California Air Resources Board under Contract No. A733-149. University of California, Berkeley, CA.
  - (2) Adams, W.C., (1993). *Measurement of Breathing Rate and Volume in Routinely Performed Daily Activities*. Prepared for California Air Resources Board under Contract No. A033-205. University of California, Davis, CA.