

## Measurement of Children's Exposure to Pesticides: Analysis of Urinary Metabolite Levels in a Probability-Based Sample

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The potential health effects associated with children's exposure to pesticides are the subject of increasing concern. Children may be exposed to unsafe levels of pesticides in the air they breathe, the food they eat, the water they drink, and the surfaces they touch. Concerns about dietary exposures in the general population resulted in the passage of the Food Quality Protection Act of 1996 [FQPA]. Under FQPA, realistic evaluation of the potential health risks to children from pesticides requires information

about the full range of children's exposures. Unfortunately, a scarcity of data are available to assess children's actual exposure to pesticides, which makes it difficult, if not impossible, to assess children's health risks realistically.

This study is one of the first probability-based samples of children's urinary pesticide levels conducted in the United States. The Minnesota Children's Pesticide Exposure Study monitored 102 children 3 to 13 years old during the summer of 1997 who represented 84,000 children in the census tracts of two Minnesota counties for commonly used pesticides. The pesticides measured included metabolites of insecticides (carbaryl, malathion, and chlorpyrifos) and a herbicide (atrazine).

In this paper we present individual and population-level urinary metabolite data that indicate widespread exposure of children to the parent compounds of carbaryl, malathion, and chlorpyrifos. Levels of metabolites for carbaryl were lower than adult reference range concentrations reported in the National Health and Nutrition Examination Survey. In contrast, metabolite concentrations of malathion were detected more frequently and found at higher levels in Minnesota children than in a recent non-probability-based sample of adults, although the relative magnitude of intra-individual variability was similar for adults and children.