FINAL REPORT

1999 Project Abstract
For the Period Ending June 30, 2001

TITLE: Measuring Children's Exposures to Environmental Health Hazards
PROJECT MANAGER: Ken Sexton, Sc.D.
ORGANIZATION: School of Public Health, University of Minnesota
ADDRESS: MMC 807 UMHC, 420 Delaware Street, S.E., Minneapolis, MN 55455
FUND: Environment and Natural Resources Trust Fund
LEGAL CITATION: ML 99 Chp 231, Sec 16, Subd. 12 (a) Benchmarks and Indicators.
APPROPRIATION AMOUNT: $500,000

Overall Project Outcome and Results: The goal of the project was to characterize important exposure-related variables for a probability-based sample of children from the economically disadvantaged neighborhoods of Lyndale and Whittier in south Minneapolis. Data collection focused on obtaining relevant environmental samples from the children's schools, residences, and community, as well as acquiring biological samples (blood, urine) from the children themselves. We enrolled 29 children in a pilot study (31% response rate) and 204 children (153 randomly selected plus 51 of their siblings) in the main study (57% response rate). In both winter and spring 2000 we collected biological samples (blood, urine) from 76% of the children participating, obtained samples of carpet dust and indoor air for approximately 100 residences, and conducted related monitoring inside and outside the Lyndale and Whittier elementary schools. Currently, results of most chemical analyses have been received, all available data (including baseline questionnaires, time-activity logs) have been entered into an integrated database, and preliminary statistical analyses are in progress.

Findings indicate that a school-based design is a practical and affordable way to recruit and monitor children from poor, ethnically diverse neighborhoods. The primary advantages are numerous: (1) the process of identifying households with age-eligible children is direct, simple, and relatively inexpensive; (2) contact and sociodemographic information is readily available, provided appropriate safeguards are in place to protect privacy; (3) the involvement of school personnel lends credibility to the study and increases the likelihood that children/families will volunteer to participate; (4) information available from the schools makes it easier to assess differences in responders and non-responders; and (5) the in-school collection of biological samples and testing of lung function is a convenient and effective way to monitor children's environmental health. Once enrolled the vast majority of children/families participated fully in this study, doing their best to comply with sometimes-demanding study protocols and willingly providing blood and urine samples.

Project Results Use and Dissemination: A final report will be disseminated to the children, their families, and the participating schools. Two journal articles have been published and several more are being prepared for publication.

Date of Report: July 1, 2001
LCMR Final Work Program Report

I. PROJECT TITLE: Measuring Children's Exposures to Environmental Health Hazards

Project Manager: Ken Sexton, Sc.D.
Affliliation: School of Public Health, University of Minnesota
Mailing Address: MMC 807 UMHC, 420 Delaware Street, S.E., Minneapolis, MN 55455
Telephone #: 612-626-4244 **E-Mail:** ksexton@mail.eoh.umn.edu **Fax:** 612-626-0650

Total Biennial Project Budget:

$LCMR: $500,000	**$Match:** Not Applicable
-$LCMR Amount Spent: $498,000	**-$Match Amount Spent:** Not Applicable
=$LCMR Balance: $0 ($2,000 returned)	**=$Match Balance:** Not Applicable

A. Legal Citation: ML 99 Chp 231, Sec 16, Subd. 12 (a) Benchmarks and Indicators.
B01 Measuring Children's Exposures to Environmental Health Hazards.

Appropriation Language: Measuring Children's Exposures to Environmental Health Hazards $250,000 the first year and $250,000 the second year are from the trust fund to the University of Minnesota in cooperation with the department of health to augment a federal study of exposure of children to multiple environmental hazards, to evaluate comparative health risks, and to design intervention strategies.

B. Status of Match Requirement: Not Applicable (LCMR money augments EPA grants)

II. FINAL PROJECT SUMMARY:

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III. OUTLINE OF PROJECT RESULTS:

Result 1 – Measure biological indicators of environmental chemicals (metals, nonpersistent pesticides, persistent pesticides, PCBs, and solvents) in blood/urine of school children from the Lyndale and Whittier elementary schools. This was the first time that such comprehensive exposure measurements were conducted in children and the resulting data provide a unique opportunity to (a) establish baseline data on children's exposure to multiple chemicals and (b) assess their cumulative health risks from diverse exposures. Blood and urine samples were analyzed by the National Center for Environmental Health, Centers for Disease Control and Prevention.

We learned that school-based collection of biological samples, with the help of the school nurse and a trained phlebotomist, was both practical and affordable. Statistical analysis of biomarker data is not yet complete.

Total cost for result 1:	LCMR Budget: $275,000 Balance: $0

Result 2 – Monitor environmental hazards in and around the residences of 100 school children, including collecting and analyzing samples of air, dust, etc., inside homes and in the Lyndale and Whittier elementary schools. The LCMR funds allowed us to (a)

increase the size of the intensive monitoring study from 50 to 100 children, (b) add bioaerosol and allergen measurements in all 100 residences, and (c) add additional and complementary measurements of volatile organic chemicals (VOCs) and allergens in the schools and in the residences.

We learned that although residential monitoring requires a specially trained field team, it is both practical and feasible under the conditions of this study. Statistical analysis of these data is just beginning.

Total cost for result 2: LCMR Budget: $192,500
Balance: $0

Result 3 – Analyze data (from results 1 and 2 above) to evaluate comparative and cumulative health risks for Minnesota school children; develop preliminary intervention strategies to prevent or reduce adverse health consequences for Minnesota school children; prepare reports and articles; and disseminate findings to the children, their families, schools, public health officials, scientists, and policy makers.

The results of this project provide more environmental exposure data (multiple chemicals measured in the same child at different points in time) for each individual child than is available from any previous study. The diversity of the information (environmental, personal, biological samples) and the complexity of the study design (stratified random selection, cross-sectional comparison) complicate the management and analysis of our data. We are presently in the early stages of data analysis, a necessary step on the way to preparing a series of articles that describe and interpret our findings.

Total cost for result 3: LCMR Budget: $32,500
Balance: $0

IV. DISSEMINATION: Based on the results of this study, we will prepare a report (possibly a series of reports) that summarizes our findings in easy-to-understand language and disseminate it to the children, their families, the schools, the Minneapolis Public Schools District, legislators, public health officials, and policy makers. In addition, we will publish a series of scientific articles in appropriate journals to disseminate new knowledge and understanding gained from the study.

Publications:

K. Sexton, I.A. Greaves, T.R. Church, J.L. Adgate, G. Ramachandran, R.L. Tweedie, A. Fredrickson, M. Geisser, M. Sikorski, G. Fischer, D. Jones, P. Ellringer. 2000. A School-Based Strategy to Assess Children'' Environmental Exposures and Related Health Effects in Economically Disadvantaged Urban Neighborhoods. *Journal of Exposure Analysis and Environmental Epidemiology*. Vol. 10, No. 6, pp 682-694.

L.L. Needham and K. Sexton (Editors). 2000. Assessment of Children's Environmental Exposure. *Journal of Exposure Analysis and Environmental Epidemiology*, Vol. 10, No. 6, pp 611-815.

V. CONTEXT

A. Significance: The U.S. EPA has recognized the importance of protecting children's health by funding two studies aimed at characterizing school-based exposures and related health effects in the Lyndale and Whittier elementary schools in south Minneapolis. The LCMR funds allowed us to extend the results beyond the school to the residential environment and make the findings much more valuable for the assessment and management of environmental risks to children's health. There is a serious lack of data available to document environmental exposures for children. Nevertheless, information on hand suggests hat children residing in inner-urban communities are likely to be more exposed than the general population to many toxic environmental hazards. This study represents groundbreaking research on multiple chemical exposures for poor inner-urban children, and will provide scientific facts necessary for informed and well-reasoned decisions about how best to safeguard these children's environmental health. This kind of high-quality, scientifically rigorous approach to cumulative exposure monitoring is essential to evaluate realistically the environmental health status of at-risk children.

B. Time: The LCMR portion of the project ended on June 30, 2001.

C. Budget Context: The LCMR funding augmented and extended two EPA grants already on hand. The first is a grant for $900,000 (1998 – 2001) to study children's complex exposures to multiple environmental chemicals, and the second is for $633,000 (1999 – 2002) to study related respiratory and immunologic health outcomes. The LCMR funds allowed us to study the residential environment of 100 children, to make complementary school-based measurements, and to analyze blood and urine samples for additional types of pollutants.