

Healthy Homes Grantees in Region IV, Southeast, Caribbean

Name of Grantee: Duke University Nicholas School of the Environment
Name of Project: Maps Where Kids Matter: GIS-Based Predictive Risks Models For Directing Housing Intervention Programs
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Project Partners: Duke University, Nicholas School of the Environment, Duke University, Division of Occupational and Environmental Medicine, the State of North Carolina, Department of Health and Human Services, and the State of North Carolina, Department of Environment and Natural Resources

Summary of Project Activities:

A variety of environmental hazards in the home pose individual and aggregate risk to children's health; yet, policy makers, public health officials, and child advocates lack the information required to evaluate children's risk and exposure potential across a broad range of risks. Our overall goal is to use sophisticated information systems technology to develop risk models for evaluating housing-related environmental hazards and illnesses and thus focus environmental health and safety control methodologies. We seek to generate a standard methodology for developing spatially based analytical models for children's environmental health programs. The methods we develop will allow counties across North Carolina and nationally to implement cost-effective approaches to environmental, in-home interventions that protect children *before* they become sick.

This research project will develop, validate, and disseminate an aggregate GIS-based predictive model that will characterize a broad range of home environmental health risks to children down to the individual house level. Risks included in the model are allergens and asthma triggers, bioavailability lead, insect and rodent pests, mold and moisture problems, asbestos, radon, fire, and combustion products from heating and cooking appliances. By incorporating a wide range of home hazards, the project creates a comprehensive children's environmental health risk model.

The proposed work will evaluate when and how different environmental exposures can reasonably be incorporated into a single predictive model, as well as when and how preventive intervention programs can be combined. As a result, the predictive model will enable communities to allocate resources most cost-effectively across a range of risks. With the characterization of the housing stock down to the individual tax parcel unit level, communities will be able to implement carefully tailored intervention programs that not only mitigate health effects from exposure, but also prevent adverse effects before exposure occurs.

This project will characterize the neighborhood housing stock in five North Carolina counties. The counties were chosen to allow for comparisons across regional, climatic, topographic, economic, and cultural zones. The analysis will incorporate three major data layers: a base layer map, consisting of county tax assessor and Census demographic data; an exposures overlay, incorporating data on housing-based environmental hazards; and a children's overlay, indicating the likely presence and characteristics of children. By using GIS-based spatial analysis it is possible to integrate multiple home environmental threats in an aggregate risk model. The resulting model will characterize the aggregate risk level of the housing stock down to the individual tax parcel unit and combine this analysis with the spatial distribution of children.

Product Outcomes/Outputs:

The proposed project will be carried out in four phases:

Phase 1: Building the Predictive Risk Model. Three major map layers - a base layer map, an exposures overlay, and a children's overlay - will be developed and integrated into a model that designates all houses according to risk for children's exposure to home environmental hazards. For each tax parcel unit, Phase I will generate a determination of 1) risk category and 2) likelihood of children in residence.

Phase 2: In-Home Assessments. In Phase 2, the predictive capability of the Phase I information system will be evaluated by conducting environmental sampling in approximately 300 homes. The Healthy Homes sampling will involve letter and poster-based recruitment into the study, a telephone survey, and in-home collection of environmental samples.

Phase 3: Validating the Predictive Risk Models. The sampling strategy is designed to allow comparisons of both the relationship between different exposure risks and the predictive value of the demographic characterization of exposure risks. The data collected during Phase 2 will be combined with the spatial models developed in Phase I to analyze the validity of the aggregate predictive risk model.

Phase 4: Communication. The final phase of this project will be: 1) to provide sampling reports to study participants; 2) to provide follow up services as requested to study participants; 3) to help local government agencies and community organizations develop strategic plans for cost-effective housing intervention programs, as well as solicit new funding to support such programs; and 4) to provide counties across North Carolina and nationally with a prototype for an aggregate predictive risk model for use in children's environmental health programs.

Collaborating agencies include:

- Duke University's School of the Environment,
- Duke University Division of Occupational and Environmental Medicine
- The State of North Carolina's Department of Health and Human Services, and

- The State of North Carolina's Department of Environment and Natural Resources.