

Healthy Homes University: An Innovative Approach to Indoor Air Quality, Asthma, and Family History in a Community Setting

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Background & Objectives

The Michigan Department of Community Health, Division of Environmental Health determined that there was a need for a more holistic program to address health hazards within the home beyond lead-based paint. As a result, in November of 2005, funding from HUD and other sources was secured to create Healthy Homes University (HHU) in 2005.

HHU Program Objectives:

- Positive change in the family's knowledge, attitudes, and behaviors regarding asthma triggers and injury reduction within the home.
- Reduced frequency of asthma and injury emergency care events and school absenteeism



Family history is an important risk factor for asthma.¹ A family history of asthma has also been associated with asthma severity.² To better understand who was affected by this program beyond the initial child that was referred (the index case), the Healthy Homes Section partnered with the MDCH Genomics Unit to integrate family history questions into the baseline survey of families. The MDCH Genomics Unit provides assessment, policy development, and assurance related to the use of genomics in public health programs. To our knowledge, this is the first time a state health department has integrated genomics into an environmental health project.



HHU and Genomics Program Objectives:

- To apply principles of gene-environment interaction and family history knowledge in an actual public health project
- To show the impact of collecting family history of asthma and the number of household members with asthma

Community & Referrals

- Eligible applicants include household units of low to moderate income families with a child less than 18 years of age with asthma that reside within Ingham County, MI.
- Higher priority is given to eligible applicants from high-risk areas of Central, Northeast, and Northwest Lansing.



Client referrals are obtained from a wide variety of sources, helping HHU meet its recruitment goals.

- Capital Area Community Services
- City of Lansing
- Clients
- Head Start / Early On
- Lansing School Nurses
- Local Health Departments
- MSU Extension
- Neighborhood Coalitions
- PHP (Medicaid provider)
- Sparrow Healthy System

References & Acknowledgements

- Burke W, Fesinmeyer M, Reed K, et al. Family History as a Predictor of Asthma Risk. *Am J Prev Med* 2003;24(2):160-69.
- Sangeloty Higgins P, Wakefield D, and Cloutier M. Risk Factors for Asthma and Asthma Severity in Nonurban Children in Connecticut. *Chest* 2005;128:3846-53.

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Methods

Throughout a 36-month period, a total of 300 homes of low to moderate income families will receive the "Basic Intervention" treatment. Each home is visually inspected and an evaluation conducted to identify and address asthma and allergy triggers and injury hazards.

Basic Interventions

- HEPA Vacuum
- Smoke detectors
- Smoking cessation kits
- Fans
- Pillow and mattress covers
- Roach and mice baits/gels



A new mattress cover: one of the basic interventions

- Poison control stickers
- Cleaning products
- Foam crack sealant/Caulk
- Shower curtain
- Low-allergen furnace filters
- Safety gate

The families enroll for a 6-month period of time, during which staff visits the home on approximately four separate occasions. The first two site visits introduce the program and staff to the family, collect baseline information about the family and house, and provide education and Basic Intervention products. Homes that qualify for the "Custom Intervention" products and services will be determined at that time. A minimum of 40 of these homes will receive Custom Intervention products and services based on multiple scored criteria including family history of asthma and the number of affected persons within each household. The remaining two site visits provide additional education and collect information about changes in knowledge, attitudes and behaviors of the family.

Custom Interventions

- Pillows
- Mattresses
- HEPA room filters
- A/C units
- Dehumidifiers
- Moisture control
- Plumbing repair
- Minor roof repair
- IPM/Extermination
- Bathroom vent installation
- Flooring replacement
- Garbage removal



Before and after: an extensive custom intervention

Family History

One adult household member in each home was interviewed. Questions were asked about a history of ever being diagnosed with asthma in first (parents and sibs) or second-degree (grandparents, half-sibs, aunts/uncles) relatives of the index case, and which of those relatives lived in the home.

Results: HUD Benchmarks

Figure 1: Total Number of Homes to Receive Basic Interventions

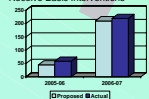
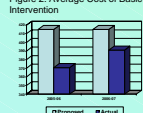


Figure 2: Average Cost of Basic Intervention



As of August 2007, 207 families have completed the basic intervention, and 116 have graduated from the program. The HHU team has been successful in employing strategies to use less custom intervention funds per home. For example, the HHU team has provided many homes with new beds, AC units, and dehumidifiers, while limiting structural repair to owner occupied units. This allows HHU to reach many more families with custom products and services.

Figure 3: Total Number of Homes to Receive Custom Interventions

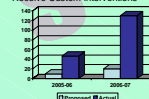
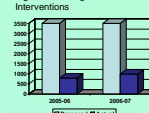


Figure 4: Average Cost of Custom Interventions



Results: Family History

Table 1: Reported family history of ever diagnosed with asthma - 162 families

Relative	Positive Family History (%)
1+ 1 st or 2 nd degree relatives	130 (80%)
0 first-degree relatives	56 (34.5%)
1 first-degree relative	56 (34.5%)
2 first degree relatives	34 (21%)
3+ 1 st degree relatives	16 (10%)
Father	48 (30%)
Mother	61 (38%)
2+ paternal 2 nd degree relatives	16 (10%)
2+ maternal 2 nd degree relatives	36 (22%)

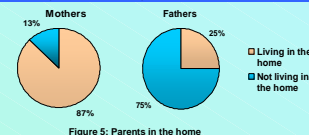


Figure 5: Parents in the home



Data on the first 162 enrolled homes have been analyzed (table 1). Of these, **93 households have 150 relatives (in addition to the index case) living in the home who were ever affected with asthma.** There is a high proportion of families with a significant self-reported family history of asthma. 65.5% reported at least one 1st degree relative with a history of asthma. A higher proportion of mothers and maternal 2nd degree relatives was reported than fathers and paternal 2nd degree relatives. Because such a large percentage of fathers do not live in the home (figure 5), knowledge of their family history, and that of their relatives, may be limited or less reliable.

Table 2: Family History, Asthma and Allergy: mean number of days with symptoms - past 30 days.

Question	0 first degree relatives	1 first degree relative	2 first degree relatives	3+ first degree relatives	1+ first degree relatives	t-test p-value: 0 vs. 1+
How many days did [CHILD] have wheezing first thing in the morning?	3.6	5.8	6.3	14.8	7.4	0.004
How many nights did [CHILD] wake up because of wheezing or tightness in the chest or cough?	4.9	7.3	7.7	11.4	8.1	0.015
How many days did [CHILD] have shortness of breath because of asthma?	6.5	9.0	11.1	13.9	10.4	0.007
How many days did [CHILD] have wheezing or tightness in the chest or cough?	8.2	11.0	11.6	19	12.4	0.006
How many days did [CHILD] have itchy or watery eyes?	5.3	6.2	10.2	11.9	8.4	0.034
How many days did [CHILD] have a stuffy, itchy, or runny nose?	10.3	11.0	12.1	15.6	12.0	0.31

For each question analyzed (table 2), mean days with symptoms rose with increasing numbers of affected 1st degree relatives. This trend was significant in simple linear regression models for five of six questions (data not shown). Comparing those without a 1st degree family history to those with at least one affected 1st degree relative, data from five of six questions showed a significant increase in mean days with symptoms for those with a 1st degree family history. This association may be due to shared environmental or genetic factors, as well as their interaction; other explanations, such as seasonality of symptoms or co-factors, cannot be ruled out from this initial analysis.

Discussion

Healthy Homes University demonstrates a practical application of genomics in a public health program by recognizing the importance of gene-environment interactions in relation to childhood asthma. In public health, it is critical to show a maximum amount of impact with limited resources. By including family history information in the HHU program, we have documented the rate of self-reported asthma in the relatives of children referred as index cases, and provided interventions in the home environment that will potentially benefit 150 additional family members. This extends the number of beneficiaries whose asthma symptoms may be alleviated. In addition, HHU staff report that collecting a family history appears to build trust and communication with families. This has led to referrals of other households within the same extended family. Moreover, among the HHU target population, there may be an association between family history of asthma and severity of asthma symptoms.