



# **Asthma: Public Health Applications**

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**School of Public Health and Community Medicine**

**University of Washington**



# Outline

1. Background
  1. Genes and Environment
  2. Family History
2. Examples from Michigan
  1. Education
  2. Healthy Home University
3. Examples from Washington Healthy Homes project



# Acknowledgements

- Michigan Department of Community Health
  - Deb Duquette
  - John Gehring
  - Courtney Wisinski

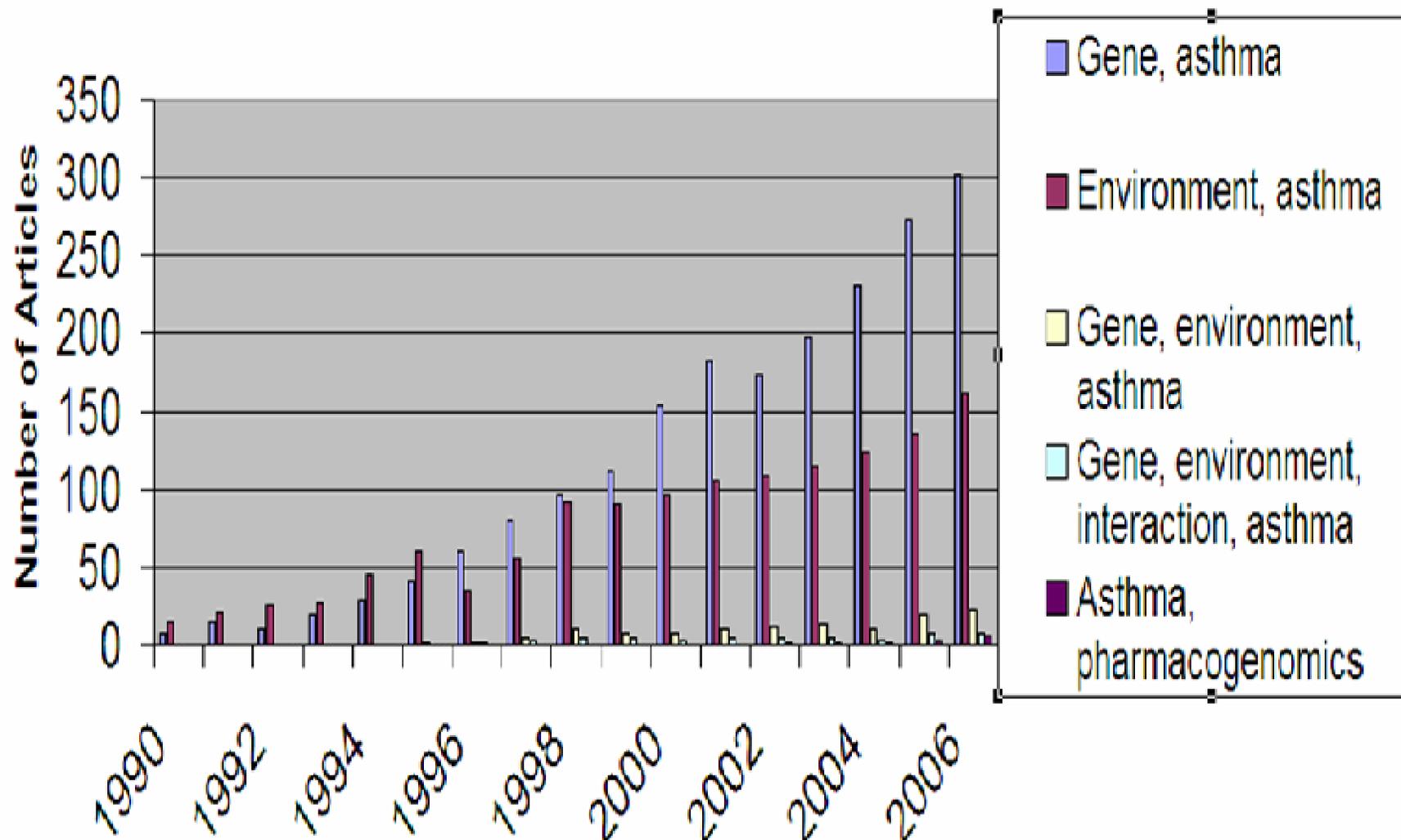
# The Search for Asthma Susceptibility Genes



*"I found one! I found one!"*

Kenneth M. Weiss & Joseph D. Terwilliger  
nature genetics • volume 26 • October 2000

# PubMed Journal Articles



# Gene-Environment Interactions

## Perspectives in asthma

Guest editor: William W. Busse, MD

## Perspectives on the past decade of asthma genetics

Carole Ober, PhD Chicago, Ill

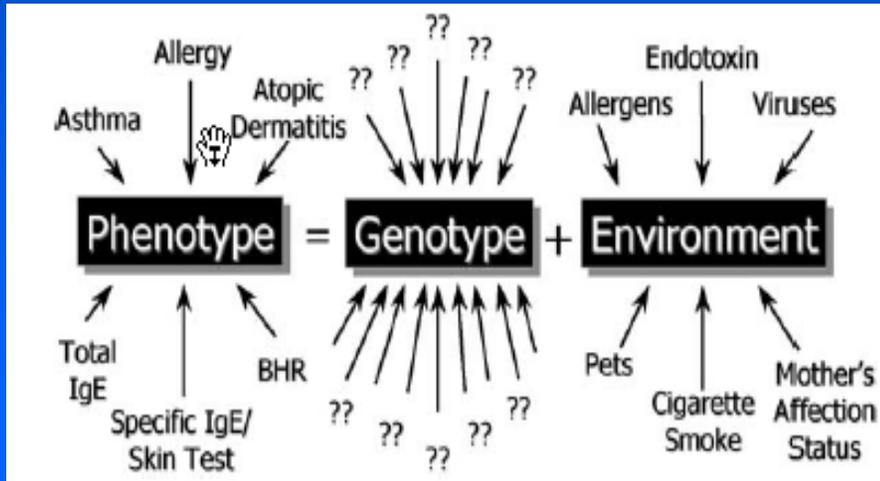


TABLE I. Examples of gene-by-environment interaction effects on asthma and atopic disease

Gene	Environmental Exposure	Phenotype	Comment	Reference
<i>LTC4S</i>	Aspirin exposure	Asthma	-44C allele is increased among individuals with aspirin-induced asthma compared with individuals with aspirin-tolerant asthma	Sanak et al <sup>9</sup>
<i>ADRB2</i>	Cigarette smoke	Asthma	Increased risk of asthma among smokers with Arg16 genotype but not among nonsmokers	Wang et al <sup>10</sup>
<i>ADRB2</i>	Physical activity	Asthma	Increased risk of asthma among sedentary women with Gly16 genotype but not among active women	Barr et al <sup>11</sup>
<i>TIM1</i>	HAV	Atopy	HAV protects against atopy in individuals with a 6-amino-acid insertion at residue 157 (157insMTTTP) but not in individuals without the insertion	McIntire et al <sup>12</sup>
<i>TLR4</i>	Endotoxin levels	Asthma	At high levels of endotoxin exposure, carriers of the Gly299 and Ile399 alleles have reduced risk for asthma compared with other genotypes and other exposure groups	Werner et al <sup>13</sup>
<i>CD14</i>	Dog ownership at birth	AD	-159TT genotype is protective against AD in the first year among children with a dog in the home at birth	Gern et al <sup>14</sup>
<i>GSTM1</i>	Diesel exhaust particles	IgE and histamine response	Enhanced responses among <i>GSTM1</i> -null individuals but not among individuals with other genotypes	Gilliland et al <sup>15</sup>
<i>GSTP1</i>	Diesel exhaust particles	IgE and histamine response	Enhanced responses among individuals with the Ile105 allele but not among individuals without this allele	Gilliland <sup>15</sup>
<i>NOS3</i>	Day-care exposure in the first 6 mo of life	Change in TH2 cytokine (IL-5 and IL-13) response in first year of life	Asp298 homozygosity associated with smallest changes in T <sub>H</sub> 2 responses among children attending day care and largest changes among children not attending day care	Hoffjan et al <sup>16</sup>
<i>FCERB1</i>	Day-care exposure in the first 6 mo of life	IL-5 response at 1 y of age	Gly237 allele associated with decreased IL-5 responsiveness among children attending day care and increased responsiveness among children not attending day care	Hoffjan et al <sup>16</sup>
<i>IL4RA</i>	Day-care exposure in the first 6 mo of life	IFN- $\gamma$ response at 1 y of age	Val50 homozygosity associated with lowest response among children attending day care and highest response among children not attending day care	Hoffjan et al <sup>16</sup>
<i>HLA-G</i>	Maternal BHR	Asthma-BHR in child	-964G allele is associated with asthma in children of mothers with BHR; -964A allele is associated with atopy and asthma among children of mothers without BHR	Nicolae et al <sup>7</sup>

HAV, Hepatitis A; BHR, bronchial hyperresponsiveness.

# Example from the literature

Eur Respir J 2007; 29: 502–508  
 DOI: 10.1183/09031506.00029506  
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Interleukin-1R antagonist gene and pre-natal smoke exposure are associated with childhood asthma

R.A. Ramadas<sup>a</sup>, A. Sadeghnejad<sup>#</sup>, W. Karmaus<sup>#</sup>, S.H. Arshad<sup>†</sup>, S. Matthews<sup>‡</sup>, M. Huebner<sup>\*</sup>, D.-Y. Kim<sup>\*</sup> and S.L. Ewart<sup>‡</sup>

**ABSTRACT:** The interleukin-1 receptor antagonist (IL1RN) is a potent anti-inflammatory cytokine. In the present study, association of the human *IL1RN* gene polymorphisms with asthma, bronchial hyperresponsiveness and forced expiratory volume in one second/forced vital capacity ratio was tested and the data was stratified by environmental tobacco smoke exposure in order to investigate a gene-smoking interaction.

In an unselected subset (n=921) of the Isle of Wight birth (UK) cohort, which has previously been evaluated for asthma and related manifestations at ages 1, 2, 4 and 10 yrs, three *IL1RN* single nucleotide polymorphisms (SNP) were genotyped. Logistic regression and repeated measurement models for tests of association using a representative SNP rs2234678 were used, as all SNPs tested were in strong linkage disequilibrium.

In the overall analysis, the SNP rs2234678 was not associated with asthma. However, in the stratum with maternal smoking during pregnancy the rs2234678 GG genotype significantly increased the relative risk of asthma in children, both in analyses of repeated asthma occurrences and persistent asthma.

In conclusion, the present results show that in the first decade of life, the gene-environment interaction of the interleukin-1 receptor antagonist gene polymorphism rs2234678 and maternal smoking during pregnancy increased the risk for childhood asthma.

#### AFFILIATIONS

<sup>\*</sup>Comparative Medicine and Integrative Biology Graduate Programme, and

<sup>†</sup>Depts of Large Animal Clinical Sciences, College of Veterinary Medicine, and

<sup>‡</sup>Statistics and Probability, Michigan State University, East Lansing, MI, and

<sup>#</sup>Arnold School of Public Health, University of South Carolina,

Columbia, SC, USA,

<sup>§</sup>David Hide Asthma and Allergy Research Centre, St Mary's Hospital, Newport, Isle of Wight, UK.

#### CORRESPONDENCE

S. Ewart  
 G. D. Veterinary Medical Center  
 Michigan State University  
 East Lansing

**TABLE 4** Effect of smoke exposure on asthma, repeated measurement at 1, 2, 4 and 10 yrs of age

<i>IL1RN</i> rs2234678	ETS-0 <sup>*</sup>		ETS-1 <sup>†</sup>		ETS-2 <sup>‡</sup>	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
AA	1.00		1.00		1.00	
GA	0.81 (0.49–1.30)	0.38	0.85 (0.51–1.42)	0.54	1.17 (0.61–2.21)	0.63
GG	1.20 (0.46–3.12)	0.71	0.70 (0.25–2.01)	0.51	4.43 (1.62–12.1)	0.0037
<b>Trajectory analysis<sup>§</sup></b>						
Transient asthma trajectory						
AA	1.00		1.00		1.00	
GA	0.89 (0.67–1.17)	0.39	1.22 (0.87–1.72)	0.24	0.99 (0.63–1.55)	0.98
GG	1.31 (0.74–2.31)	0.35	1.30 (0.73–2.33)	0.37	1.17 (0.61–2.21)	0.63
Persistent asthma trajectory						
AA	1.00		1.00		1.00	
GA	0.78 (0.34–2.96)	0.31	0.86 (0.56–1.39)	0.59	1.32 (0.76–2.30)	0.33
GG	1.01 (0.49–1.25)	0.98	NE	NE	4.53 (1.69–12.1)	0.0025

Data were adjusted for sex, environmental tobacco smoke (ETS) exposure, breastfeeding  $\geq 3$  months, low birth weight (<2,500 g) and birth order. *IL1RN*: interleukin-1 receptor antagonist receptor gene; NE: not estimated (due to small numbers). ETS-0: mothers did not smoke during pregnancy and children were not exposed to household ETS; ETS-1: mothers did not smoke during pregnancy but children were exposed to household ETS; ETS-2: mothers smoked during pregnancy and children were exposed to household ETS. <sup>\*</sup>: 1,001 observations, 151 subjects; <sup>†</sup>: 782 observations, 141 subjects; <sup>‡</sup>: 463 observations, 119 subjects; <sup>§</sup>: assessed with categorical modelling with all trajectory phenotypes in one model.

# Challenge: How to integrate genomics into asthma activities?



# Validity and Relevance of Family History of Asthma?

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## Family History as a Predictor of Asthma Risk

Wylie Burke, MD, PhD, Megan Fesinmeyer, Kate Reed, MPH, Lindsay Hampson, Chris Carlsten, MD

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**Background:** Asthma, one of the most important chronic diseases of children, disproportionately affects minority and low-income children. Many environmental risk factors for asthma have been identified, including animal, mite, and other allergens; cigarette smoke; and air pollutants. Genetics also play an important causative role, as indicated by familial aggregation and the identification of candidate genes and chromosomal regions linked to asthma risk. Using a positive family history of asthma to identify children at increased risk could provide a basis for targeted prevention efforts, aimed at reducing exposure to environmental risk factors.

**Methods:** To assess the predictive value of family history as an indicator of risk for childhood asthma, we reviewed population-based studies that evaluated family history of asthma and atopic disease in children with asthma.

**Results:** Our search identified 33 studies from all geographic regions of the world for review. The studies varied in definitions of positive family history and asthma phenotype and used study populations with asthma prevalence ranging from 2% to 26%. Nevertheless, family history of asthma in one or more first-degree relatives was consistently identified as a risk factor for asthma. In ten studies, sensitivity and predictive value of a positive family history of asthma could be calculated: sensitivity ranged from 4% to 43%, positive predictive value from 11% to 37%, and negative predictive value from 86% to 97%.

**Conclusion:** Although a positive family history predicts an increased risk of asthma, it identifies a minority of children at risk. Positive family history may have utility in targeting some individual prevention efforts, but the low positive predictive value limits its value as a means to direct environmental remediation efforts. (Am J Prev Med 2003;24(2):160–169) © 2003 American Journal of Preventive Medicine

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# Rationale for using Family History as a Public Health Tool

1. Screening for single major gene(s) is unlikely
2. Reflects unique *Genomic* information
  - genomic, ecologic, behavioral and interactions
3. Effective interventions
4. Identify individuals for targeted intervention
5. Family-Centered approaches

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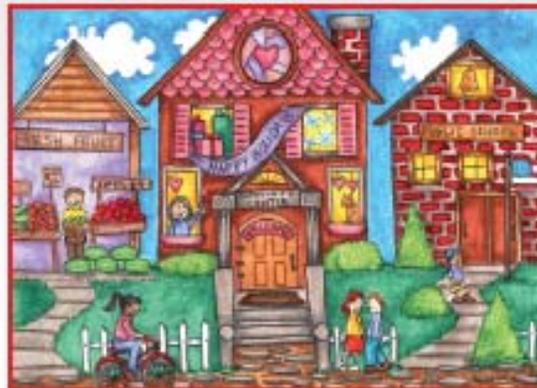


# Family History Reflects . . .

## *Shared Environments*

- Secondhand smoke
- Psychological factors

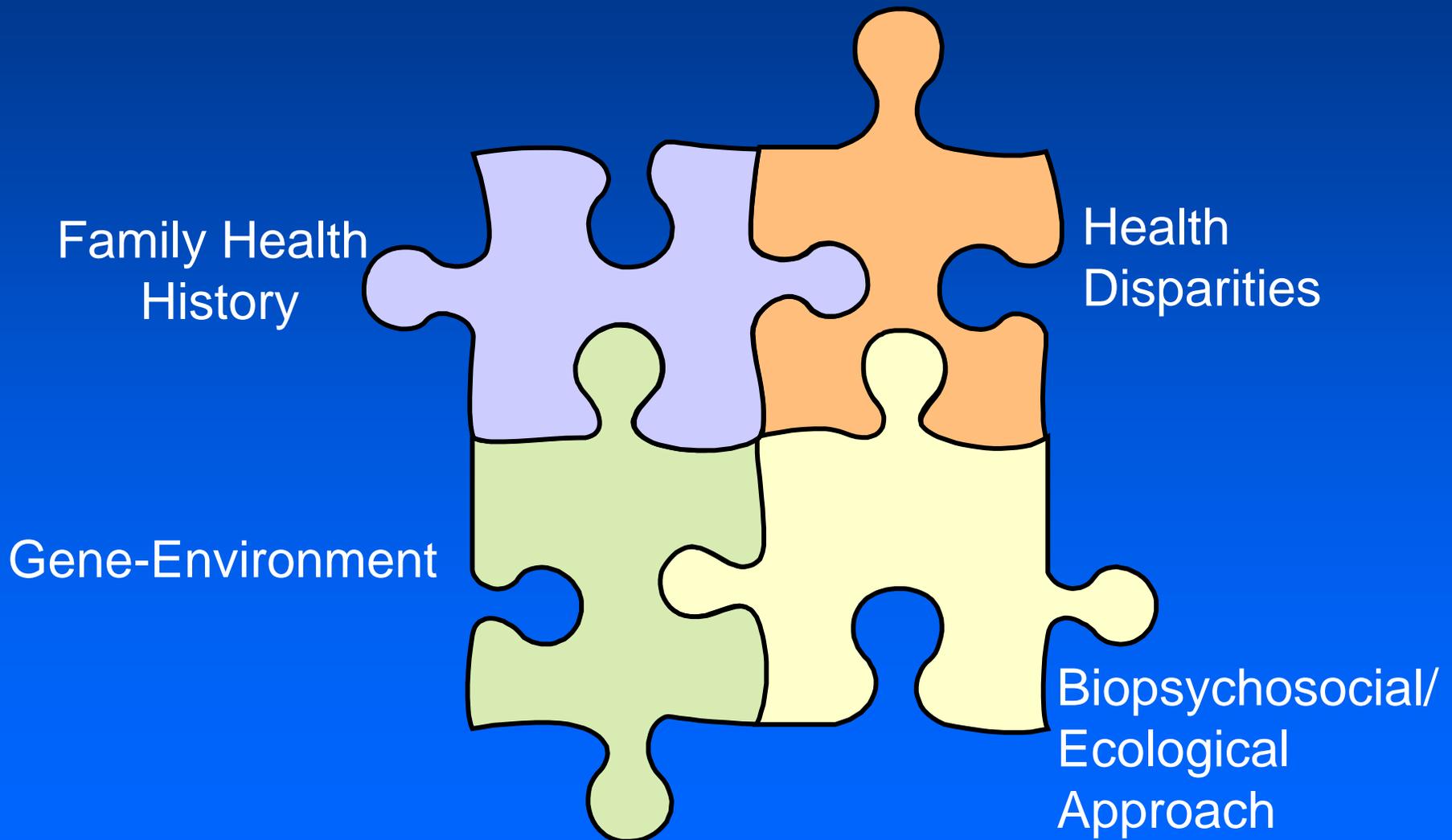
- Location



- Support systems

- Geography
- Neighborhoods

# Application of Asthma and Public Health Genomics



# Healthy Homes University: Using Family History to Identify and Intervene with Families in a Low-Income Community

Deb Duquette, MS, CGC  
Adult Genetics/Genomics Coordinator  
Michigan Department of Community  
Health

# Right Time, Right Place: MDCH Moves to New Location



- In Fall, 2005, MDCH Genomics, MDCH Environmental Epidemiology, MDCH Chronic Disease/Asthma Epidemiology moved to same new building and same floor
- MDCH staff had new opportunities to network
- MDCH Genomics and Healthy Homes University staff meet
  - Healthy Homes University project in planning stage
- Healthy Homes University staff open to genomics integration
- Technical Assistance from University of Washington-Center for Genomics and Public Health
- First project for MDCH Environmental Epidemiology and MDCH Genomics



# Healthy Home University (HHU) Program Summary

- MDCH was one of five grantees out of 40 total that received the 2005 grant.
- Healthy Homes Demonstration Grant.
- Awarded 11/1/2005 through 10/30/2008.
- \$989,717 HUD Funds.
- \$797,350 Partnering Leveraged Resources.



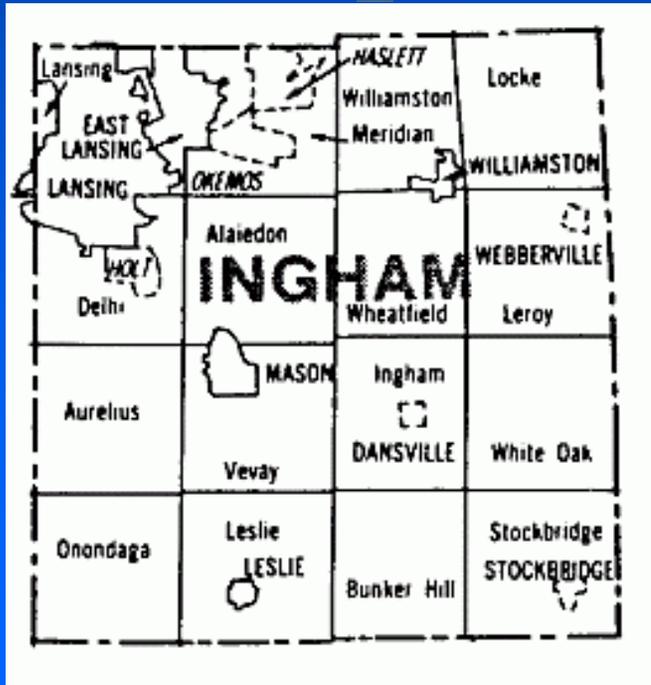
# Key Partners

- Staff consultation on health and housing issues.
- Client referrals.
- Education and outreach to communities.
- Reduced cost of intervention products.
- Housing rehabilitation and lead based paint remediation.





# Target Area



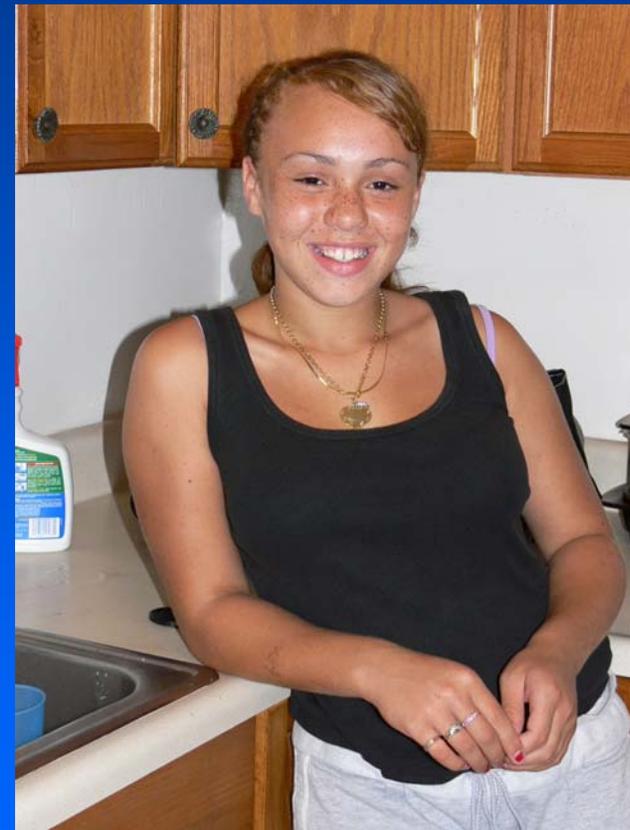
- Ingham County, Michigan
- Based on housing age, asthma hospitalization rates, income status, race data and asthma coalition



# Participant Criteria

Homes in Ingham County that have:

- Low-moderate income families.
- A child 18 years of age or under with asthma.





## Help for Families and Children with *Asthma* or *Allergies*

### Who is eligible for services?

- Children less than 18 years old with asthma or allergy symptoms
- Low-moderate income households in *Ingham County*, Michigan

### What is the cost?

- **FREE**

### What help is available?

- We will inspect your home and install the following products to reduce asthma and allergy triggers and prevent injuries.

#### Basic Products for EVERY Family

- |                                |                                       |
|--------------------------------|---------------------------------------|
| • Outlet safety plugs          | • Carbon monoxide and smoke detectors |
| • HEPA vacuum                  | • Cabinet safety locks                |
| • Rug gripper tape             | • Skid proof bath mat                 |
| • Fire extinguisher            | • Gun trigger locks                   |
| • Mercury-free thermometers    | • Trash can with lid                  |
| • Plastic food containers      | • Smoking cessation kits              |
| • Nightlights and flashlights  | • Fans                                |
| • Bleach and detergent         | • Pillow and mattress covers          |
| • Pest oils and baits          | • Foam crack sealant and caulk        |
| • Mildew proof shower curtain  | • Window security locks               |
| • Low-allergen furnace filters | • Child safety gate                   |
| • Mini-blind cord wind-ups     | • Door mats                           |
| • Step stool                   | • Temperature gauge                   |

#### Custom Products/Services for at least 40 Families

- |                                       |   |
|---------------------------------------|---|
| • Bed, pillows and mattresses         | • HEPA filter unit                      |
| • Moisture control                    | • HVAC duct cleaning                    |
| • Minor roof repairs                  | • Plumbing repairs                      |
| • Carpet removal                      | • Pest intrusion prevention             |
| • Floor refinishing                   | • Bush removal/landscaping installation |
| • Bathroom vent installation          | • House cleaning services               |
| • Furniture slipcovers                | • Garbage removal                       |
| • Outdoor play equipment improvements | • Dead bolts                            |
| • Window air-conditioning unit        |   |

### Getting started is easy!

If you would like a Healthy Homes University Program application MAILED to you, just complete the information requested below and return this sheet by mail or fax or e-mail.

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

Referred by: \_\_\_\_\_

If you are interested in referring families, please contact:

Courtney Wisinski  
Linda Stewart  
Michigan Dept of Community Health  
Lead and Healthy Homes Section  
P O Box 30195  
Lansing, MI 48909

Phone: 517.335.8262  
Phone: 517.335.8867  
Fax: 517.335.9800  
E-mail: [wisinski@michigan.gov](mailto:wisinski@michigan.gov)  
[stewartlin1@michigan.gov](mailto:stewartlin1@michigan.gov)

# Client Referrals

- Sparrow/Dr. Autumn Clos
- Lansing School Nurses
- City of Lansing
- Capital Area Community Services (CACS)
- Head Start/Early On
- Neighborhood Coalitions
- ICHD/Well Child Clinic/WIC
- PHP
- MSU Extension
- Clients

# Healthy Homes University: Desired Outcomes



- 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.

# Healthy Homes University and Genomics: Desired Outcomes



- To apply principles of gene-environment interactions and family history knowledge in an actual public health project
- To show impact of collection of family history of asthma and collection of number of household members with asthma
  - “Think Genomically, Act Locally” – Kris Peterson Oehlke
  - Consider 300 households with potential to reach greater than 300 children and adults
    - Broader impact than one affected child per household
    - Reaches more than just 300 children/households
    - Document actual number of children and family members in household
- To demonstrate genomics value in allocation of limited resources
  - Families at greatest risk with greatest number of affected receive greater amounts of resources
  - Helping largest number of people with least costs
    - “More bang for the buck”



# Technical Approach

- 300 homes will be enrolled.
  - Family history of asthma collected on all 300 homes at first visit
- Each family will enroll for a 6 month period.
- The HHU staff will complete four visits per home.
  - Provide asthma and injury control education and material.
  - Install asthma or injury reduction products or services.
  - Evaluate knowledge, attitudes, and behaviors.





# Technical Approach

- There are two levels of interventions:
  - All 300 homes will receive the Basic Intervention.
  - At least 40 of the 300 homes will receive the additional Custom Intervention products and services.
    - More family members with asthma in household, more resources provided
- HHU staff will refer lead-based paint, radon, asbestos, etc. to the appropriate agency or program



Moisture reduction; basement window replacement

# Basic Intervention Products



- HEPA Vacuum
- Outlet plug covers
- Carbon monoxide detector
- Smoke detector
- Skid-proof bath mats
- Fire extinguisher
- Gun trigger locks
- Mercury-free thermometers
- Trash can with lid
- Food containers
- Smoking cessation kits
- Nightlights
- Poison control stickers



- Fans
- Bleach and detergent
- Pillow and mattress covers
- Roach and mice baits/gels
- Foam crack sealant/Caulk
- Mildew-proof shower curtain
- Low-allergen furnace filters
- Safety gate
- Mini-blind cord wind-ups
- Door mat
- Flashlights



# Custom Intervention Products or Services

- Pillows (hypoallergenic)
- Mattresses
- HEPA room filter
- A/C unit
- Furniture slipcovers
- Moisture control
- Plumbing repair
- Minor roof repair



- IPM/Extermination
- Landscaping/bush removal
- Bathroom vent installation
- House cleaning services
- Garbage removal
- Outdoor play area improvements



# Study Surveys



Surveys conducted  
at 4 time points:  
Baseline intervention

- Includes Family History Collection
- 1, 3, and 6-month post-intervention

Michigan Department of Community Health  
**M D C H**

HEALTHY HOMES UNIVERSITY

**SECTION A: FAMILY INFORMATION**

Interviewer Name: \_\_\_\_\_

**\*\*FOR INTERVIEWER\*\*** The purpose of this interview is to collect information about [Child's Name] asthma or allergy symptoms and injuries. Some of the questions are designed to help guide us with the type of help you will receive. Other questions are for research purposes and will help us figure out what kind of help to give other families who have children with asthma or allergies. If there is a question that you do not want to answer, please let me know and we can skip it. All of your responses are confidential.

A01. Street Address: \_\_\_\_\_ Apt #: \_\_\_\_\_  
City: \_\_\_\_\_ ZIP: \_\_\_\_\_  
Phone: \_\_\_\_\_ Cell: \_\_\_\_\_

A02. Interviewee Name: \_\_\_\_\_

A03. Relationship to Subject Child: \_\_\_\_\_

A04. Subject Child Name: \_\_\_\_\_ Age: \_\_\_\_\_

A05. Subject Child Gender:  Male  Female

# HHU Family History Questions



Project #: \_\_\_\_\_  
Date: \_\_\_\_\_

Project #: \_\_\_\_\_  
Date: \_\_\_\_\_

## SECTION B: FAMILY HISTORY INFORMATION

**\*\*FOR INTERVIEWER\*\*** The following questions ask you about the history of asthma and allergy symptoms within the biological family of [CHILD].

B01.	Has the biological mother of [CHILD] ever been diagnosed with asthma?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know
B02.	Does the biological mother of [CHILD] live in the home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know
B03.	Has the biological father of [CHILD] ever been diagnosed with asthma?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know
B04.	Does the biological father of [CHILD] live in the home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know

B05.	Have any other biological family members been diagnosed with asthma? <i>Of the Child, his/her biological parent, siblings (full/half), grandparents, aunts/uncles, nieces/nephews, and child (no cousins).</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know
		<div style="border: 1px solid black; padding: 5px; display: inline-block;">GO TO C01</div>
B06.	What other biological family members have been diagnosed with asthma?	Specify:  <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know <input type="checkbox"/> Skipped
B07.	How many of these family members live in the home?	# of family members:  <input type="checkbox"/> Refused <input type="checkbox"/> Don't Know

# Family History



Reported family history of ever being diagnosed with asthma - 160 families

Relative	Positive family history (%)
1+ siblings	46 (29%)
Father	48 (30%)
Mother	61 (38%)
1+ 2 <sup>nd</sup> degree relatives	101 (63%)
1+ 1 <sup>st</sup> or 2 <sup>nd</sup> degree relatives	131 (82%)
Adopted	2 (1.25%)



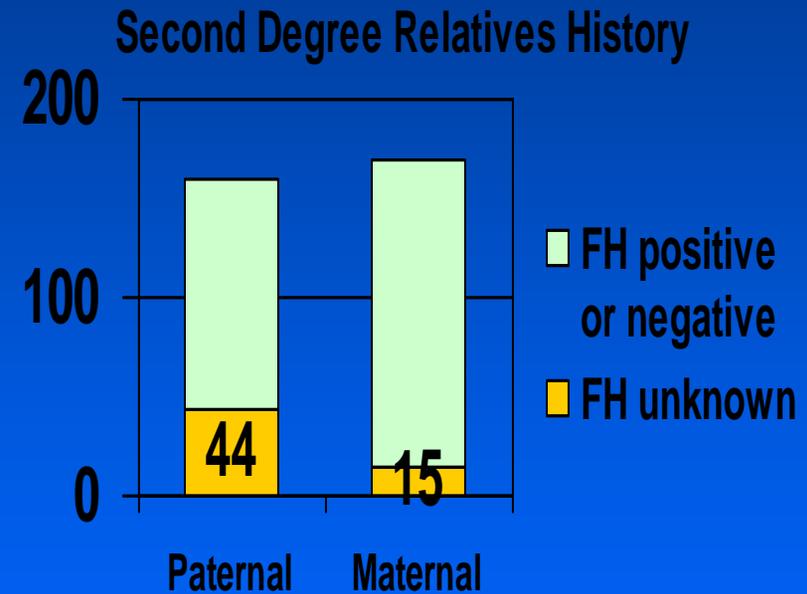
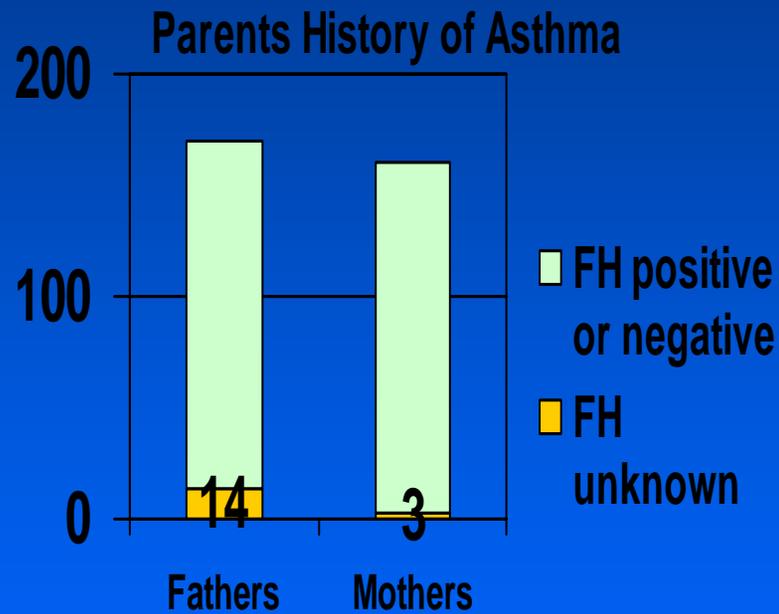
# Family History

Reported family history of ever being diagnosed with asthma - 160 families

Relative	Positive family history (%)
1+ 1 <sup>st</sup> degree relatives	106 (66%)
1+ parents	91 (57%)
both parents	18 (11%)
both parents + sibling(s)	4 (2.5%)
2+ siblings	19 (12%)
3+ 2 <sup>nd</sup> degree relatives	32 (20%)
2+ maternal 2 <sup>nd</sup> degree relatives	38 (24%)
2+ paternal 2 <sup>nd</sup> degree relatives	16 (10%)

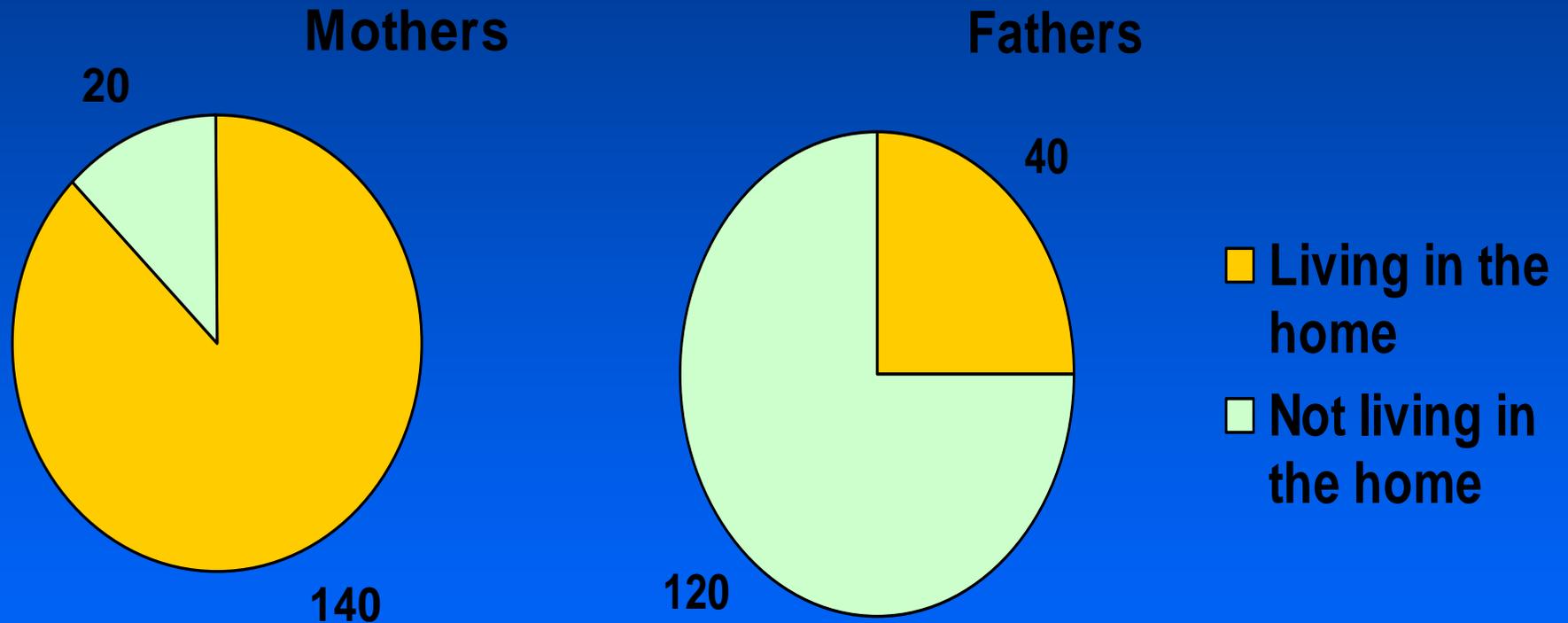


# Unknown Family History





# Parents Living in Household





# Household Members with Asthma

- 160 child probands PLUS
- 150 relatives ever affected with asthma in 93 households
  - 56 Mothers
  - 12 Fathers
  - 82 Others
    - Majority are siblings



# Case Example: Two for the Price of One

- Without collection of family history,
  - Would only document one child with asthma in household
  - Limits documentation of actual impact
- With collection of family history,
  - Documentation of significant family history of asthma
    - At least one first degree relative
    - Two second degree relatives
  - Documents at least two individuals in household with asthma receiving HHU interventions
  - Raises possibility of asthma diagnosis in another sibling



# Basic Intervention Facts



- To date, 137 homes have received the basic intervention (120 proposed for time period).
- The average cost of the basic intervention per home is \$370 (\$415 proposed).

Revised 1/17/07

Used with permission of Courtney Wisinski, Michigan Department of Community Health

# Visual Assessment Findings



Bath tile with water damage.



Roof leak caused ceiling to deteriorate.



Basement foundation leak.



# Custom Intervention Facts

Plumbing repair and flooring replacement within bathroom

- Approximately \$3,500 per 40 homes proposed for custom intervention during the grant writing.
- To date, 105 homes have been approved for custom intervention.
- Average cost per household for custom intervention is \$743
  - Each family member with asthma in household receives products
  - More family members with asthma in household, more resources provided, and greater average costs



Carpet removal within child's bedroom

# Client Letter



June 27, 2006

Pearl Lilly  
800 W. Edgewood Blvd.  
Unit # 252  
Lansing, MI 48911

Linda Stewart and Courtney  
P.O. Box 30195  
Lansing, MI 48909

Re: 027-290-01

Dear Linda and Courtney

I am writing to take this time to say thank you both for allowing my family to participate in the Healthy Homes University program.

This program has made a significant difference in my children's asthma and allergies. My son Steven, whom is nine years old, has not had a cold in the last three to four weeks. Normally he would have had at least two colds back to back. He has a sniffle now and then, but nothing serious that required a breathing treatment or Prednisone. The health of my children has gotten a little better, but the main important thing is that we have not taken any trips to Sparrow's ER or After Hour. They have just been having normal Dr. appointments. I thank you both. I can now focus on Steven's internal allergies to foods. I hope that other families are satisfied like my family is.

Again, I would like to thank you both for coming into my home to assist with the knowledge, tools, equipment, and information packages, and being kind to my family.

Thank you,

  
Pearl Lilly

**RECEIVED**  
MICHIGAN DEPARTMENT OF  
COMMUNITY HEALTH

JUN 28 2006

DIVISION OF ENVIRONMENTAL AND  
OCCUPATIONAL EPIDEMIOLOGY  
LEAD HAZARD REMEDIATION PROGRAM



# Anecdotal Reports of Interest

- Anecdotal reports by families
  - Feel that HEPA vacuum and covers for mattress and pillows are of greatest health benefit to reduce asthma symptoms and severity
- Anecdotal reports by HHU staff
  - Collection of family history appears to build trust and communication with families and HHU staff
  - Positive experiences of one family leads to more referrals to other households within the same extended family

# The Burden of Asthma in Washington State



Washington State Department of Health  
Washington Asthma Initiative  
June 2005

# Making Housing Healthier



New public healthy housing at High Point

## Partners

**High Point Resident Council, Mithun Architects,  
Neighborhood House, Public Health, Seattle  
Housing Authority, University of Washington**

## Bringing Healthy Innovations Home

There is a lot of attention focused on positive lifestyle and environmental changes that reduce the incidence of, and suffering from, the near epidemic of childhood and adult asthma. To address this pressing health issue, Seattle Housing's High Point Team collaborated with the University of Washington School of Public Health, Neighborhood House, Public Health Seattle and King County and the American Lung Association of Washington to implement a long-range program designed to improve indoor air quality and ultimately reduce the occurrence of asthma attacks in children.

Through the program, 35 innovative Breathe-Easy Homes have been designed and built for rent to qualified low-income families. These homes incorporate special features to reduce indoor air pollutants and increase the quality of life for the residents.

The residents of the homes were chosen by completing surveys assessing the severity of their children's asthma. Once accepted into the program, residents completed a questionnaire that serves as a baseline for monitoring.

Specialists then go to the participants' current homes and, as much as possible, improve the air quality by educating the families. The families are then given a second questionnaire as they leave their old home for their new one at High Point. A final questionnaire will be presented to them after they have lived in their new High Point home for 12 months.

Each of the participants must follow a sensible list of rules to ensure the highest possible air quality for the children. These include no smoking, no pets, and a restriction on using certain cleaning agents.

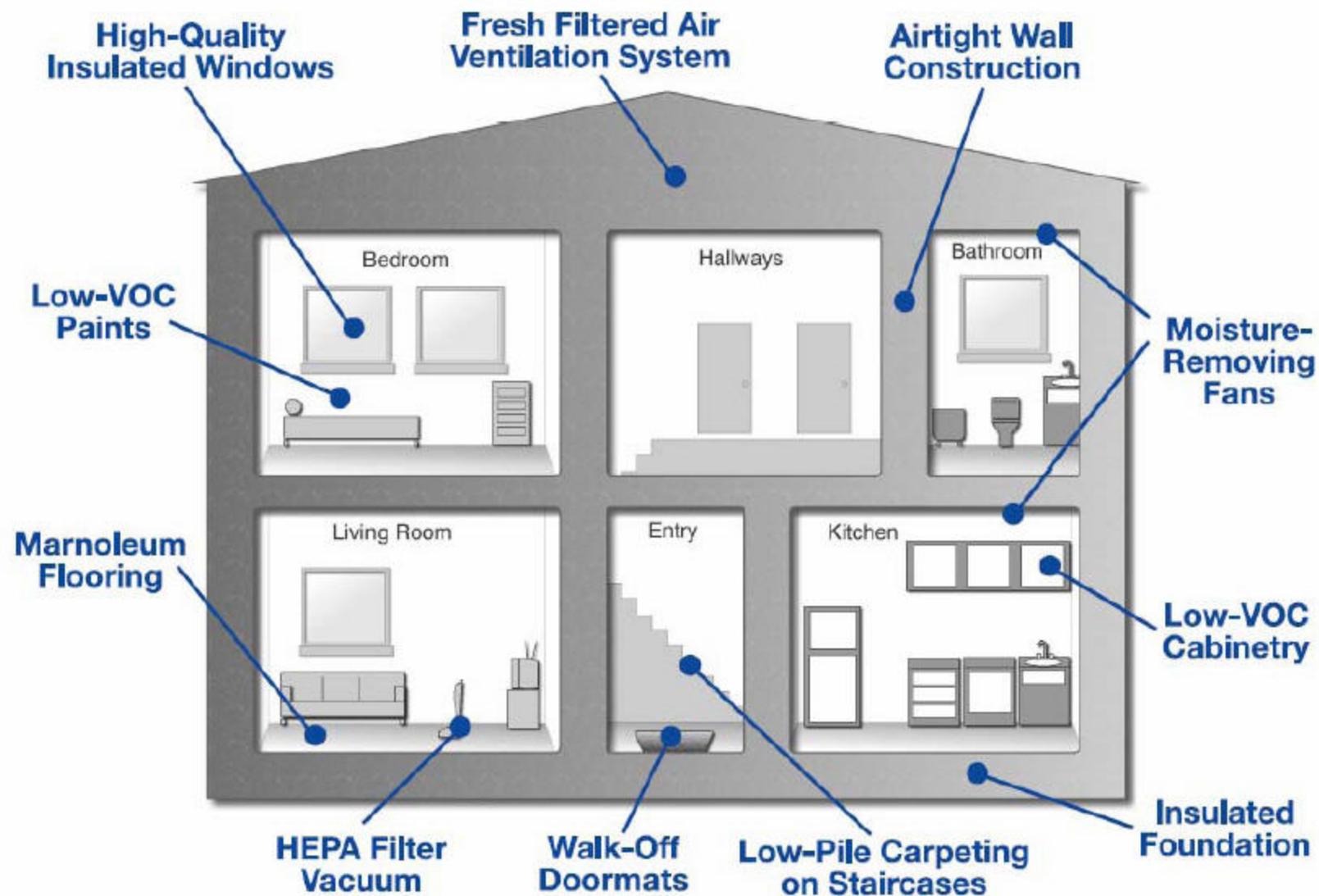


# **Breathe Easy Homes:**

## **Building New Asthma-Friendly Homes**

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- **Build 35 Breathe Easy units for children with asthma at High Point Public Housing site**
  - **Insulated slab to keep floor warm and dry**
  - **Exterior grade plywood (no OSB)**
  - **Airtight drywall with low-emission joint compound**
  - **Cement board exterior siding/rain screen**
  - **Low emission doors, trim, cabinets, finishes, adhesives**
  - **Hard surface floors (marmoleum)**
  - **Enhanced ventilation (HEPA whole house continuous fan, kitchen/bath fans with timers/humidistats)**
  - **Radiant/Hydronic baseboard heat to decrease humidity**



**HIGH POINT BREATHE EASY HOMES**



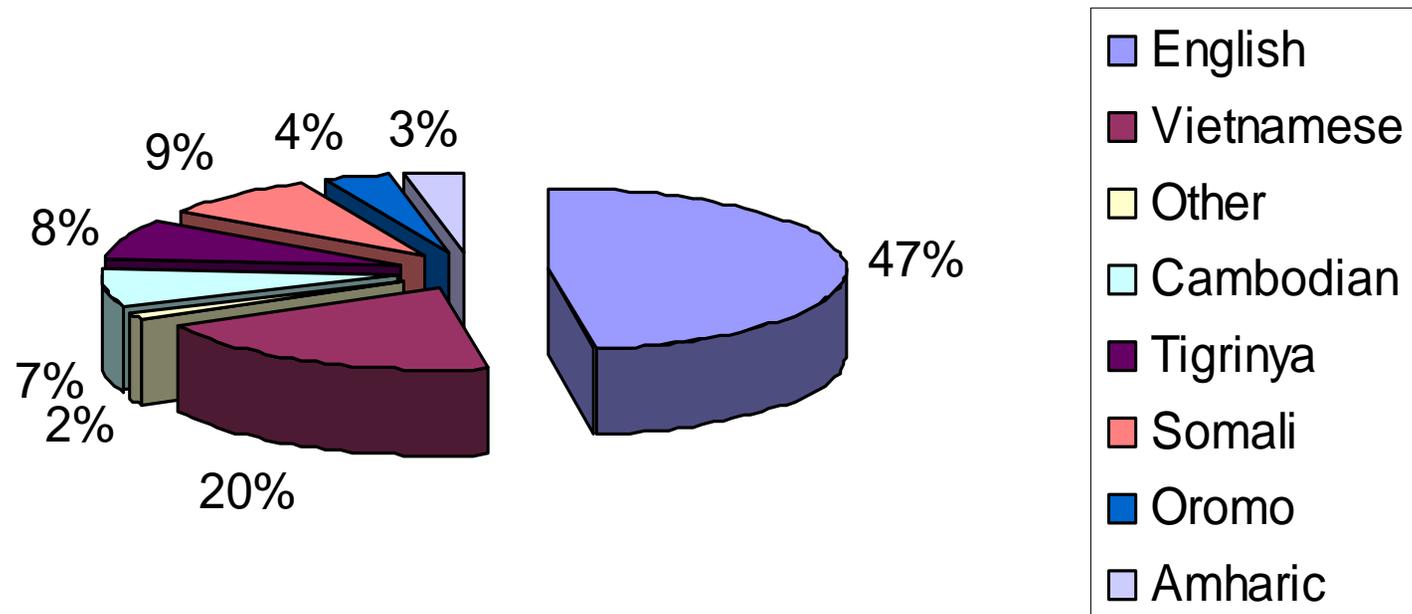
**Old High Point  
Housing**

**New High Point  
Breathe Easy  
Home**



# High Point Neighborhood is Diverse

## Primary Languages Spoken at High Point



# Breathe Easy Homes: Evaluation

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- **Test the marginal benefit of new home over education-only intervention in old home**
- **Longitudinal asthma cohort with pre/post measures**
- **Measures**
  - **Changes in home environment**
  - **Changes in participant behaviors**
  - **Changes in asthma-related health outcomes**
    - ♦ **Symptoms**
    - ♦ **Quality of Life**
    - ♦ **Health services utilization**
    - ♦ **Airways hyper-responsiveness**
- **Community-Based Participatory Research**
- **Findings available in 2008**



# Selecting Families

- Door to door survey to identify families for new breath easy home
  - Community volunteers administered surveys
  - 244 / 260 high point families surveyed
  - Families were selected based on number of asthmatic children living in the home, severity and willingness to participate
    - No smoking or pets in the household
  - Asthma was validated by medical records
  - Asthma severity defined by Public Health-Seattle & King County based NHLBI's NAEPP Expert Panel Report Guidelines for the Diagnosis and Management of Asthma-2002 – 4 levels of severity
  - 132 families had a child with asthma living in the home

# Integrating Family History

- Evaluate the association between asthma severity and family history
  - MPH thesis project through the UWCGPH (Ms.Kayleen Williams)
  - Added family history to high-point survey
  - Conducted a case-control study
    - Family history defined as parental history of asthma
    - Cases were 40 unrelated children with +FH, controls were 78 unrelated children with –FH
- Findings: Maternal history was associated with asthma severity in the child ( $p < 0.01$ ), but paternal history of asthma was not associated with severity in the child.



# **Additional Examples and Resources**

# Family History and Your Health Newsletters

Michigan Department of Community Health  
May, 2006—Vol. 9, No. 2

## Family History and Your Health

Spring is here! And along with it allergy season.....

**May is Asthma and Allergy Awareness Month**

Asthma is a lifelong (chronic) breathing problem. It is caused by swelling of the airways in reaction to various substances in the environment called stimuli or triggers. The symptoms can vary from coughing to wheezing and having difficulty breathing. Asthma, left untreated or not treated properly, may even cause death.

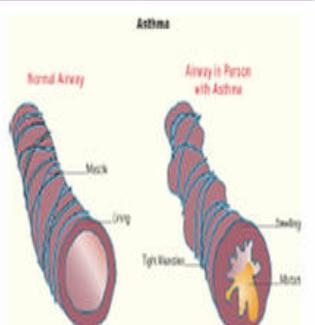
One in every 15 Michigan children attending school is affected with asthma, and it is the leading cause of missed school days. Asthma rates in Michigan adults are slightly higher than in the U.S. By identifying children at risk for developing asthma and educating both adults and children about prevention and warning signs, complications related to asthma can be reduced.

### Family History and Asthma

There are many risk factors to consider when determining someone's risk for asthma. However, one risk factor is often overlooked—the family health history. Although no single "asthma gene" has yet been identified, family history is still an important tool. It is thought that a person's susceptibility to asthma may be due to many genes interacting together as well as with the environment. Studies have shown:

- ◆ Over half of children who are diagnosed with asthma have a family history of asthma
- ◆ A person's risk of developing asthma is

**Asthma**



National Heart, Lung and Blood Institute  
Your trachea (or windpipe) divides into two "tubes" that go into the lungs where they branch out even more into the bronchial "tree". This is where oxygen is taken into the body. In someone with asthma, the linings of these tubes

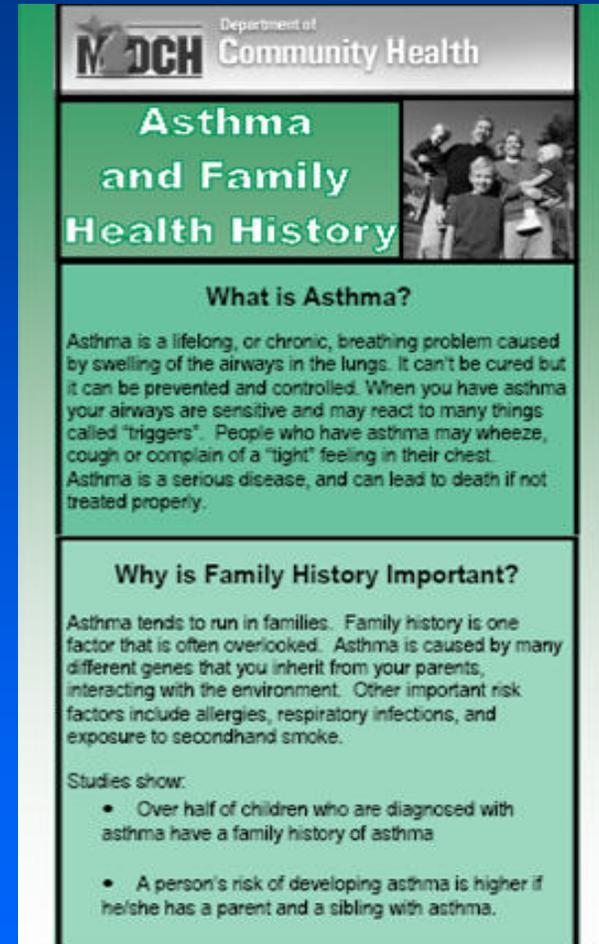
- Michigan Department of Community Health (MDCH) disseminates via e-mail to:
  - Libraries
  - Public health professionals
  - Teachers
  - Health Plans
  - Primary care providers
  - Genetic professionals
  - Genealogy Groups
- May 2006 newsletter focus on asthma, family history, and environmental triggers
  - Over half of children who are diagnosed with asthma have a family history of asthma
  - Risk of developing asthma is higher if parent and sibling with asthma
- 863 downloads of this newsletter in month of May 2006

<http://www.migeneticsconnection.org/familyhealth.shtml>

Used with permission of Deb Duquette, MDCH

# Asthma and Family Health History Fact Cards

- Fact Cards on Family Health History developed on a variety of topics
  - Distributed to providers and the public since May 2007
- Developed by MDCH Genomics and MDCH Asthma staff



<http://www.migeneticsconnection.org/factcards.shtml>



# University of Washington Center for Genomics and Public Health

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**Mission:** To integrate advances in genomics into public health practice

- Contribute to the knowledge base on genomics and public health, focusing on chronic diseases with modifiable environmental risk factors
- Provide technical assistance to local, state, & regional public health organizations
- Serve as a reliable and credible source of information
- Serve as a regional resource for public health
- Develop and provide training for the public health work force



**University of Washington**  
**Center for Genomics and Public Health**

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- **Asthma Genomics: Implications for Public Health**
  - **Spotlights**
  - **Compilation of BRFSS Genomics Questions**

**<http://depts.washington.edu/cgph>**

**Funded by the National Office of Public Health Genomics  
Centers for Disease Control and Prevention**



## **CDC funded Genomics Centers and States**

**Chronic Disease Genomics Program, Utah Department of Health**  
<http://health.utah.gov/genomics/>

**Oregon Genetics Program, Oregon Department of Human Services**  
<http://www.oregon.gov/DHS/ph/genetics/>

**Chronic Disease Genomics Project, Minnesota Department of Health**  
<http://www.health.state.mn.us/divs/hpcd/genomics/>

**Public Health Genomics Program, Michigan Department of Community Health**  
<http://www.michigan.gov/mdch/>

**Michigan Center for Public Health & Community Genomics**  
<http://www.sph.umich.edu/genomics/>

**University of Washington Center for Genomics & Public Health**  
[www.uwgcgph.org](http://www.uwgcgph.org)

# Summary

- Asthma – not due to a single gene
- Gene – environment interactions are important
- Family history is a consistent risk factor for asthma
- Family history can be used in public health settings for a variety of purposes
  - Education
  - Identify undiagnosed cases
  - Motivate behavior change
  - Cost effective?

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## What can you do?

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- A small shift in thinking:
  - ◆ Consider how family history could relate to your activities
  - ◆ Include family history when appropriate
  - ◆ Collect and share information

***Think Genomically!***

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## What else can you do?

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- Include family history as a risk factor in health messages.
- Target messages to high risk groups.
- Get the facts about genomics and asthma in the news - dispel media hype.

***Think Genomically!***