



# BOSTON HEALTHY HOMES: PART ONE

## INTEGRATED PEST MANAGEMENT INTERVENTION



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# Interventions

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## Standard Interventions

- **Mattress & Pillow Covers**
- **Air Conditioner**
- **HEPA Vacuum**
- **Integrated Pest Management**
- **Education/Materials**
- **House Cleaning**
- **Radiator Covers/Duct Cleaning**
- **Window Guards**

## Enhanced Interventions

### Moderate Remediation

- **Wall to wall carpet removal**
- **Bathroom/kitchen fan installation**
- **Windows and/or door replacement**
- **Plumbing and leak repair**
- **Patching of plaster**
- **Roof/flashing/gutter repair**
- **Repair/replace stove**
- **Ventilate dryer**

# Integrated Pest Management

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IPM is an effective approach to reducing pest infestation by eliminating sources of food, water, shelter, and blocking entry points, thus decreasing the need for harmful chemicals.

# Focus on IPM

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- Intervention offered to all households pre-remediation
- Professional Services consists of up to two visits 3-5 weeks apart using environmentally safe products.
- Participants not required to leave home during intervention.
- Follow-up health ed and low-cost supplies



# Problem of Pests

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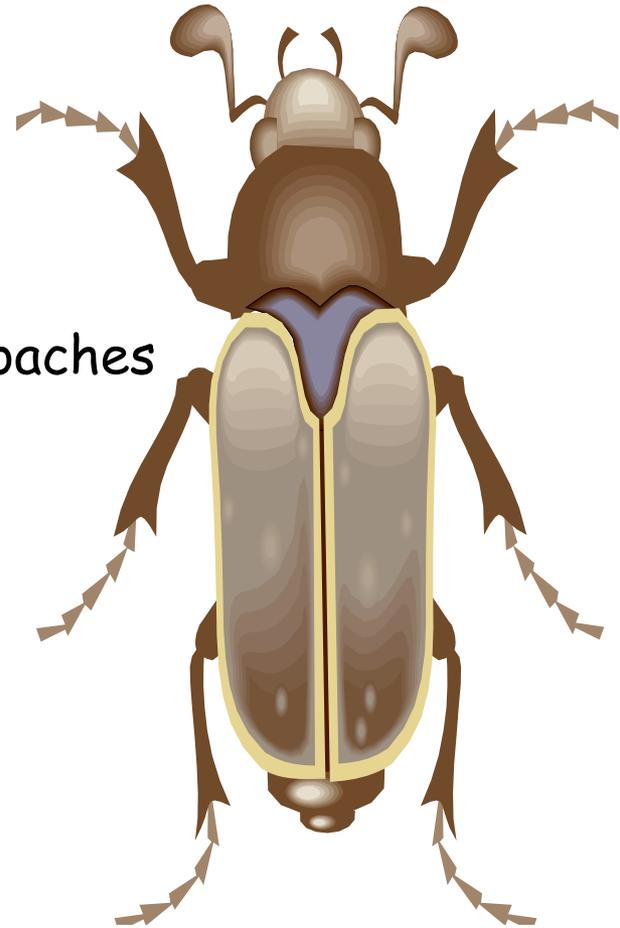
- 64% (127 houses) of Healthy Homes sites report a pest problem (mice, rats or roaches):

66% (84 houses) have just mice

10% (13 houses) have just cockroaches

24% (30 houses) have both mice and cockroaches

- 16% of sites report no pest problem
- 20% of sites either did not respond or reported "not sure" when asked about pest problems.



# IPM Contractor Services:

INSPECTION

TREATMENT

EXCLUSION

EDUCATION

FOLLOW-UP

# IPM Service Delivery

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116 sites have received at least one pest management visit through Healthy Homes. This represents 91% of all the participants who report a problem with pests.

100 sites completed 2 visits,  
16 sites completed 1 visit



# Evaluation of Pest Management Services

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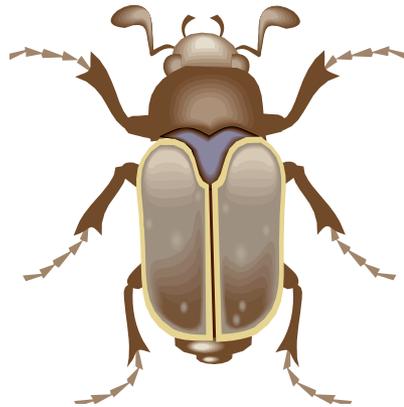
- Telephone survey of 18 questions administered to families who completed IPM.
- 70 (83%) participants surveyed amongst those 85 completed sites.
- Voluntary participation
- Subjective questions related to infestation and health status before and after IPM services.

# Ratings used to describe type/severity of infestation

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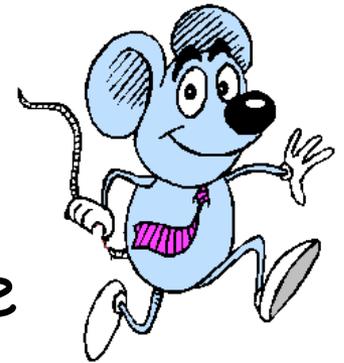
Rate cockroach problem before and after IPM as:

none  
light  
moderate  
heavy  
very heavy



Rate mouse problem before and after IPM as:

none  
light  
moderate  
heavy  
very heavy



# Ratings used to describe severity of child's asthma

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Rate child's asthma status before and after IPM as:

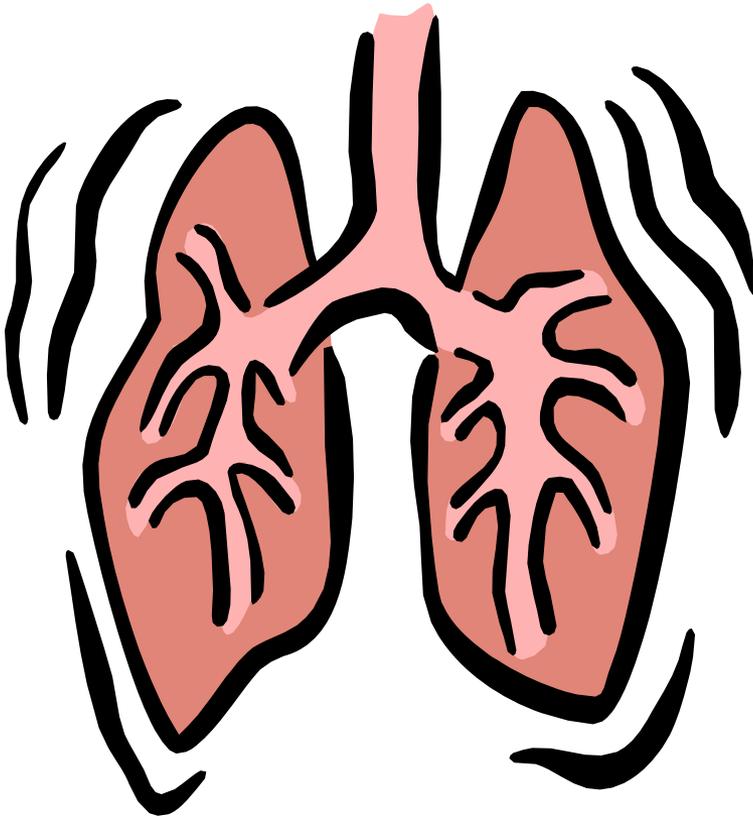
Very mild

Mild

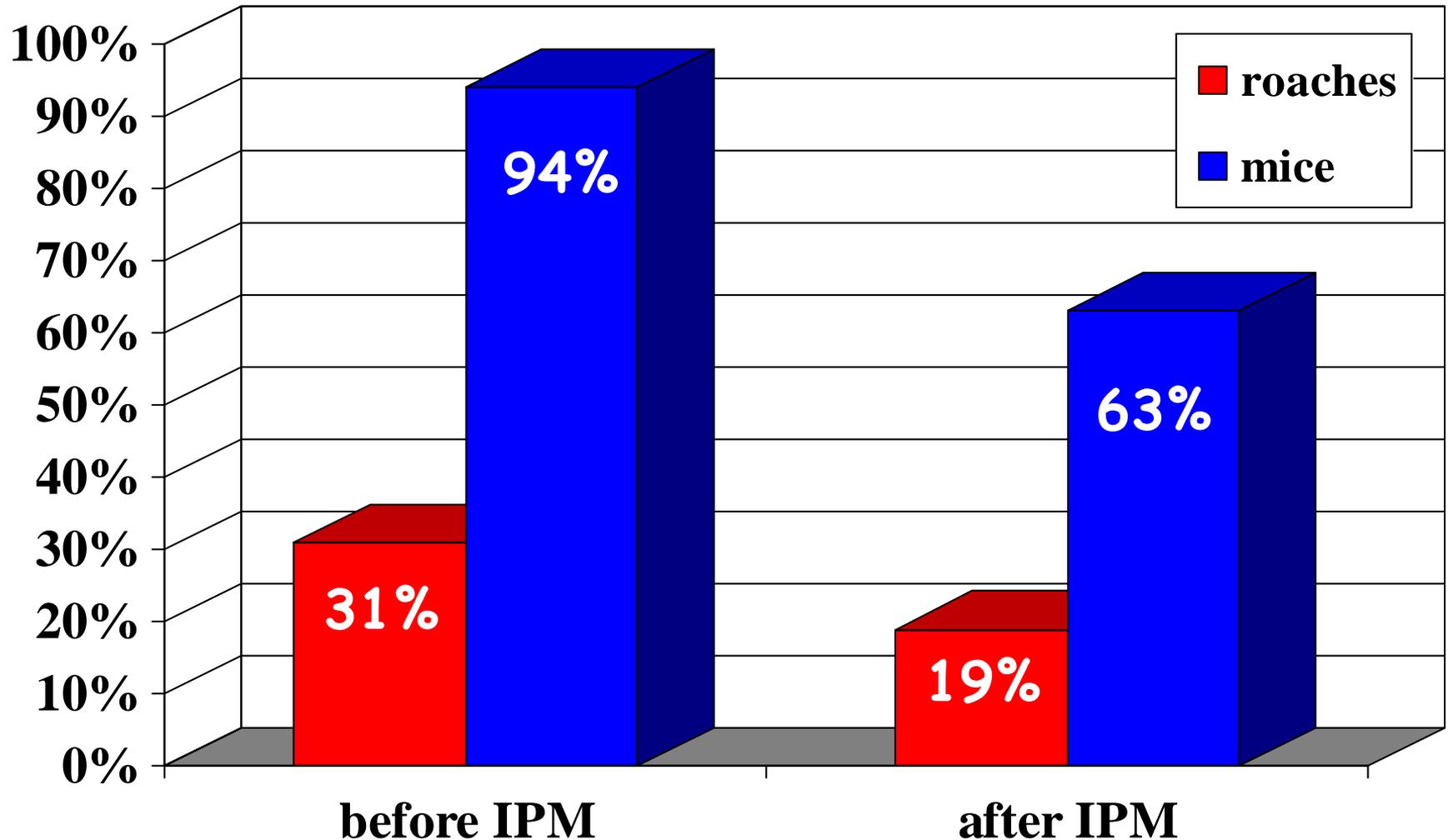
Moderate

Severe

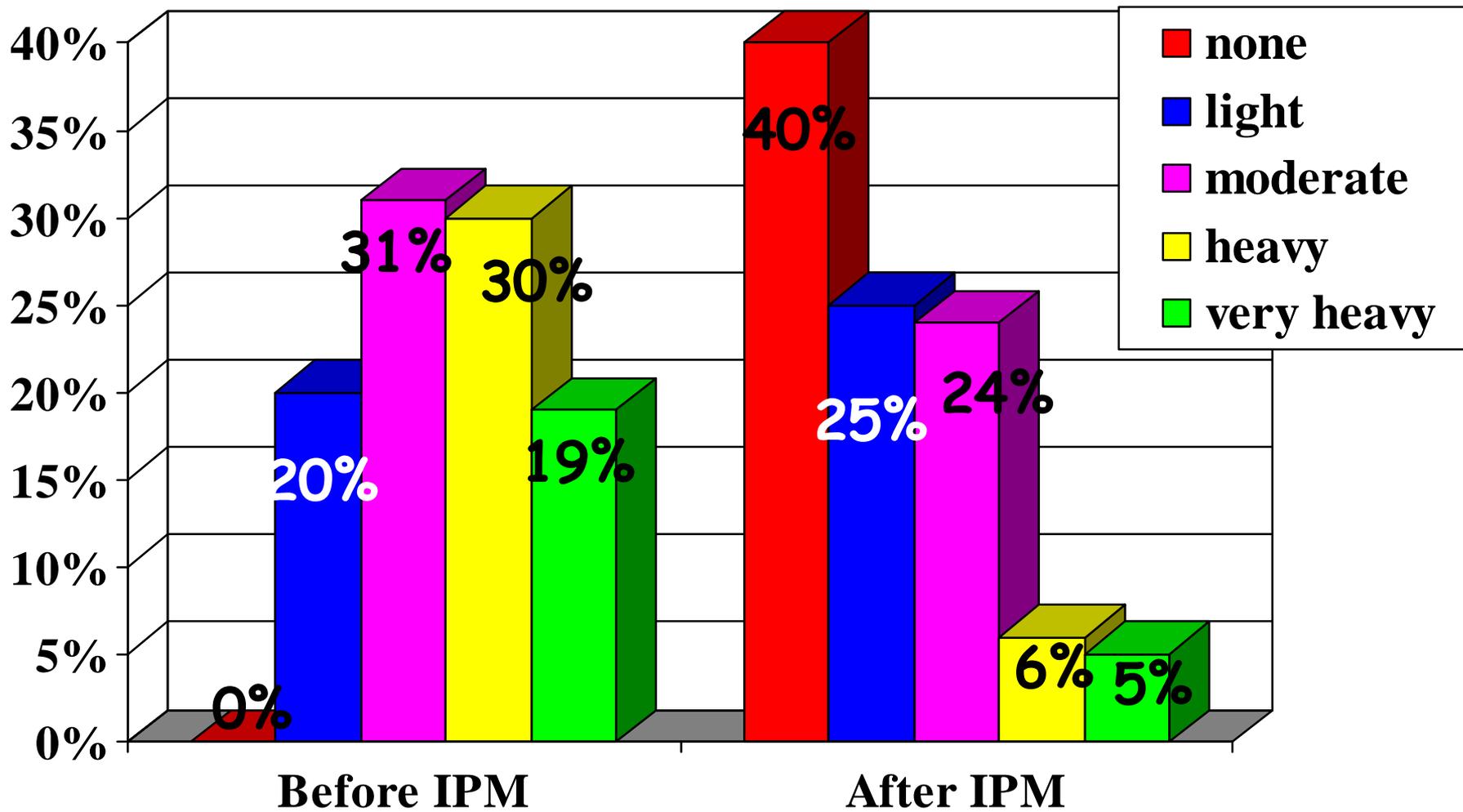
Very severe



# Infestation rates before and after IPM service



# Mouse infestation levels (for participants with known mouse problem)



# Infestation self-rating vs. MUP levels in dust before IPM

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Self-rating	MUP level (ng/G)
None	18
Light	629
Moderate	2,777
Heavy	5,965
Very Heavy	23,091

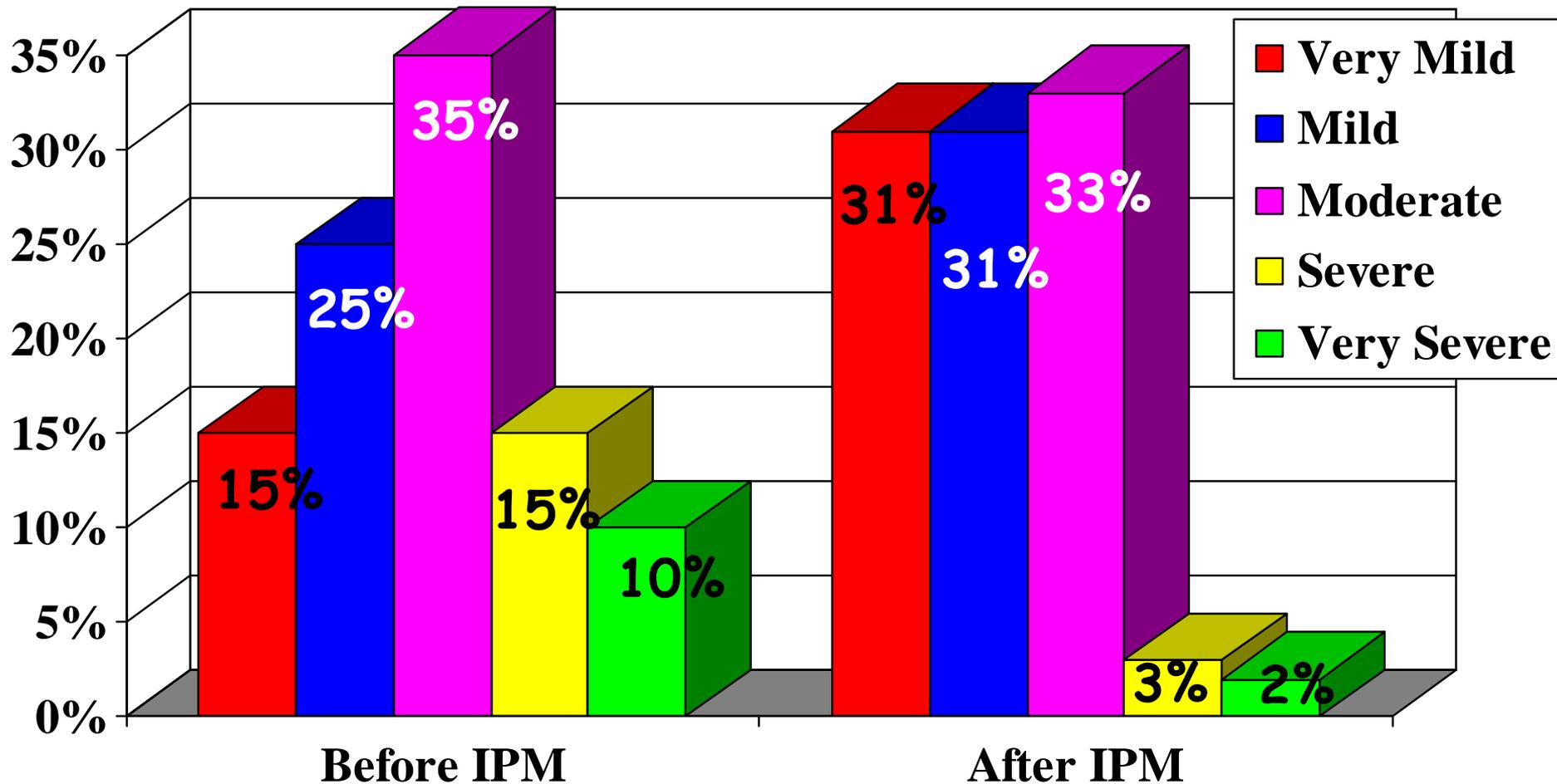
# Infestation self rating vs. MUP levels in dust before IPM

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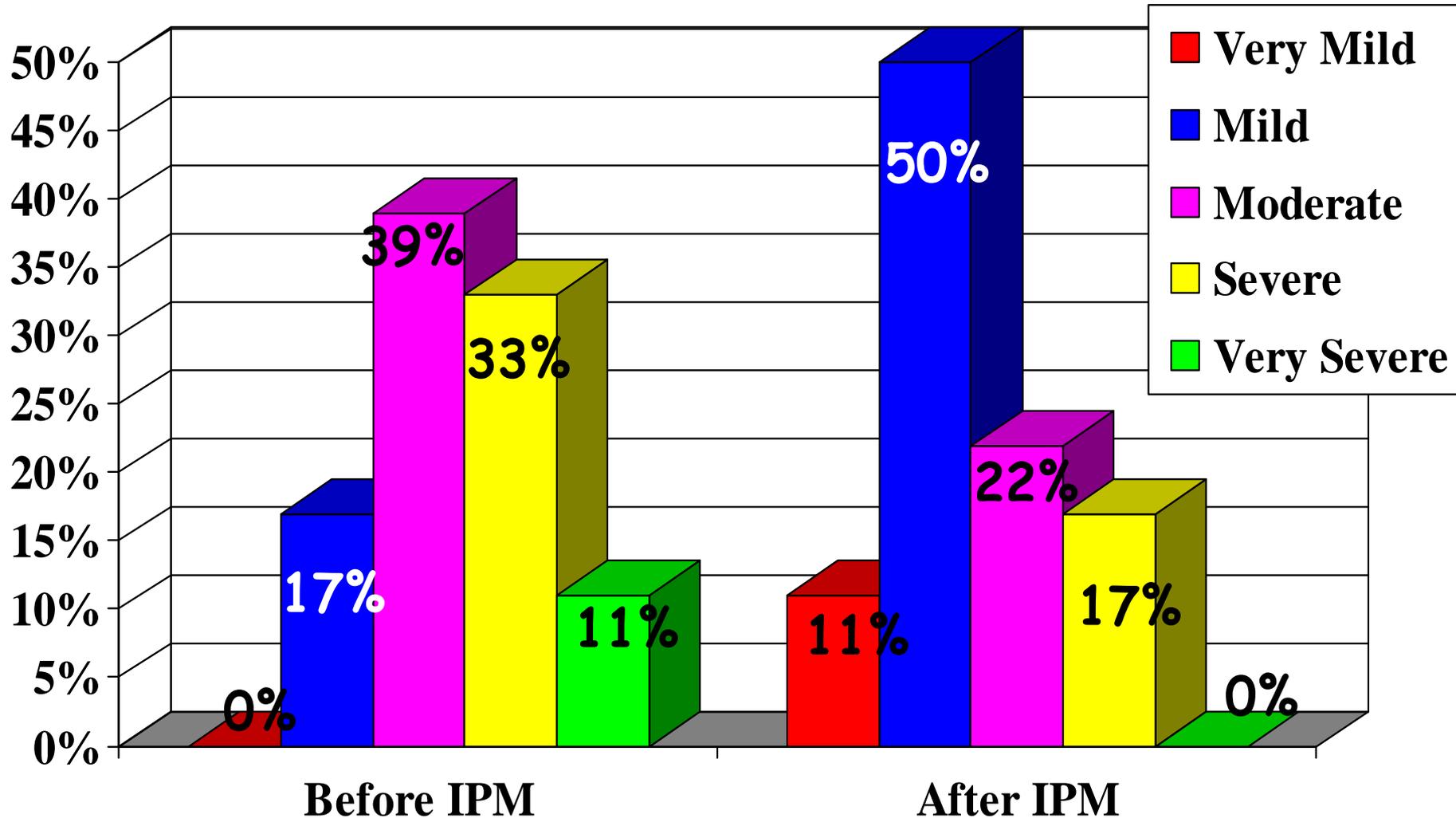
Baseline rating	MUP level
None, light, moderate	1,213
Heavy, very heavy	14,737

P=0.009

# Asthma self-rating 0-6 months after IPM



# Asthma self rating 7-13 months after IPM



# Symptom Days

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<b>Baseline rating (before IPM)</b>	<b># Days Wheezing in 2-wk period</b>
<b>Very mild, mild, moderate</b>	<b>3.2</b>
<b>Severe, very severe</b>	<b>6.2</b>

P=0.005

# Public Health Implications

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- Parental report of pests correlated very highly with inspector report of pests, and with dust allergens at baseline.
- Parents are accurate reporters of pest infestation and consistent reporters of asthma severity. These findings have implications for further studies where expensive allergen testing or repeated asthma symptom assessment may not be required.
- Delivery of a successful, low cost program to an inner-city population disproportionately burdened by asthma is possible:
  - 58% of HH families African American, 31% Latino
  - 47% of participants born outside the U.S.
  - 52% of families utilize Sec. 8 voucher

# Boston Healthy Homes Program: Part 2

Asthma Regional Council of New England

Boston Public Health Commission

Boston Medical Center

ERT Associates



Megan Sandel MD MPH

Emily Litonjua MA

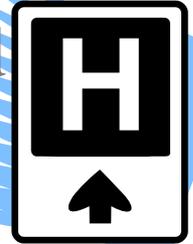
Margaret Reid RN

Ellen Tohn MCP



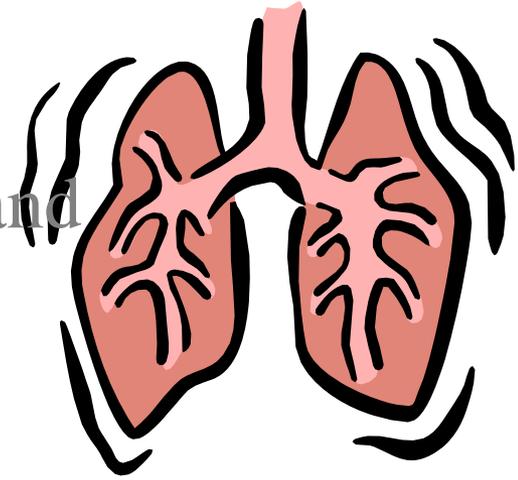
# Asthma and Housing

- **Healthy Homes** Grant from Department of Housing and Urban Development (HUD) to Asthma Regional Council of New England
- Two main components to grant
- **Education** on housing improvements and change in housing policy (>2,000 units annually)
- **Home improvements** for asthmatic children in both **rural** and **urban** settings
- Boston Public Health Commission (BPHC) was the site for the urban demonstration study



# Boston Site study

- **Designed** to determine if varying levels of housing interventions improved symptoms, medication and health care in asthmatic children
- **Enrolled** children age 0-17 with doctor diagnosed asthma
- **Partnered** with two Community Development Corporations (CDCs) Nuestra Comunidad and Urban Edge to identify and recruit families.
- Also home visiting cases from BPHC and other referrals accepted



# Housing Interventions



- Families recruited from CDCs were randomized to two groups, others were enrolled into one of two groups (education alone or home intervention groups)
- Education alone received the home intervention after 4 months
- The **education** included pest control supplies and smoking cessation
- The **home intervention** was \$2000 per unit to reduce asthma hazards including carpet removal, ventilation improvements and professional integrated pest management

# Study Methods

- At baseline, interim and 4 months after intervention families had
  - Home inspections done by a trained healthy home inspector
  - Environmental interview done by health educator about conditions and housekeeping practices
- Educator also called the family every two months to monitor asthma symptoms, medication use and health care utilization



# Study Results

- 75 homes were recruited
- 105 children with asthma
- 3 families moved and were kept in the study and homes re-evaluated
  - CDC families delayed (n=15)
  - Home SAFE BPHC families (n=14)
  - CDC families intervention first (n=24)
  - Other referrals who received intervention first (n=22)

DUST MITE



# Study Results

- 67 families received home interventions
  - 8 families dropped out prior to intervention
  - 5/8 moved, 2/8 landlords did not cooperate, 1/8 did not respond to multiple contacts
- Follow up was completed on 56 homes
  - 11 families were not available for follow up inspections and interviews
  - 5/11 families moved, 6/11 did not respond to multiple attempts to contact



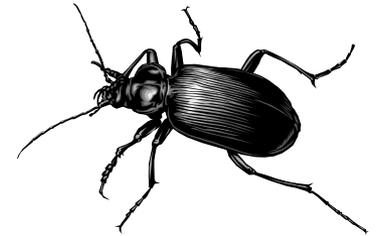
# Demographic Results

- 90% renters, 30% Section 8
- Study served a diverse population
  - 38% of caregivers born outside U.S.
  - 26% Spanish, 9 % Haitian Creole as primary language
  - 45% had a high school education or less
  - 42% African American, 36% Latino  
12% Caribbean, 7 % Other



# Environmental Results

- 68% reported a mouse problem at baseline
- Less than 20% cockroach problem
- 38% had at least one pet
  - 11% Bird
  - 19% Cat
  - 4% Dog
  - 4% Other
- 29% had a at least one smoker



# Home Interventions

- 76 % needed IPM
- Most frequent interventions
  - 40% carpet removal
  - 36% bathroom fan
  - 12% HEPA filter
  - 10% Kitchen fan
  - 15% window fan
- 6 % needed more IPM
- Average cost per unit \$1870



VENTILATION  
FAN

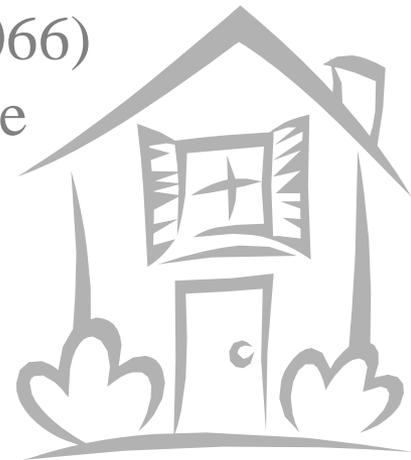
# Housing Conditions Improved

- Many housing conditions improved:
  - Reduction in average mouse infestation scores from 1.5 to 0.7 ( $p=0.02$ )
  - Reduction in mold in bathrooms ( $p=.01$ )
- Education did not show changes
  - No change in mopping, vacuuming, sweeping
  - No change in use of air fresheners, scented or unscented candles



# Asthma Symptoms Improved

- **Asthma symptoms improved after intervention**
  - Fewer days of symptoms over 2 weeks (38% vs 23%) ( $p < .001$ )
  - Stopped play for asthma over 2 weeks (21% v. 8%) ( $p < .001$ )
- **When compared with education alone, intervention children improved more, trending toward significance**
  - Fewer symptoms (-15.3% vs. -6.8%) ( $p = .287$ )
  - Stopped play (-12.8% vs. -0.9%) ( $p = .066$ )
  - Limited by asthma more than 50% time (-3.0% vs. +0.7% ) ( $p = 0.058$ )



# Medication Usage Improved

- **Asthma medication usage improved after intervention as well**
  - Need for quick relief medication usage over 2 weeks (67% vs. 48%) ( $p=.024$ )
  - Quick relief medications more than twice a week (44% vs. 34%) ( $p=.226$ )
- **When compared with education alone, intervention children improved more, trending toward significance**
  - Quick Relief more than twice a week (-10% vs. +11%) ( $p=.185$ )



# Limitations

- Due to limitations of the recruitment within the grant period, not all families were randomized, so education only comparison group may be different
- Small sample size may limit finding of significant results
  - Difficult to examine health care usage
  - Difficult to adjust for seasonal variation and change in meds



# Conclusions

- It is possible to do a “streamlined” process of home assessment and intervention working with Community Development Corporations (CDCs) and other landlords
- Home based interventions appear to improve asthma symptoms and medication usage
- Future programs should link medical, public health and housing services to address asthma housing hazards as part of treatment



# Thank you to Our Partners

- Asthma Regional Council of New England
- Boston Public Health Commission
- ERT Associates (Ellen Tohn)
- Nuestra Comunidad
- Urban Edge
- Don Rivard Associates (Integrated Pest Management Services)
- Boston Housing Authority
- Inspectional Services Department
- National Center for Healthy Housing



B O S T O N

# Building Healthy Public Housing Communities

**High  
Point**

Healthy Homes and Community  
sức khỏe trong nhà và cộng đồng

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Caafimaadka guryaha bulshada



**Jim Krieger, MD, MPH**

Public Health – Seattle & King County

**Denise Tung Sharify**

Neighborhood House

**September 2008**



# Thanks to....

- **Our Colleagues**

- ◆ Janice Rabkin, PhD, MPH
- ◆ Tim Takaro, MD, MS, MPH
- ◆ Tom Phillips
- ◆ Lin Song, PhD
- ◆ Rose Long

- **Our Partners**

High Point residents, High Point Medical Clinic, International District Housing Alliance, SafeFutures Youth Center, Seattle Housing Authority, Seattle Public Utilities

- **Our Funders**

- ◆ National Institute of Environmental Health Sciences
- ◆ Department of Housing and Urban Development

# Program Aim and Values

- **Develop new approaches to building social and physical environments that improve health for a multi-ethnic, low-income public housing community**
- **Values**
  - ◆ **Reducing Health Inequities**
  - ◆ **Addressing Environmental Determinants of Health**
  - ◆ **Empowering Residents**
  - ◆ **Promoting Critical Thinking**
  - ◆ **Building Intergenerational and Intercultural Connections**
  - ◆ **Seeking Simplicity and Flexibility**



# Community-Resident-Institutional Partnership



Research

Community Residents  
Bilingual Para-professionals

Housing Authority



IDHA

SFYC

**SPU**



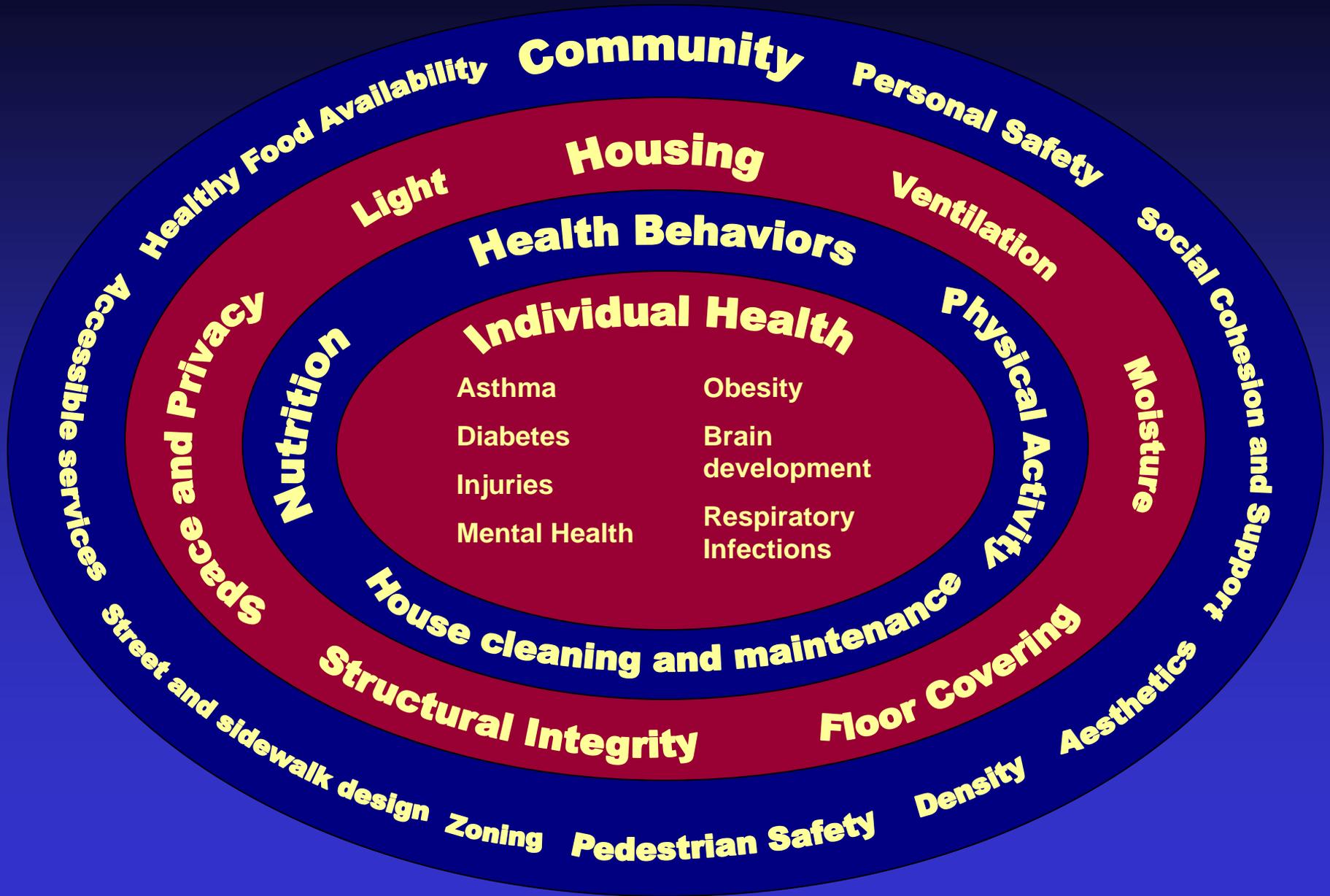
Community Based Organizations



HOAS

**Feet  
First**

# Determinants of Health



# Housing and Health

**Many diseases and health behaviors are affected by housing quality:**

- ◆ Asthma
- ◆ Injuries
- ◆ Mental Health
- ◆ Brain development
- ◆ Respiratory Infections

**Attributes of housing that affect health include:**

- ◆ Ventilation
- ◆ Flooring
- ◆ Paint and finishes
- ◆ Construction products
- ◆ Moisture barriers
- ◆ Space and privacy
- ◆ Light
- ◆ Noise

# Example:

## Asthma and Housing

- Indoor asthma triggers increase asthma morbidity.
- Substandard housing increases exposure to asthma triggers.
  - Excessive moisture and water damage (mites, mold, roaches)
  - Breaks in walls (roaches and rodents can enter)
  - Poor ventilation (higher allergen and tobacco smoke levels)
  - Deteriorated carpeting (reservoir for triggers)
- Resident behaviors also affect housing conditions.
  - Cleaning
  - Hazardous household products
  - Smoking
  - Pets



Mold due to leaky roof

# Example: Community Environment and Obesity

- **Easy to walk and bike**
  - Physical safety
  - Aesthetics
  - Paths and trails
  - Connectedness
- **Access to affordable, healthy foods**
  - Full service supermarkets
  - Farmers markets
  - Gardens



# High Point Overview



Property of Museum of History & Industry, Seattle

Originally built for military workers during WWII;  
became low income housing in 1953

# High Point Overview

- 716 deteriorating housing units replaced with 1600 mixed income units
- 35 Breathe Easy Homes for children & families with asthma



High Point Redevelopment  
Phase I (north) and Phase II (south)

# High Point Overview



## High Point, 2004

Residents reported water damage, condensation, mold and mildew, pests (mice or rats) crime and lack of pedestrian safety



## High Point, 2006

Guided by principles of New Urbanism with mixed income housing built with “BuildGreen™” materials

# **A Healthy Social Environment**

- **Community Projects to Build Community Cohesion and Promote Healthy Environments**
  - Making Healthy Home visits to neighbors
  - Cleaning staircase to link walking trails
  - Organizing walking groups
  - Developing walking maps
  - Organizing for pedestrian safety
  - Promoting use of walking trails: maps, signs
- **Projects led by Action Teams**
- **Action Teams use empowerment and critical thinking approaches**

# **Community Action Team Building community capacity**



**Diverse community includes youth and seniors,  
immigrants and refugees who speak English, Spanish,  
Vietnamese, Cambodian, Somali, & Amharic**

# Walking Groups

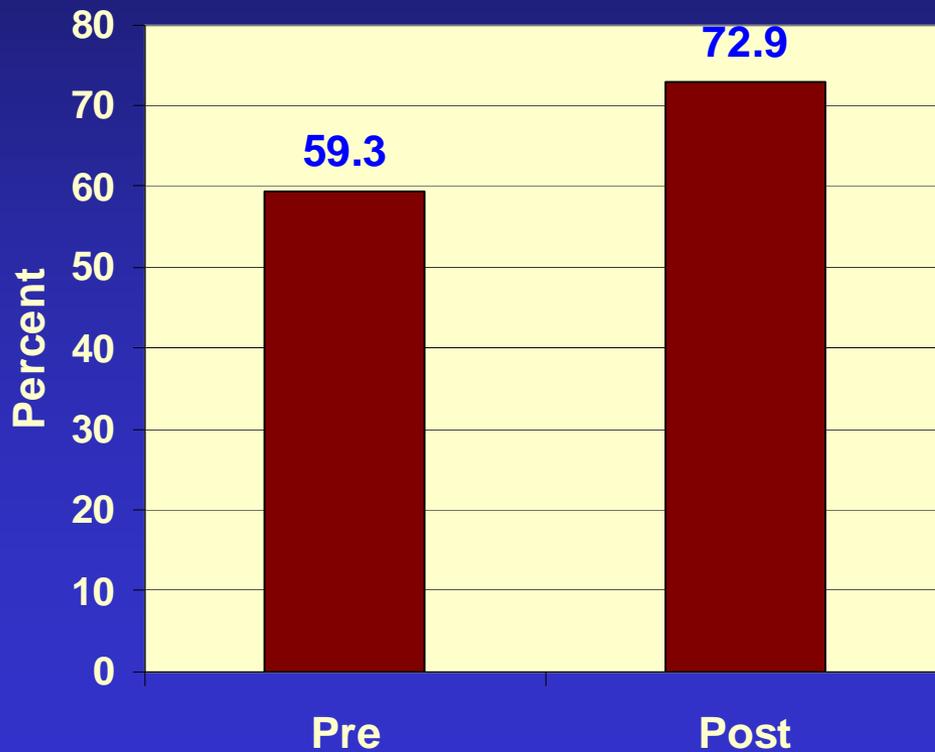
- ◆ Led by residents and community partners
- ◆ Two to five times a week
- ◆ Goals:
  - Promote physical activity
  - Prevent chronic illness (diabetes, high blood pressure, obesity)
  - Meet neighbors, build community
  - Be the eyes and ears of community

# From our weekly walks



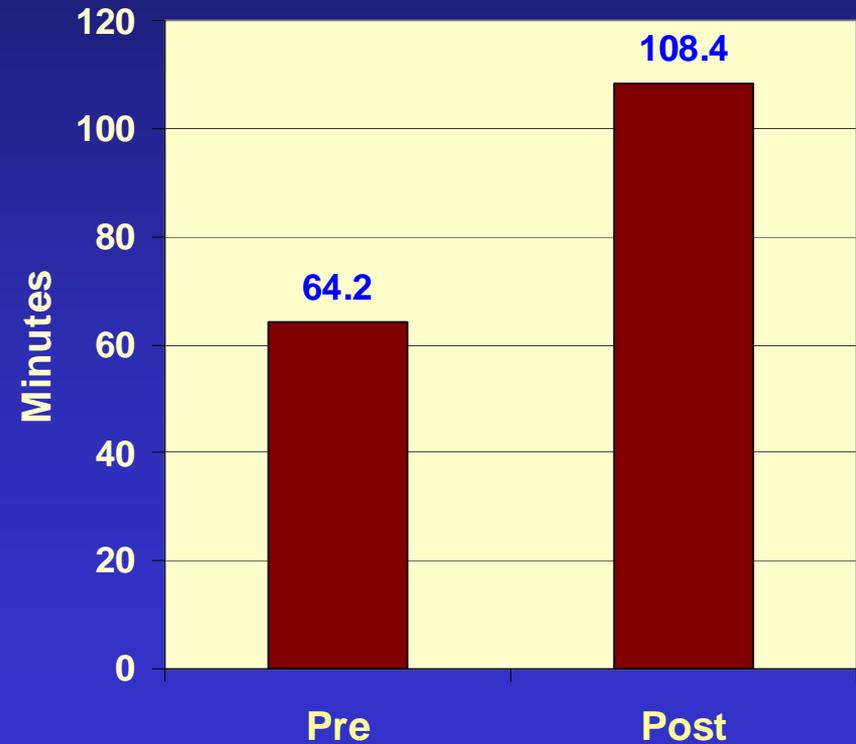
# Walking Groups

Meeting Recommended Level of Moderate/Vigorous Physical Activity



$p = 0.103$

Minutes Walked per Day



$p = 0.000$

# Walking Map

- ◆ **Encourage people to walk**
- ◆ **Meet neighbors**
- ◆ **Know what is going on in the community (i.e., graffiti, trash in public spaces, etc.)**
- ◆ **Developed in partnership with Public Health and community partners**

# Educational Workshops

## Goals:

- ◆ Provide education focusing on environmental justice, health, and other community priorities.
- ◆ Connect to available community resources.

# **Sample Monthly Activities**

**1/26 – Pedestrian Safety**

**3/13 - Community Workshop: Forming a Walking Group**

**4/12 – South Park Transfer Station tour**

**5/11 – API Heritage Celebration**

**6/20 – Duwamish River orientation**

**6/26 – Duwamish Boat Tour and Marra Organic Farm Picnic**

**7/18 – Improve your Recycling IQ**

**8/05 – Healthy Homes & Healthy Living Fair**

# It's FUN!



# **Community Gatherings**

**Provide venues to discuss concerns,  
help each other, connect to resources  
and have fun!**

**Vietnamese tea group**

**Cambodian association**

**Somali coffee group**

**Community potluck**

# Building Healthier Communities



8 year old resident's image of a healthy community

# A Healthy Physical Environment

- Walkable streets
- Network of open spaces and trails
- Spaces for social interaction
- Tobacco-free units and zones
- Community gardens
- Access to transit
- Low-allergen landscaping
- Greenbelt and wetland sustenance
- Watershed protection





**Old High Point Street**



**New High Point Street**  
Note separation between cars and pedestrians, plantings, porch on street

# Staircase Renovation Project



# Improving Pedestrian Safety

- **Photo Voice assessment and data gathering by the Community Action Teams identified community concerns.**
- **In response, four community forums and a street rally were held from 2005 – 2007 to give residents a chance to voice their concerns to government officials.**

# **ACCOMPLISHMENTS**

## **At Major 4-Lane Arterials**

- **School bus stop was changed so middle school students did not have to cross arterial**
- **Student Crossing Signage and Crosswalk were installed for elementary school students**
- **Pedestrian crossing time at a walk light was lengthened at busy crosswalk**
- **Full traffic light installed at busy intersection  
Speed radar monitors to be installed THIS MONTH!**

# Parking restriction and permanent center line implemented at busy street



# Ongoing Concerns & Advocacy

- ◆ Increased traffic due to increased housing density
- ◆ Increased vehicle accidents
- ◆ Speeding vehicles through the new neighborhood
- ◆ 3 vehicle-related deaths in less than two years

# Building Healthier Housing



**Old High Point  
Housing**

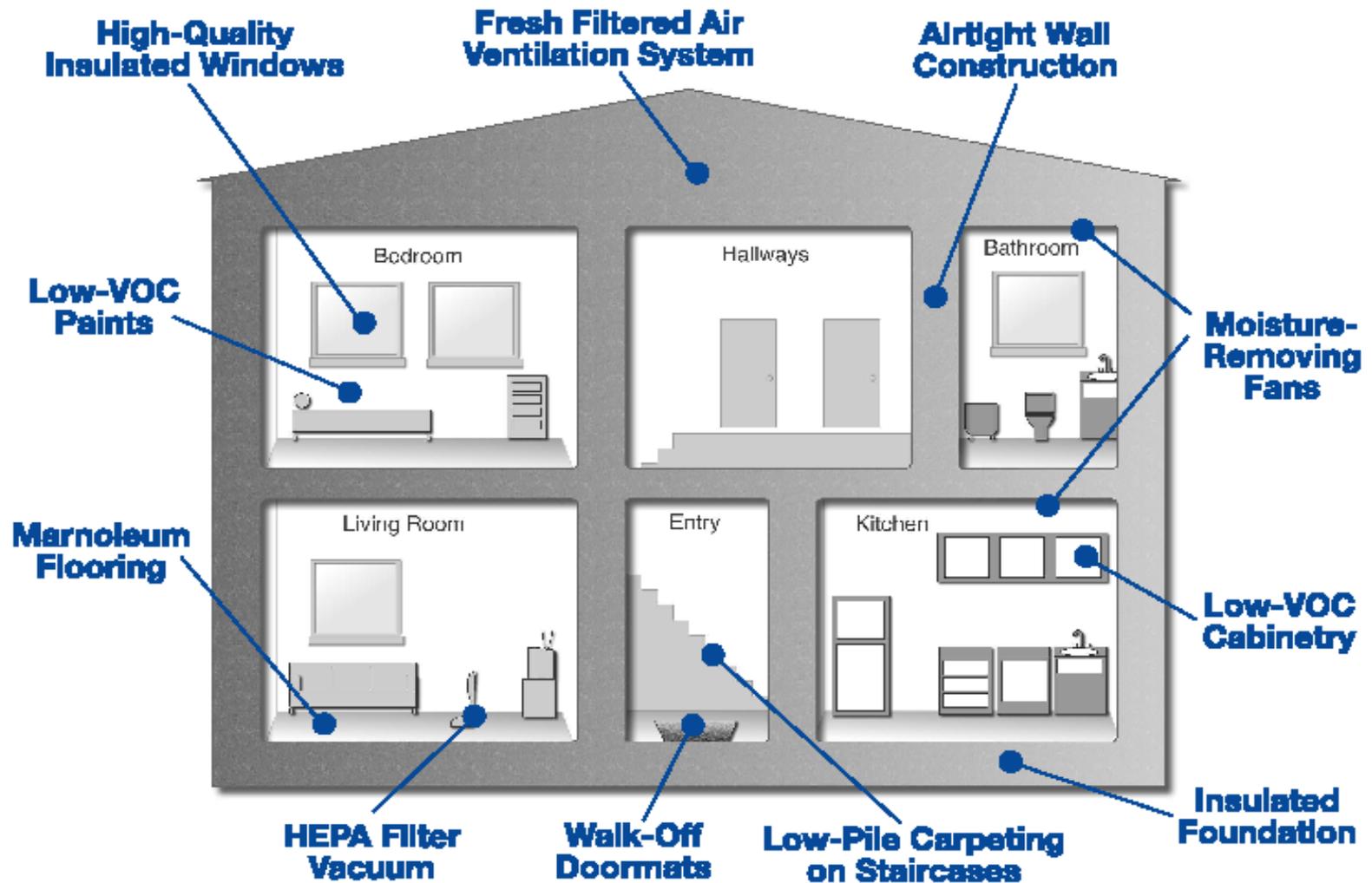
**New High Point  
Breathe Easy  
Home**



# **Breathe Easy Homes: Building New Asthma-Friendly Homes**

**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)
- Radiant/Hydronic baseboard heat to decrease humidity



**HIGH POINT BREATHE EASY HOMES**





FB1 T2

8-2604 COLUMBIA MAR 05

Square D

100 AMP







# Breathe Easy Homes: Providing Resident Support

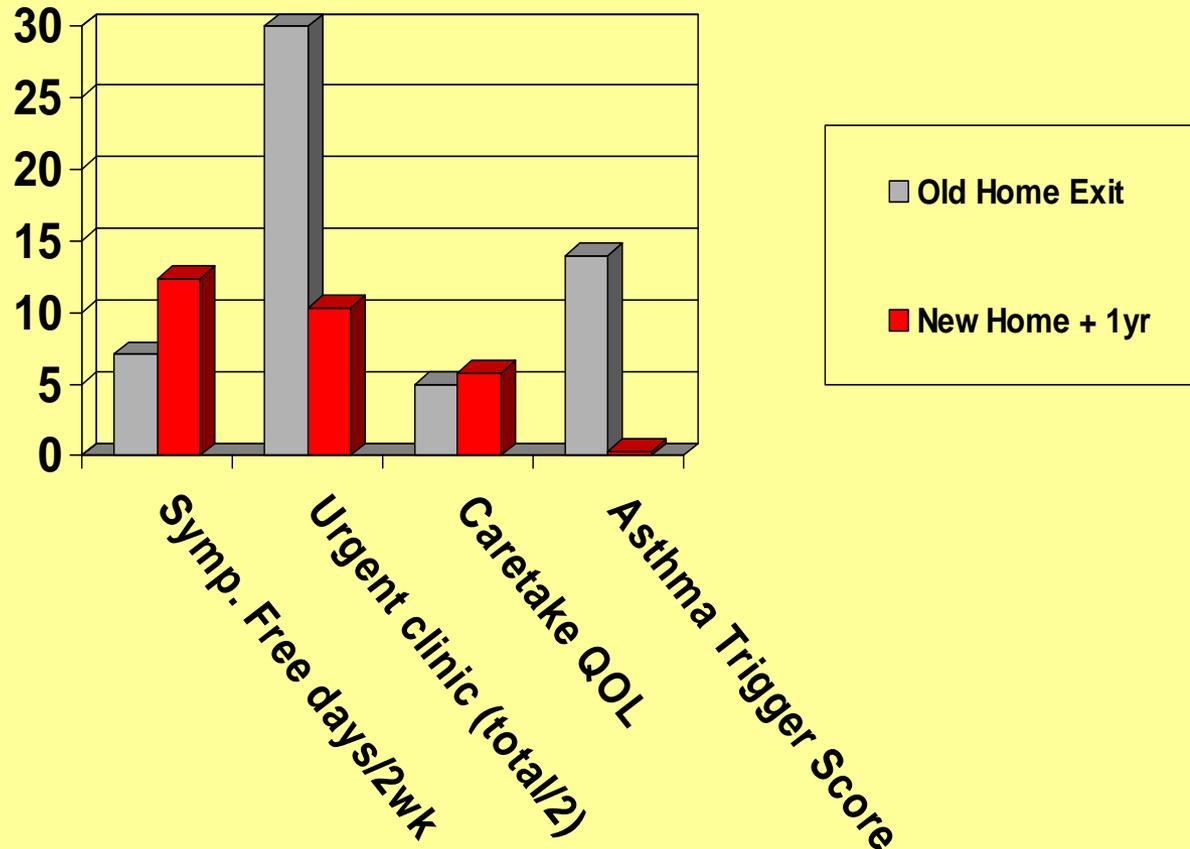
- Home visits provided in five languages: English, Vietnamese, Cambodian, Spanish and Somali by bilingual Community Health Workers
- Education includes how to maintain new home and reduce asthma triggers
- Resources include a vacuum, green cleaning supplies, doormat and steam cleaning of furniture
- Mutual housing agreements
  - ◆ No smoking, pets
  - ◆ Use of ventilation
  - ◆ SHA maintenance



# Clinical Outcomes

Asthma Clinical Endpoints	Old Home	New Home	$\Delta$	
	n= 35	n= 34	$\Delta$	p
Symptom-free days / 2 weeks	7.6	12.4	+4.8	.004
Caretaker quality of life	5.0	5.8	+0.8	.002
Urgent clinical care (% in past 3 months)	61.8	20.6	-41.2	.002
Rescue medicine use/2 weeks (mean)	6.0	1.9	-4.1	0.0002
Activity limitation days/2 weeks (mean)	4.0	1.2	-2.8	0.010
Symptom nights/2 weeks (mean)	4.5	1.0	-3.5	0.001
Asthma attacks/3 months (mean)	6.0	1.1	-4.9	0.007

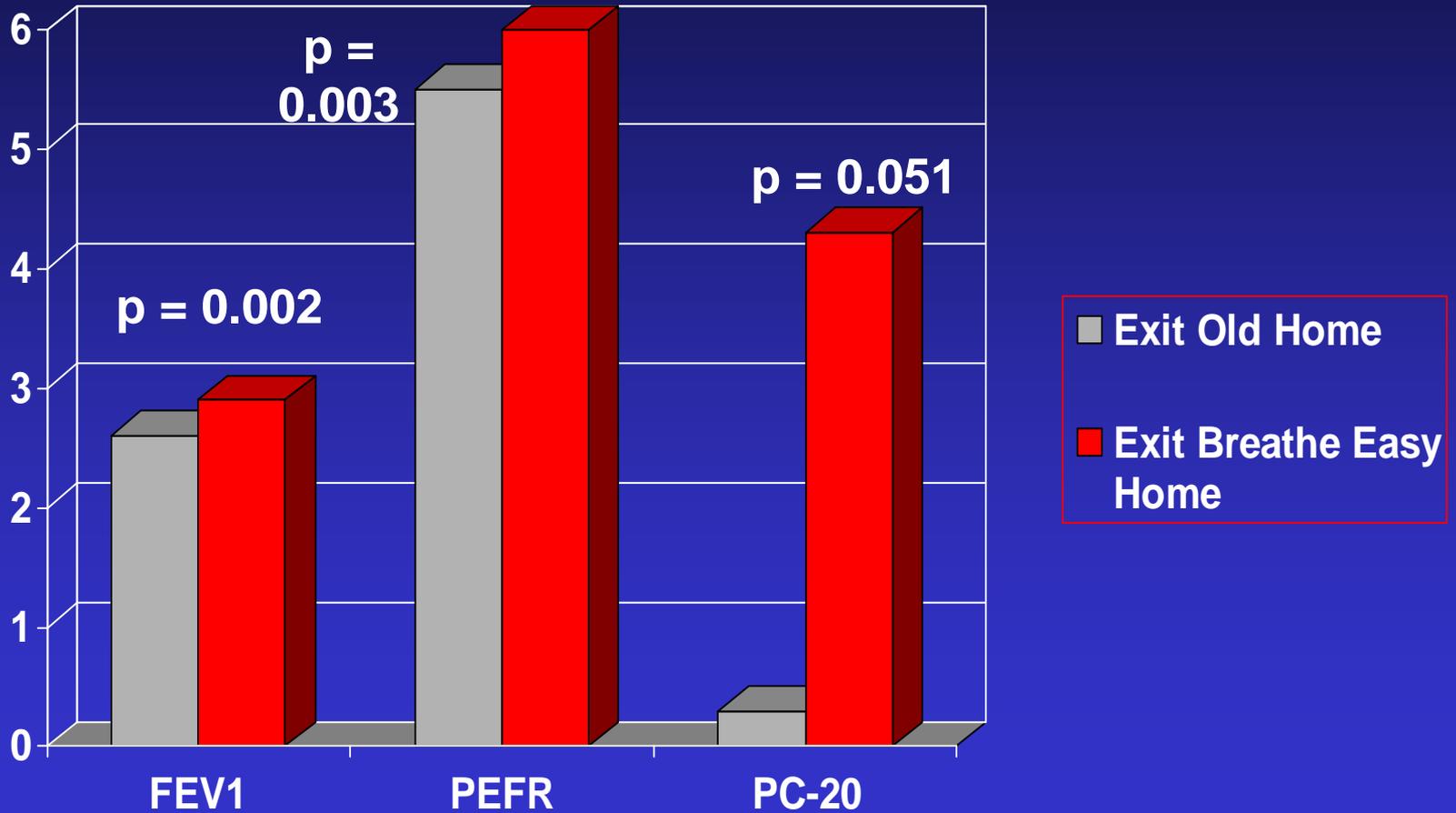
# Clinical Outcomes



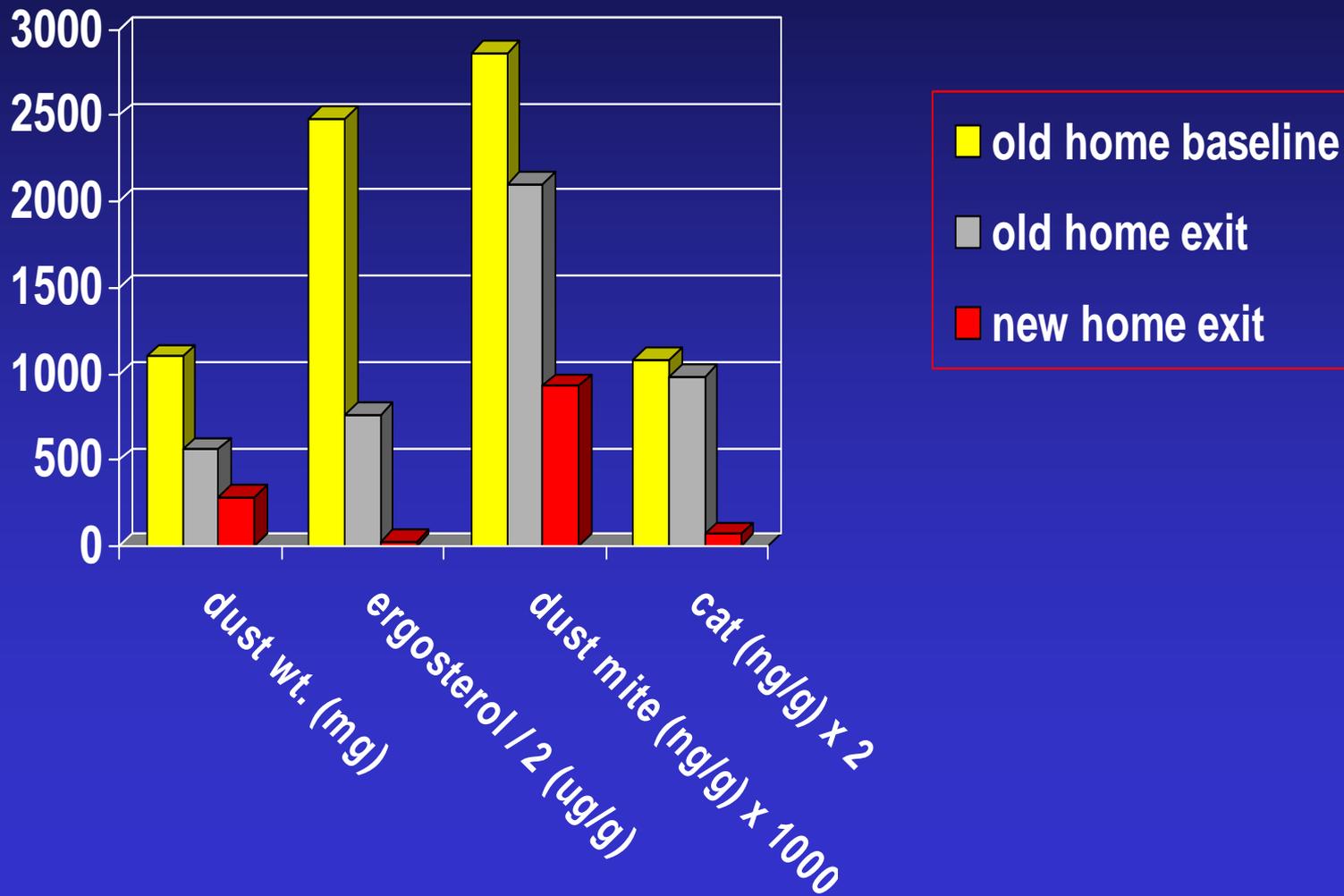
\*  $p < 0.004$

Old Home to New Home +1 yr.

# Breathing Tests



# House Dust Measures from Child's Bedroom Floor



# Evaluation

- **Partnership process evaluation**
- **Quantitative impact assessment**
  - **Baseline survey (2005)**
  - **Follow-up surveys (2008 and 2010)**
  - **Measures**
    - ◆ **Health status, physical activity, safety**
    - ◆ **Social capital, networks and cohesion**
    - ◆ **Perceptions of built environment**
- **Qualitative impact assessment**
- **Unobtrusive measures**
  - **Quality of built environment**
  - **Social interaction (e.g. benches, lighting)**
  - **Recreational use (e.g. paths, parks)**

# Baseline Survey: Sample Items

Item	Percent
There are many attractive natural sites in my neighborhood (% agree)	58%
There is so much traffic that it makes it difficult or unpleasant to walk in neighborhood (% agree)	52%
There are crosswalks and pedestrian signals to help walkers cross busy streets (% DISagree)	43%
How likely is that your neighbors would do something if they saw school children hanging out and skipping school (% likely)	43%
Doing moderate physical activity at least 5 days per week for at least 30 minutes	9%
Mold in homes	45%
Mice or rats in home	35%

# Qualitative Impact Assessment

**“This is community building. I feel safer getting to know everyone. We like walking together.” (Walking group)**

**“We learn about safety, living healthy & celebrate our culture.” (Ethnic tea & coffee times)**

**“Before it was a chore... now I come to be heard ... the healthy kiosk at the pond is our idea.” (Youth action team)**

**“We need more cross walks & lights...you’re taking your life in hand when you try & cross the street” (Pedestrian safety committee)**

# Conclusions

## Impact on Social Environment

- Better networking and connection with other residents
- Better access to community providers and services
- More involvement on leadership councils
- Increased social capital
- Safer streets and walking groups = more walking in community



# **Conclusions**

## **Impact on Built Environment**

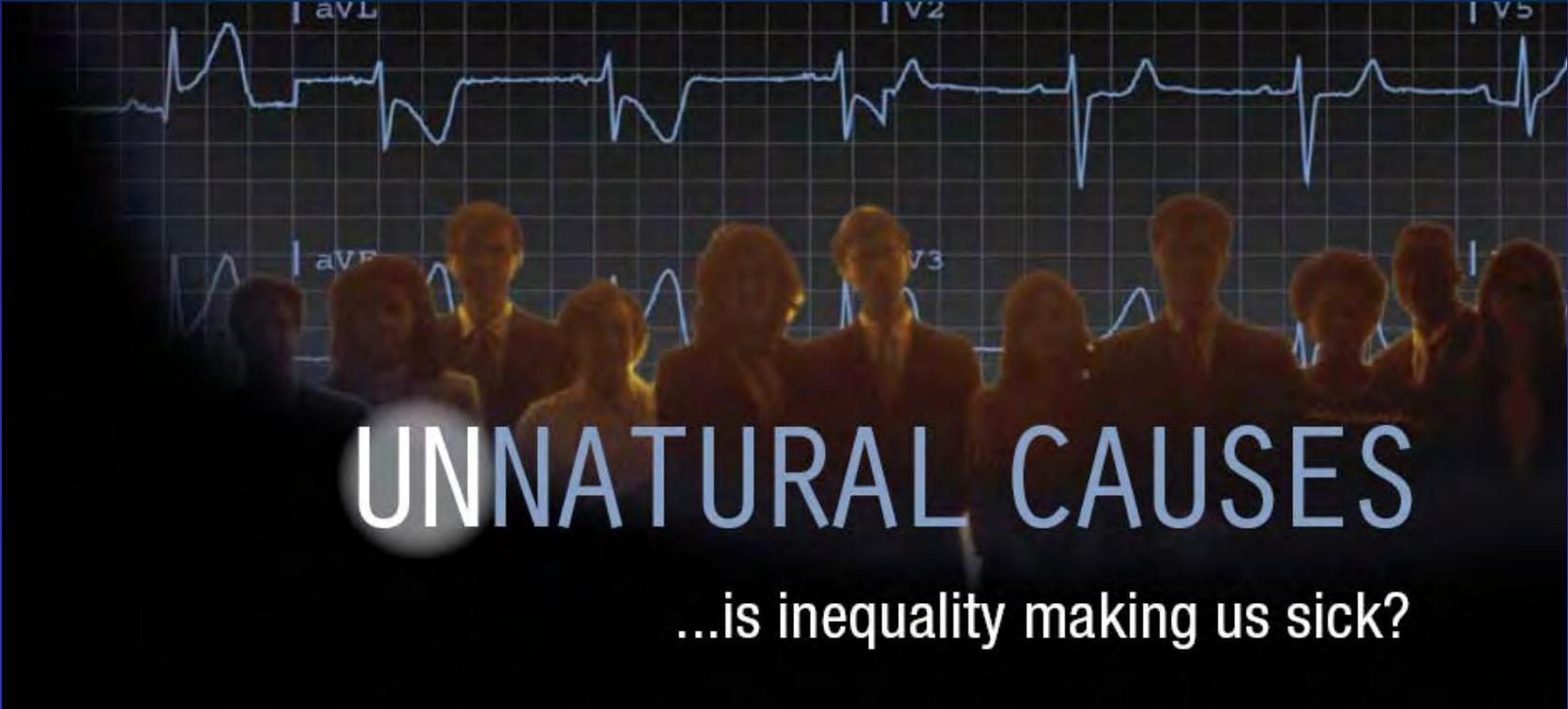
- **Breathe Easy Homes: Improved asthma control**
- **Pedestrian Safety: Street improvements accomplished**
- **Complete Streets and New Urban Design: Evaluation pending**
- **Community Garden: Fully used**

# Next Steps

- **Sustain successful activities by community partners**
- **New 5-year NIH grant to promote physical activities and healthy living**
- **Build 25 more Breathe Easy Homes**
- **Continued advocacy for pedestrian and driver safety**

**For more details...**

[www.unnaturalcauses.org](http://www.unnaturalcauses.org)



**UNNATURAL CAUSES**

...is inequality making us sick?