

Asthma and Housing

What's the Evidence


What Can We Do?

Margaret Reid, Director, Asthma and Diabetes Prevention and Control

Emily Litonjua, Senior Program Manager for Healthy Homes

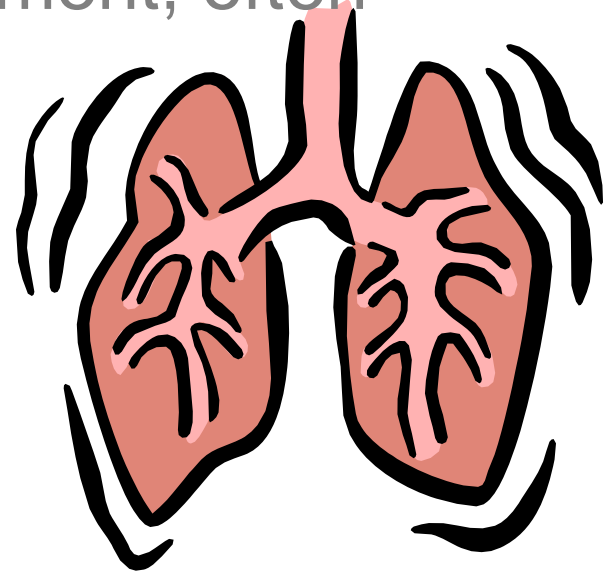
Megan Sandel, MD MPH, Boston Medical Center and Boston University
School of Public Health, National Healthy Homes Training Network, NCHH





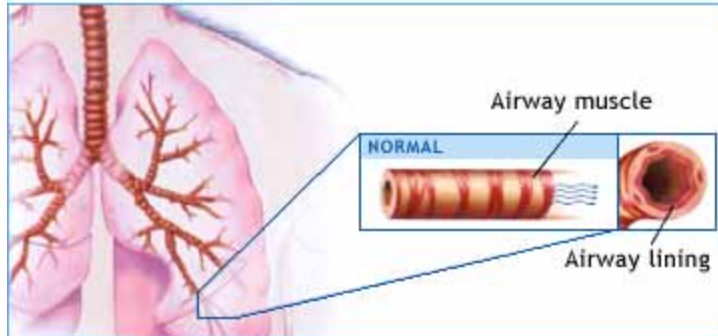
What is Asthma?

- **Asthma** is a chronic disease of the medium and small airways in the lung
- These airways are hypersensitive to certain “triggers” in the environment, often **irritants or allergens**
- **Asthma** cannot be cured but can be controlled through **environmental changes and medication**

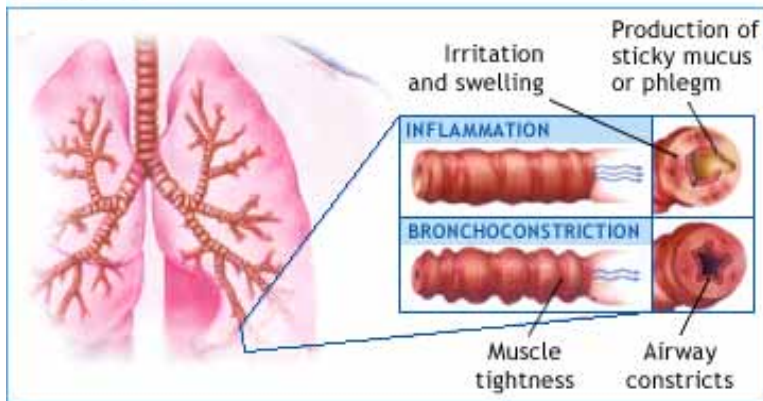


Asthma is a Serious Disease

Normal



Asthmatic

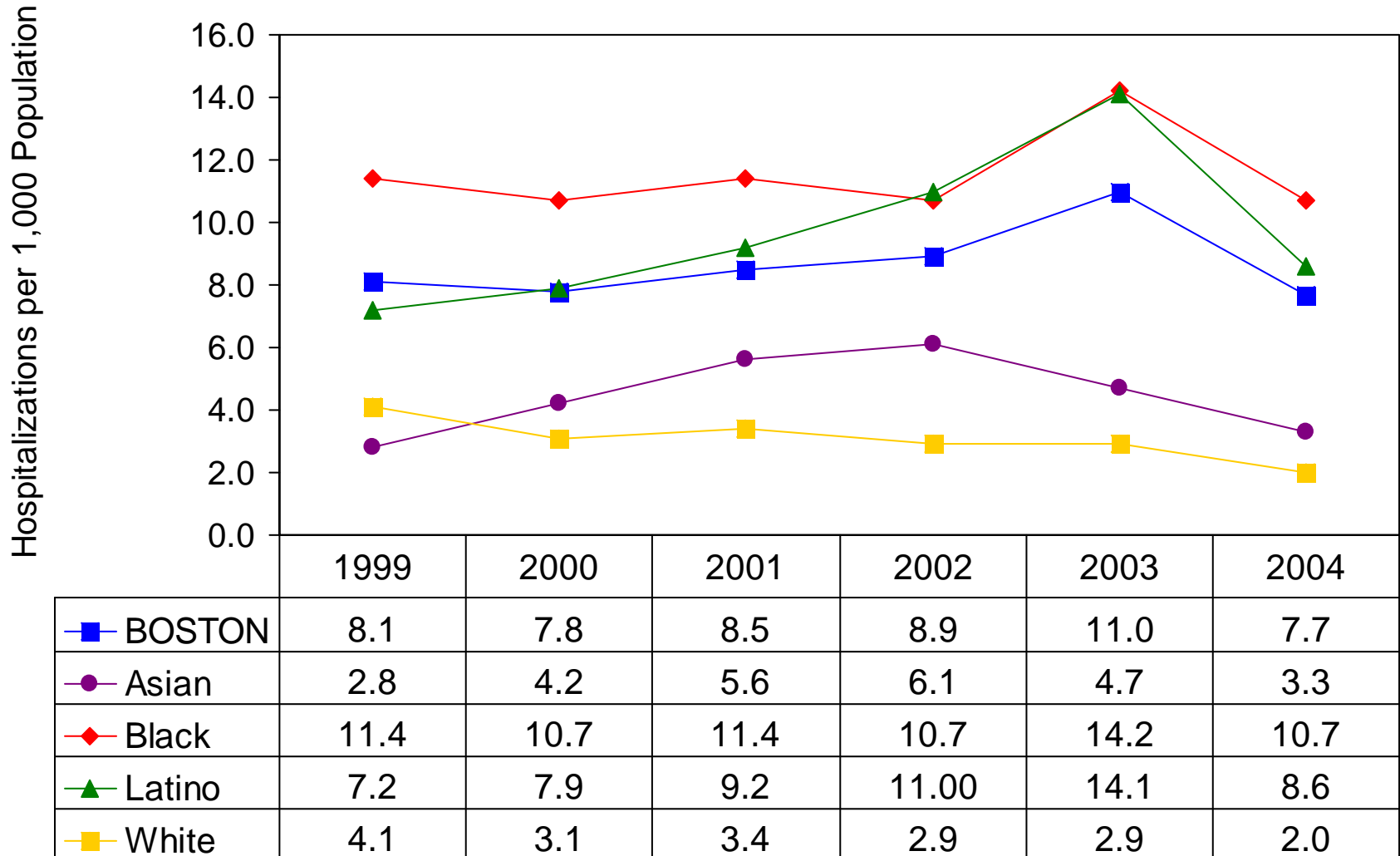


- Asthma attacks are allergic reactions to triggers or exposures
- The airways **swell** and fill with mucus and secretions
- The muscles around the airways contract and **spasm**
- Airways can collapse causing shortness of breath, **even death**

Why do we care about Asthma?

- Asthma rates have increased from 13.7/mil in 1993 to 17/mil in 1998
- Massachusetts has among highest asthma rates in the US
- 3 million lost work days and 10 million lost school days each year
- Burden higher in minority populations, low income and in urban populations

Asthma Hospitalization Rates Among Children Under Age 5 by Race/Ethnicity and Year, Boston, 1999-2004



DATA SOURCE: Acute Care Hospital Case Mix Files, Massachusetts Division of Health Care Finance and Policy
 DATA ANALYSIS: Boston Public Health Commission Research Office




Studies in Boston Public Housing

- One study found that
 - ✓ 40% of adults and
 - ✓ 56% of children surveyed reported Dr. diagnosed asthma*
- A second study found 26% of all residents reported asthma**

*Brugge D et al New Solutions Summer 2001

**Hynes HP et al Planning Practice & Research, Vol. 15, Nos ½ pp 31-39, 2000



Why Asthma and Housing?

- **Asthma** is now the **number one** cause of hospitalization for children

- Children spend **extensive** time indoors

- Anecdotal examples of :

Children with well controlled **asthma** have attacks after changes in the home

- Children have **asthma** free periods in another home and **asthma** symptoms return when back in their own home





Clearing the Air

- NIH, Institute of Medicine published, *Clearing the Air: Asthma and Indoor Air Exposures*, in 2000
- Reviewed over 1000 studies from medical, housing, and public health literatures
- Published in 2000, so does not include more recent evidence
- Foundation for extensive research and demonstration projects, many in Boston!

Summary of *Clearing the Air*

Exposures	Evidence to Cause to Develop	Evidence to Cause to Exacerbate	Evidence of Association to Develop	Evidence of Association to Exacerbate	Limited or Suggestive Evidence of Cause to Develop	Limited or Suggestive Evidence of Cause to Exacerbate
House Dust Mite	X	X				
Cockroach		X			X	
Cat		X				
ETS		X	X			
Dog				X		
Mold				X		
NO/NO2				X		
Formal-dahyde						X



The Boston Experience

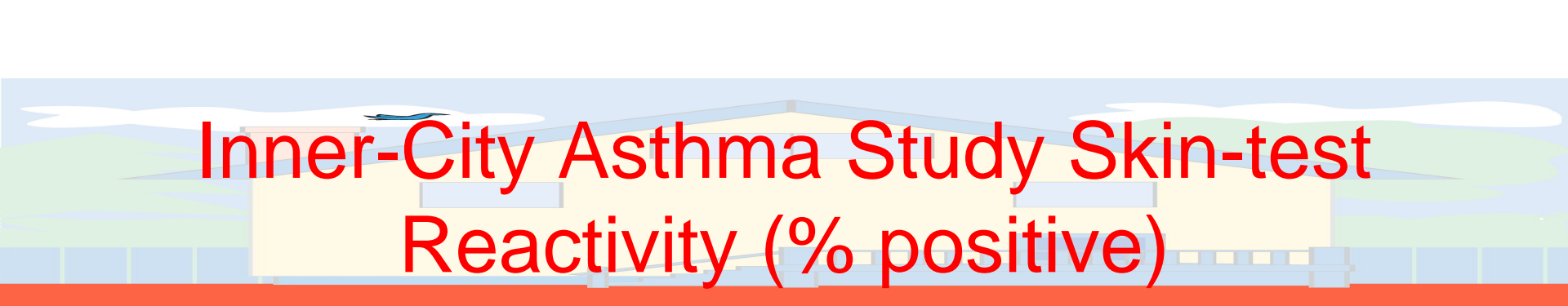
- Boston has hosted multiple studies and demonstration projects on the impact of home environmental modifications on asthma in:
 - Public, private, section 8, market rate
 - Owner-occupied, multi-unit
 - Nonprofit CDC and for profit buildings
- Research and demonstration projects have been conducted in existing housing, must translate to new construction and design



Inner-City Asthma Study

- Follows 937 urban children
 - 1 year of intervention, monitored over 24 months
- Evaluation --questionnaire and skin testing
- Home sampling --dust, cockroach, cat and dog allergen
- Interventions aimed at patient-specific triggers
 - Allergen impermeable mattress and pillow covers
 - HEPA air filters and Miele vacuum cleaners
 - Professional pest control

Morgan WJ, et al. *New Engl J Med* 2004;351:1068-80



Inner-City Asthma Study Skin-test Reactivity (% positive)

942 moderate-to-severe asthmatic children

- Cockroach: 69%
- Mold (one or more): 50%
- Rat: 19%
- Mouse: 28%
- Cat: 44%



Environmental Intervention

- Environmental Intervention modules included both information and remediation demonstrations
- Five planned and two optional home visits over a 12 month period
- All subjects received dust mite remediation and ETS education/reduction strategies
- Other allergen/irritant remediation based on baseline allergy testing and home environment assessment



Inner-City Asthma Study

Home Environmental Exposures

942 moderate-to-severe asthmatic children

- At least one smoker in home 53%
- Water damage, dampness, or leaks 70%
- Cockroaches 73%
- Mice or rats 49%
- Furry pet 28%



Inner-City Asthma Study Results

- Reductions in levels of cockroach and dust mite allergen intervention group significantly correlated with reduced symptom days, hospitalizations and unscheduled asthma visits.
- Greater environmental and health improvement for intervention VS control group
- Health and environmental benefit sustained through year two

Morgan WJ, et al. *New Engl J Med* 2004;351:1068-80



Boston Healthy Homes 1 and 2

- Demonstration projects with strong evaluation component
- Healthy Homes 1 environmental sampling and allergy testing
- Healthy Homes 2
 - Lead agency New England Asthma Regional Council
 - RFP to CDC's; Urban Edge and Nuestra Comunidad responded
 - Built on HH1 experience and improved model
 - Clearer health and environmental outcomes
- Both @ \$2,000/unit



Healthy Homes 1 Data Collection

- Similar to ICAS
- Also conducted Air Quality Monitoring
 - PM10, CO, CO2, Temp, Humidity, VOC's, NO2 (outside done as control)

Boston Healthy Homes 1

Standard Interventions

Enhanced Interventions

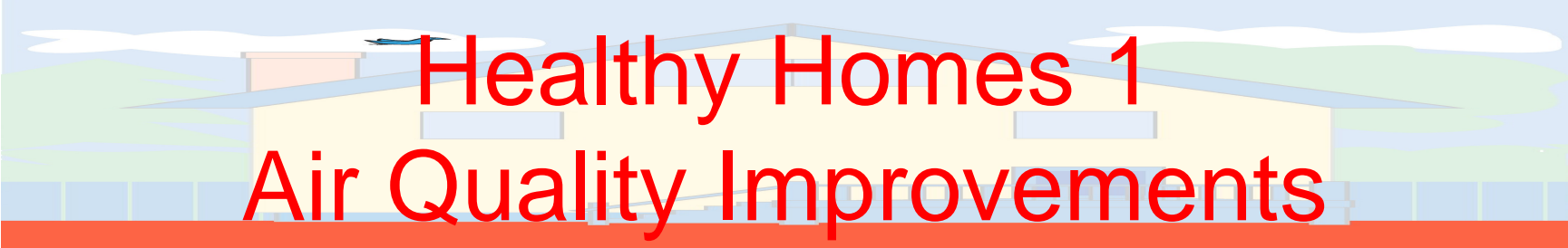
- **Mattress & Pillow Covers**
- **Air Conditioner**
- **HEPA Vacuum**
- **Integrated Pest Management**
- **Education/Materials**
- **House Cleaning**
- **Radiator Covers/Duct Cleaning**
- **Window Guards**

- **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**
- **Carpentry**

Healthy Homes 1 Data

- 182 homes at baseline
 - 55 homes, 33% with elevated NO₂ (samplers in kitchen)
 - 91% with a gas stove
 - 30% report a smoker in the home
 - 17% with visible mold
 - 66% with mice
 - 10% with cockroaches
 - 67% with carpeting
 - 75% use air fresheners



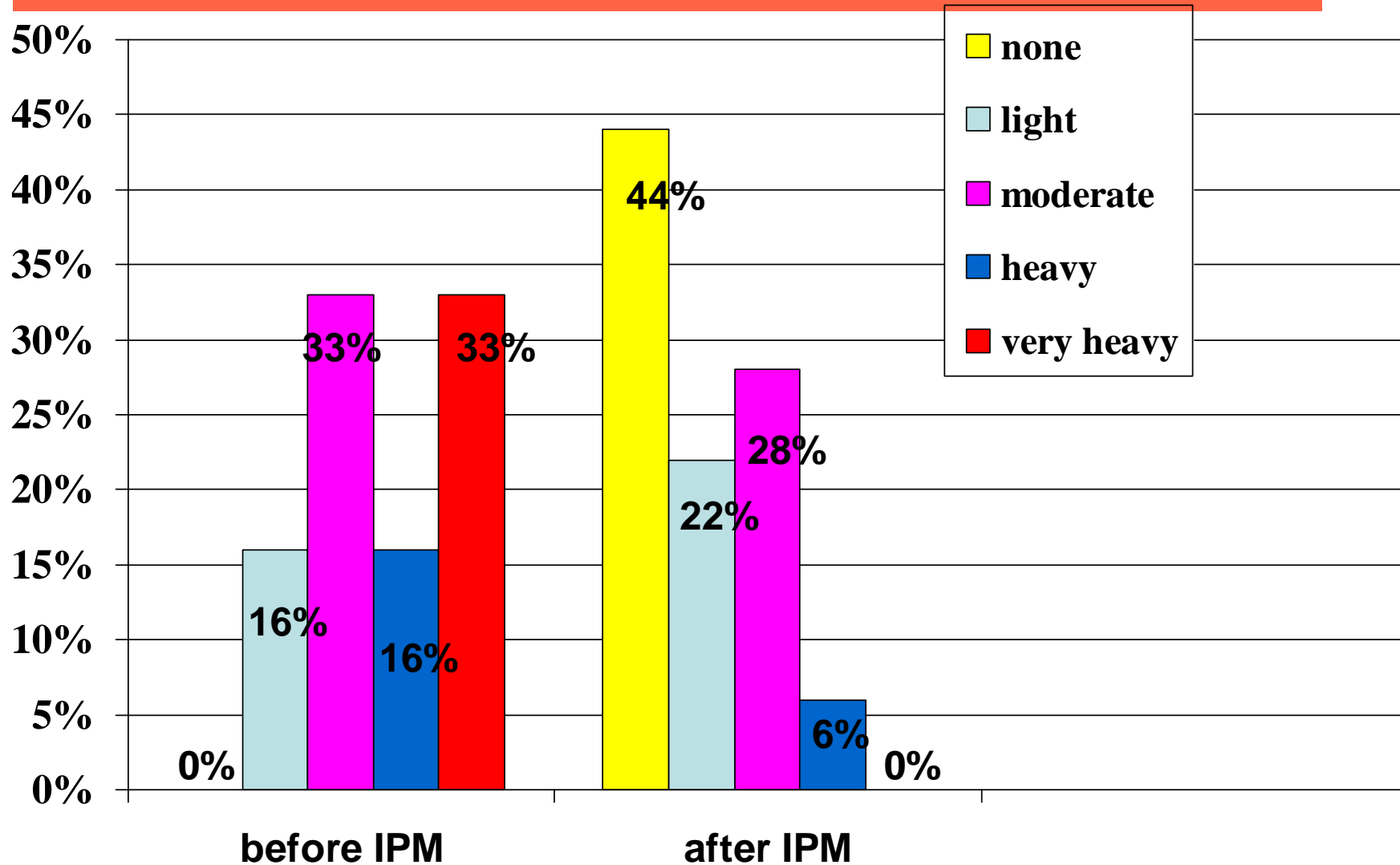


Healthy Homes 1

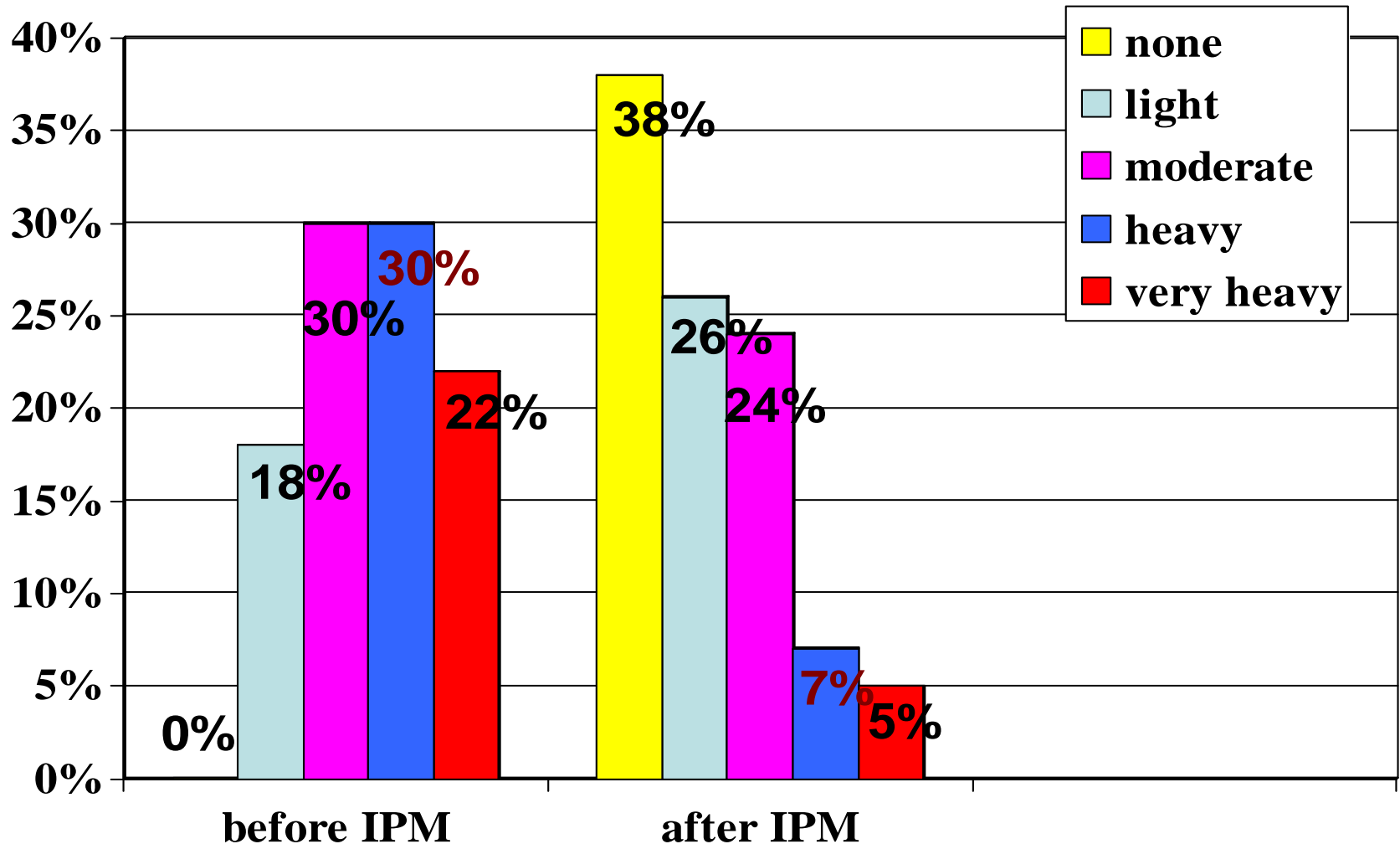
Air Quality Improvements

- Most significant improvements in PM10 (airborne dust) and Volatile Organic Compounds (VOC's)
- CO and CO2 within normal limits at baseline, but improvements
- Temp and Relative Humidity (Rh) unchanged
 - Indicates assessments distributed across seasons
- Not enough NO2 sampling post intervention

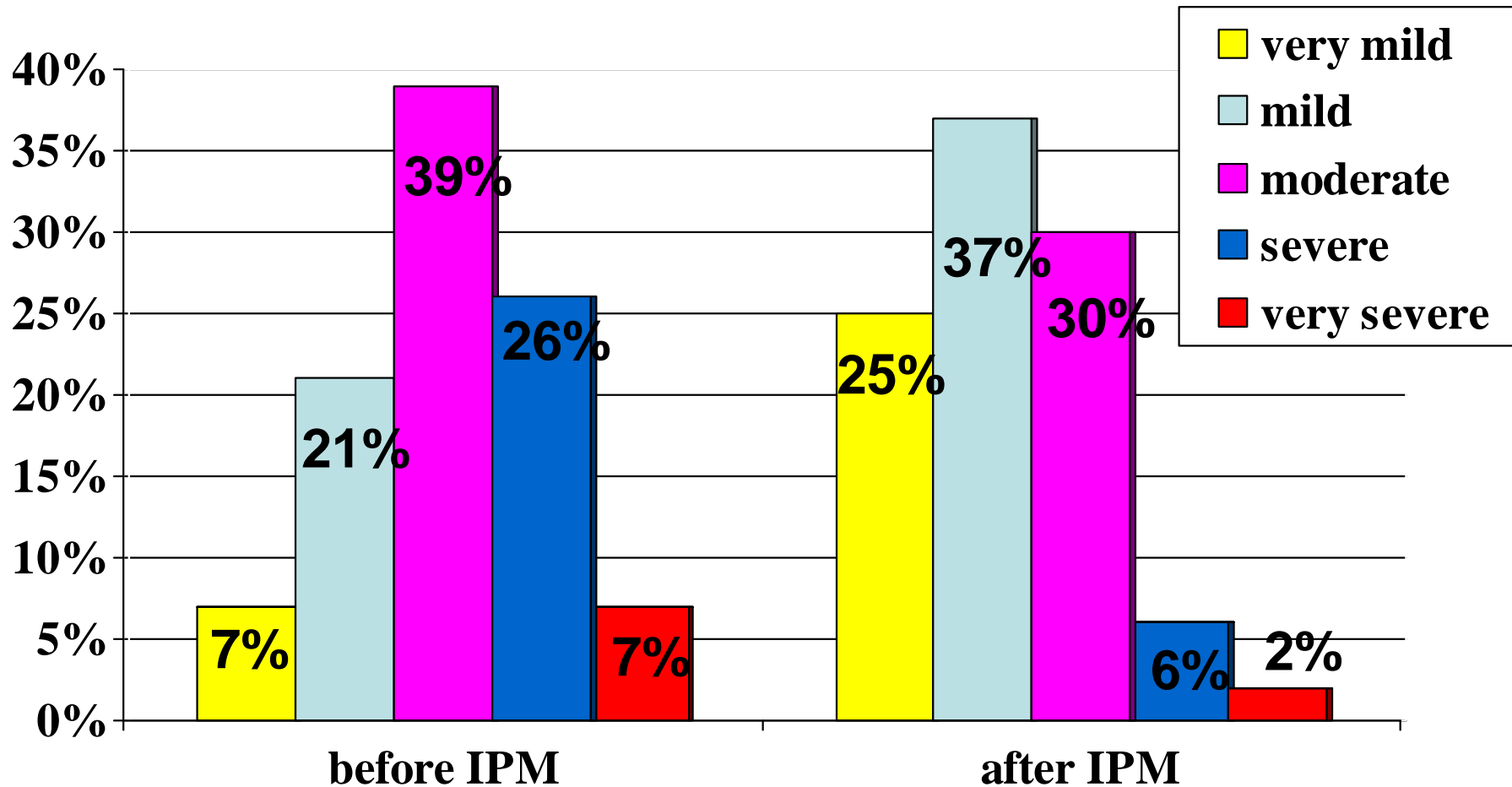
Cockroach infestation levels (participants with known roach problem)



Mouse infestation levels (participants with known mouse problem)



Severity of child's asthma before and after IPM



HH2 Housing Conditions Improved

- Many housing condition improved:
 - Reduction in average mouse infestation scores from 1.5 to 0.7 ($p=0.02$) among intervention group
 - Reduction in mold in bathrooms ($p=.01$)
- Education did not show changes
 - No reduction in use of air fresheners, scented or unscented candles (volatile organic compounds).



HH2 Asthma Symptoms Improved

- Among intervention children, statistically significant improvement
 - Fewer days of symptoms (wheeze, cough, shortness of breathe) over 2 weeks (38% vs 23%) ($p < .001$)
 - Stopped play for asthma over 2 weeks (21% v. 8%) ($p < .001$)
- Education only group improved, but greater improvement among intervention group



HH2 Medication Usage Improved

- Asthma medication usage improved after intervention
 - 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%) ($p=.226$)
- Education only group improved, but greater improvement among intervention group



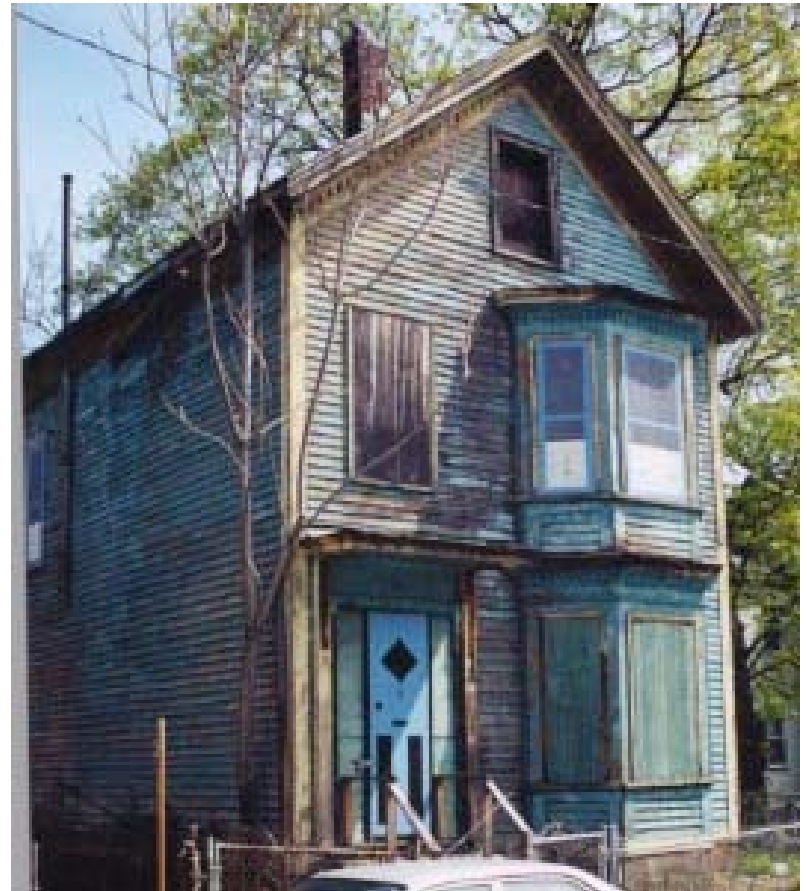


Remediation vs New Construction

- These studies conducted on existing housing demonstrate that environmental improvements lead to health improvements
 - Easy to clean, wipable surfaces can reduce dust mite and pest allergen (pesticides and other pollutants)
 - Adequate ventilation can reduce excessive humidity and airborne pollutants
 - Moisture reductions can lead to mold reductions
 - Sealing and maintenance can support pest free environments
- Resident education is key
 - Tobacco, pest infestation, use of chemicals

Is There Consumer Interest?

- In 2003, Respiratory Friendly House for the first time home buyer program
- BPHC, Nuestra Comunidad, Dept. of Neighborhood Development, BUAC, BMC
- Very limited marketing time limited outreach, required to have MD documentation of relevant respiratory condition
- 43 responses with medical documentation.



How Can We Help?

- In home health ed with multilingual educational materials and videos
- Low-cost supplies to encourage a pest-free environment: cleaning supplies, trash can with lid, door sweeps, plastic food containers, traps
- Referrals for tobacco treatment and other resources



Home SAFE Program

For Boston kids and

The Boston Public Health Commission offers free in-home education and inspection to Boston residents with asthma.

Includes:

- Inspection to identify asthma triggers
(such as mold, pests, dust)
- Indoor air quality monitoring
- Health education
- Cleaning & pest management supplies
- Referrals for additional help



Home SAFE Program

For more information or to schedule
an appointment, please call 534-5966.

Asthma Program - 1010 Massachusetts Avenue, 2nd Floor, Boston, MA 02118

