

*Healthy Residents, Healthy Homes:*  
**An Intervention to Help Persons with Asthma in  
Newport Housing Authority**

November 2009



**Members of the Newport Housing Authority Healthy Residents, Healthy Homes Coalition prepared this report.**

**Nancy Sutton**

Program Manager

Rhode Island Department of Health, Asthma Control Program

**Deborah N. Pearlman, PhD**

Senior Epidemiologist

Rhode Island Department of Health, Asthma Control Program

Research Faculty

Brown University

**Nicholas J. Everage, ScM**

Epidemiologist

Rhode Island Department of Health, Asthma Control Program

Program in Public Health, Epidemiology Section

Brown University

**Ellen Tohn**

Consultant

Tohn Environmental Strategies, LLC

**Lee Ann Freitas**

Parent Consultant

Southern Rhode Island Area Health Education Center

Rhode Island Parent Information Network (RIPIN)

**Jim Reed**

Director

Newport Housing Authority

**Jim Sattel & Diane Vendetti**

Project Coordinator

Southern Rhode Island Area Health Education Center

*Appreciation is expressed to Susan L. Pinheiro, Project Consultant, for the design and programming of the ACCESS program database used to generate the tables shown in this report. The project team would also like to thank the Asthma Regional Council of New England for its support.*

This publication was supported in part by Grant/Cooperative Agreement Number 1U59EH000199-01 from the Centers for Disease Control and Prevention (CDC) and EPA Grant Award ID Number: HC-97174801-1. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC or EPA.

## Table of Contents

	<u>Page</u>
Overview	3
Intervention Planning	4
Intervention Description	5
Intervention Findings	6
Baseline	7
Baseline to 6 Months	15
Conclusion	26
References	26

## I. Overview

Asthma is a chronic respiratory disease characterized by episodes or attacks of inflammation and narrowing of small airways and is one of the most common chronic diseases in the United States. It is not clear exactly why some people develop asthma, but both genetic and environmental factors are thought to cause it. People with a family history of asthma are more likely to develop the disease. Exposure to tobacco smoke, infections, and some allergens early in life may increase a person's chances of developing asthma.<sup>1</sup> Many things can trigger asthma symptoms and attacks. The most common triggers are indoor and outdoor allergens (e.g., house dust mites, pet dander, airborne pollens, and dampness/mold), exposure to second-hand smoke, and other factors such as exercise, cold air, and stress can also spur attacks.

There is now overwhelming evidence that the burden of asthma is not borne equally by all population groups in the United States. Poverty is one important contributor to the risk of developing asthma and having more severe asthma. Exposure to the triggers that stimulate asthma is higher in low-income and poor communities.<sup>2</sup> Cockroaches, rodents, dust mites, and moisture/mold in inner-city homes, air pollution in industrial neighborhoods, and the high prevalence of cigarette smoking among low-income adults are some of the ways that poverty might predispose persons with asthma to have more severe disease. In many poor communities, medical care may not be sought because it is too difficult to access or persons needing care do not have health care coverage.<sup>3</sup>

*Healthy Residents, Healthy Homes* is a project of the Newport Housing Authority in Newport, Rhode Island. This report provides an overview of the *Healthy Residents, Healthy Homes* intervention (February 2007 – September 2009). In early 2005, the Newport Housing Authority's Director became concerned about the use of emergency medical care by residents living at the Housing Authority. In response, the Newport Housing Authority undertook a series of activities to improve the health of residents that included holding a community health fair and convening a coalition to explore strategies to reduce the burden of asthma on families and individuals living in the Housing Authority's housing units. The *Healthy Residents, Healthy Homes* Coalition was formed to design and implement an intervention to reduce the burden of asthma among public housing residents in Newport Housing.

### **The *Healthy Residents, Healthy Homes* project had four main goals:**

1. To work with residents who have asthma to access quality health care;
2. To work with residents to implement environmental interventions within their homes to control their asthma and prevent emergency department use;
3. To help residents with asthma become more proactive in managing their disease; and
4. To respond to the Centers for Disease Control and Prevention (CDC) call for the elimination of the disproportionate burden of asthma in minority populations and those living in poverty.<sup>4</sup>

## II. Intervention Planning

### A. Lessons learned from other healthy homes projects

The first step in planning the *Healthy Residents, Healthy Homes* project was to learn from other projects designed to reduce asthma triggers in low-income communities. A Boston-based Healthy Public Housing Initiative implemented in three public housing developments in Boston, Massachusetts, for example, followed fifty asthmatic children aged 4–17 who were enrolled in an intervention that included environmental changes to the home, education about asthma, and limited case management. The Boston project found significant improvements in children’s respiratory symptoms and other asthma-related health outcomes over time.<sup>5</sup>

### B. Survey of Newport Housing Authority residents

The second step in planning the *Healthy Residents, Healthy Homes* project was to survey residents of the Newport Housing Authority to better understand and document asthma prevalence, environmental asthma triggers, and health care use. Over 10 weeks in the spring of 2006, 301 of the 577 housing units at Newport Housing Authority completed the *Healthy Residents, Healthy Homes* survey, either by mail or in response to a door-to-door request by housing authority staff. Two types of housing properties were surveyed, those for families and those for the elderly and disabled. Because survey findings were based on a convenience sample, the information obtained from the survey provided a “snapshot” picture of residents living at Newport Housing Authority. The survey was available in English and Spanish.

#### Summary of survey findings:

- Among residents in family housing, 45% of households reported that someone in the household had doctor-diagnosed asthma as compared with 20% of households in senior/disabled housing.
- Among residents in family housing, 51% of households reported that someone in the household smoked as compared with 29% of households in senior/disabled housing.
- Among residents in family housing, 35% of households reported that someone in the household did not have health insurance in the past 12 months as compared with 12% of households in senior/disabled housing.
- Among residents in family housing, 21% of households reported that someone in the household went to an emergency room or urgent care center because of breathing problems in the past 12 months (when they did not have a cold or flu) as compared with 13% of households in senior/disabled housing.
- Among residents in family housing, 34% of reported a problem with mildew odor or musty smell in their home, compared to 13% of households in senior/disabled housing.

The survey responses provided sufficient information to structure and undertake activities to address environmental triggers and connect individuals with asthma to medical and social services for better asthma management. Based on these survey findings, the *Healthy Residents, Healthy Homes* coalition recommended that “high-risk” households would be the first to participate in the *Healthy Residents, Healthy Homes* intervention. A “high-risk” household was defined as a household where someone had asthma and at least one person in the home was without health care insurance, did not have a regular medical home and/or had housing-based environmental triggers for asthma in the housing unit.

### **III. Intervention Description**

In the fall of 2006, a Response Team was formed to implement and oversee the *Healthy Residents, Healthy Homes* intervention. The Response Team was multidisciplinary. It included one social worker from Newport Housing Authority, an administrator from a local community action agency, housing authority maintenance staff and housing managers, and a Rhode Island Parent Information Network (RIPIN) Parent Consultant. The parent consultant served as the Response Team coordinator.

The intervention had six major components. They are as follows:

- First, households were invited to participate in the *Healthy Residents, Healthy Homes* project and sign a consent form indicating their understanding of the project and willingness to participate.
- Second, a Response Team member completed an in-home assessment with participating households. The assessment form included: (1) a profile of household members, (2) number of recent asthma-related hospitalizations and emergency department visits, (3) information about common asthma triggers, and (4) a visual assessment of the home to identify moisture, mold, and pest problems.
- Third, the Parent Consultant opened a case file for participating households. Based on the assessment results, the Parent Consultant may have submitted a priority work order to the Housing Authority’s Maintenance Office for preventive home maintenance. Work orders ranged from a moisture/mold problem to a problem with a heating or air conditioning system in the unit.
- Fourth, the Parent Consultant worked one-on-one with household members to complete an action goal work sheet. The health and social goals chosen by household members were far ranging. These goals encompassed preventive maintenance in the home to reduce asthma triggers to getting help scheduling follow-up medical appointments for the person with asthma. The Parent Consultant regularly checked in with participants to review the action goal work sheets and identify community and health care resources that may have helped residents be proactive in achieving their goals. Referrals were made to community health centers and/or RIte Care. The latter is Rhode Island’s Medicaid Managed Care Program for eligible qualifying adults and children in families with incomes up to 250% of the federal poverty level.<sup>6</sup>
- Fifth, the Parent Consultant completed a second in-home assessment, approximately six months after the baseline assessment, to identify individual- or

household-level changes that may have improved asthma outcomes for participants with asthma. Cases were closed within 90 days of the follow-up assessment.

- Sixth, the Parent Consultant recorded information from the baseline and 6-month assessments in a database designed specifically for the intervention. In addition, the case file had forms for recording phone calls and meetings with participants, actions taken on behalf of the participants, and progress on helping participants meet their self-identified action goals.

Over five months (February 2007 to July 2007) the Response Team visited 31 “high risk” units, which were occupied by 112 individuals. Forty-six residents (41%) indicated that they currently had asthma. In August 2007, a brief report summarized findings from the initial implementation phase. The report outlined several important achievements including timely home repairs by the maintenance staff to reduce asthma triggers, success in helping residents with asthma better control their asthma, and the establishment of a database. As described above, the database recorded information from the in-home assessments. Two additional EXCEL files recorded residents’ steps to meet their self-identified action goals and work orders for asthma-related home repairs with associated costs.

In March 2008, the *Healthy Residents, Healthy Homes* Coalition published a draft report on the findings from the first year of the *Healthy Residents, Healthy Homes* intervention. A copy of this report is available from Nancy Sutton, Program Manager, Rhode Island Department of Health Asthma Control Program.<sup>7</sup> Based on the results from the Year One report, it was clear that the intervention presented four challenges. First, the medical and social service needs of public housing residents extended far beyond asthma, and residents’ needs sometimes overwhelmed an intervention that was asthma-specific. Second, time was needed to refine the protocols and tracking system to ensure Response Team members were using their time efficiently. Third, participants needed more coaching than originally anticipated to meet their self-identified action goals and to follow through on referrals to health care and community organizations with expertise to asthma management. Fourth, the project’s database needed to be redesigned so that reports were easier to interpret and more clearly distinguished between information from household units and information from individual participants.

#### **IV. Intervention Findings**

As discussed above, highlighted in this report are key findings from the *Healthy Residents, Healthy Homes* intervention from March 2007 to September 2009. Through a rolling admission process over a 24-month period, the intervention successfully enrolled 76 households where someone in the home had asthma. The 76 households included 211 public housing residents, of which 61 adults and 43 children, or 104 in total, had asthma. At six months, 66 of the 76 households completed the six-month assessment (87%). The 66 households included 181 of the originally enrolled public housing residents (85%), of whom 88 had asthma (52 adults and 36 children).

Part one of the report summarizes findings from the baseline in-home assessments. Part two of the report summarizes findings for household units that completed both a baseline and 6-month assessment. Part three summarizes findings from participants' self-identified action goals. Tables in this report do not show tests of statistical significance. The focus here is on displaying frequencies and percentages, which provide an opportunity to observe how the intervention is being implemented and to make recommendations to improve program performance.

## **A. Baseline**

The 224 individuals reached through the *Healthy Residents, Healthy Homes* intervention included children (45%) and adults (55%). A majority of the individuals were male (all ages combined; 61%). About 33% were White non-Hispanic, 27% were Black non-Hispanic, and 14% were Hispanic. Asthma was common in both children and adults (44% and 56%, respectively). Although most children and adults had health insurance, only 75% of adults said that they had regular primary care as compared with 95% of children. See Table 1.

**Table 1. Characteristics of Individuals in the Healthy Residents, Healthy Homes Project at Baseline<sup>1,2</sup>**

Characteristic	Number	Percent Yes
<b>Total Number of Participants</b>	224	
<b>Age</b>		
0 to 17 years	100	44.6
18+ years	122	54.5
<b>Gender</b>		
Males	136	60.7
Females	86	38.4
<b>Ethnicity/Race</b>		
Hispanic	32	14.3
White non-Hispanic	74	33.0
Black non-Hispanic	61	27.2
Asian non-Hispanic	0	0.0
Am.Indian non-Hispanic	6	2.7
Other non-Hispanic	25	11.2
Unknown	26	11.6
<b>Have health Insurance</b>		
Child - Yes	96	96.0
Adult - Yes	97	79.5
<b>Have regular primary medical care</b>		
Child	95	95.0
Adult	92	75.4
<b>Has asthma</b>		
Child	45	45.0
Adult	68	55.7

<sup>1</sup> The 224 participants represent 86 homes. Of the 224 participants, 113 have asthma.

<sup>2</sup> Frequencies may not equal total number of participants at baseline due to missing data.

About one-half of households (44%) had someone in the home that smoked. Smokers comprised over one-fifth or 22% of all participants and 40% of all adults (assuming smokers were 18 years older). Second-hand smoke is a well-known asthma trigger. Being a smoker is an obvious risk for many chronic health conditions, but just being around people who smoke—and breathing in second-hand smoke—can cause problems for someone with asthma. See Table 2.

---

**Table 2. Tobacco Use in the Healthy Residents, Healthy Homes Project at Baseline**

<b>Characteristic</b>	<b>Number</b>	<b>Percent</b>
<b>Households with smoker <sup>1</sup></b>	38	44.2
<b>Current smokers <sup>2</sup></b>	49	21.9
<b>Cigarettes smoked per day by smokers <sup>3</sup></b>		
Only smoke outside	11	22.4
< 6 inside home	12	24.5
>= 6 inside home	15	30.6
<b>Smokers interested in quitting smoking <sup>4</sup></b>		
Yes	28	57.1

---

<sup>1</sup> Based on number of households in the Healthy Residents, Healthy Homes Project.

<sup>2</sup> Based on number of participants in the Healthy Residents, Healthy Homes Project.

<sup>3</sup> Based on number of participants who smoke in the home in the Healthy Residents, Healthy Homes Project (The denominator is 49 at baseline).

<sup>4</sup> Based on number of smokers in Healthy Residents, Healthy Homes Project.

Percentages may not equal 100% because of missing data.

Asthma triggers at baseline are shown in Table 3. In addition to environmental tobacco smoke, there are many other asthma triggers, including mold, mildew, dust mites, and cockroach allergen. The most common asthma triggers reported in homes were excessive heat (43%) and excessive cold (31%). Temperature shifts and extremes, either hot or cold, can cause asthma attacks.

**Table 3. Asthma Triggers in Households in the Healthy Residents, Healthy Homes Project at Baseline**

Characteristic	Baseline	
	Number	Percent
Total # of households	86	
House has cockroaches, mice rats or bedbugs in last 4 months - Yes	3	3.5
Visual evidence of a pest problem - Yes	5	5.8
In past year, 24-hour period with excessive heat? - Yes	37	43.0
In past year, 24-hour period with excessive cold? - Yes	27	31.4
Evidence of water leaks - Yes	13	15.1
Damp / musty odor in dwelling - Yes	8	9.3
Carpeting present in asthmatic's bedroom - Yes	16	18.6
Dust mite covers on mattress or pillows in asthmatic's bedroom - Yes	6	7.0

Percentages may not equal 100% because of missing data.

Of the 76 households that completed an in-home baseline assessment, 55% of homes (n = 47) had evidence of mold in the bathroom and 36% had evidence of mold in other rooms. Mold can trigger an allergic reaction and asthma episode in sensitized individuals. See Table 4.

**Table 4. Evidence of Mold in Bathroom and Non-Bathroom Rooms in Households in the Healthy Residents, Healthy Homes Project at Baseline**

Characteristic	Measure	Number	Percent Yes
Evidence of mold in non-bathroom room	<2 feet	7	8.1
	2 ft or more	29	33.7
	None	46	53.5
Evidence of mold in bathroom	<1 foot	25	29.1
	1 ft or more	22	25.6
	None	35	40.7

Percentages may not equal 100% because of missing data.

Asthma is a highly controllable disease, but for many persons with asthma living symptom-free all or most of the time can be challenging. Among **adults** with asthma, 69% reported some daytime asthma symptoms, 56% reported that asthma symptoms interrupted their sleep at night, and 32% used relief medications for asthma symptoms every day. More than half of adults with asthma reported that their asthma was not under control (62%). See Table 5.

Among **children** with asthma, 47% had daytime asthma symptoms, 38% had asthma symptoms that interrupted sleep at night, and 18% used relief medications for asthma symptoms every day. Over two-fifth of children with asthma reported that their asthma was not under control (40%). See Table 5.

**Table 5. Out of Control Asthma for Persons with Asthma in the Healthy Residents, Healthy Homes Project at Baseline**

<b>Characteristic</b>	<b>Number - Adult</b>	<b>Percent - Adult</b>	<b>Number - Child</b>	<b>Percent - Child</b>
<b>Total # of persons with asthma</b>	68	55.7	45	45.0
<b>Had asthma symptoms</b>				
1-2 times a week	12	17.6	6	13.3
3-6 times a week	12	17.6	9	20.0
Once a day	15	22.1	2	4.4
More than once a day	8	11.8	4	8.9
Not at all	21	30.9	24	53.3
Unknown	0	0.0	0	0.0
<b>Sleep interrupted due to asthma symptoms</b>				
Once or twice a month	12	17.6	8	17.8
Once a week	7	10.3	3	6.7
2-3 nights a week	6	8.8	2	4.4
4 or more nights a week	13	19.1	4	8.9
Not at all	30	44.1	28	62.2
Unknown	0	0.0	0	0.0
<b>Used relief medication for asthma symptoms</b>				
1-2 days a week	10	14.7	12	26.7
3-6 days a week	17	25.0	4	8.9
Every day	22	32.4	8	17.8
Not at all	19	27.9	21	46.7
Unknown	0	0.0	0	0.0
<b>Asthma "out of control"</b>				
Yes	42	61.8	18	40.0
No	26	38.2	27	60.0
Unknown	0	0.0	0	0.0

Percentages may not equal 100% because of missing data.

Asthma is one of the leading causes of school absenteeism. Poorly controlled asthma symptoms are a leading cause for school absenteeism in children and missed workdays among adults. At baseline, 18 of the 45 children with asthma missed 10 school days, on average, in the past year. Twelve of the 68 adults with asthma missed 10 workdays, on average, in the past year. These missed days of work and school have a real cost in terms of reduced productivity and reduction in quality of life for those who suffer asthma attacks.

**Table 6. Missed school and work days due to asthma in the Healthy Residents, Healthy Homes Project at Baseline**

Events	Time Period	# People w/ asthma	Total # days (sum)	# Asthmatics w/>0 days	Average # days per asthmatic w/>0 days
If <18 years, days school missed	Past year	45	172	18	10
If >=18 years, days work missed	Past year	68	111	12	9

Average days per asthmatic with > 0 days is calculated as Total number of days / Number of asthmatics with > 0 days.

At baseline, an asthma-related hospitalization in the past year was not a common event. Of the 68 adults with asthma, five had a hospital admission for asthma and 18 had an asthma-related emergency room visit. See Table 7a. Of the 43 children with asthma, none had a hospital admission for asthma and only 5 children had an emergency room visit for asthma. See Table 7b.

**Table 7a. Health care use (events) due to asthma for adults with asthma in the Healthy Residents, Healthy Homes Project at Baseline**

Events	Time Period	# Adults w/ asthma	# Adults w/ asthma w/ 1+ events	# Events <sup>1</sup>	Average # events per asthmatic w/ 1+ events
In-patient hospitalizations	Past year	68	5	10	2
Emergency room visits	Past year	68	18	50	3

<sup>1</sup>An event is a hospital stay for one or more days in the past year or one or more emergency room (ER) visits in the past year.

The average number of events is the number of events (column 5) divided by the number of people with asthma that have at least one event (column 4).

**Table 7b. Health care use (events) due to asthma for children with asthma in the Healthy Residents, Healthy Homes Project at Baseline**

<b>Events</b>	<b>Time Period</b>	<b># Child w/ asthma</b>	<b># Child w/ asthma w/ 1+ events</b>	<b># Events <sup>1</sup></b>	<b>Average # events per asthmatic w/ 1+ events</b>
In-patient hospitalizations	Past year	45	0	0	0
Emergency room visits	Past year	45	5	9	2

---

<sup>1</sup>An event is a hospital stay for one or more days in the past year or one or more emergency room (ER) visits in the past year.

The average number of events is the number of events (column 5) divided by the number of people with asthma that have at least one event (column 4).

## **B. Baseline and 6 Month Assessments**

As described above, the driving force behind the *Healthy Residents, Healthy Homes* intervention was the one-on-one relationship between the Parent Consultant and public housing residents with asthma. The Parent Consultant had the responsibility for completing the in-home baseline and 6-month assessments with residents. Other responsibilities included helping residents with asthma to set goals for reducing the risk of an asthma attack and connecting residents with asthma to appropriate medical and social services. Through a rolling admission process over 24 months (March 2007 – January 2009), 86 homes were enrolled in the *Healthy Residents, Healthy Homes* intervention. Of these 86 homes, 67 homes completed the baseline and 6-month assessments (78%), which reached 181 individuals (81%). Table 8 shows the characteristics of individuals with a baseline and 6-month assessments.

**The results shown in Table 8 highlight an important success of the *Healthy Residents, Healthy Homes* intervention.** At baseline, 75% of adult participants reported that they had regular primary care (See Table 1), which increased to 91% at the 6-month assessment (see Table 8); a 18% increase from baseline. Within 6 months of the intervention, all children had health insurance and had established regular primary care.

**Table 8. Characteristics of Participants in the Healthy Residents, Healthy Homes Project at Baseline and 6 Months<sup>1</sup>**

Characteristic	Baseline		6-months	
	Number	Percent	Number	Percent
<b>Total Number of Participants</b>	181		181	
<b>Total Number of Children</b>	82	45.3	82	45.3
<b>Total Number of Adult</b>	99	54.7	99	54.7
<b>Have health insurance</b>				
Child - Yes	79	96.3	82	100.0
Adult - Yes	81	81.8	81	81.8
<b>Have regular primary medical care</b>				
Child	78	95.1	82	100.0
Adult	74	74.7	90	90.9

<sup>1</sup> The 181 participants who completed baseline and 6-month assessments represent 67 low-income households. This table includes those with a baseline and a 6-month.

The benefits of quitting smoking are well known, but helping public housing residents who smoke to quit is challenging. Public housing residents have many health, economic, and social issues that often take priority over quitting smoking.

**The results shown in Table 9 highlight an important success for the *Healthy Residents, Healthy Homes* intervention.** The number of current smokers increased from baseline to the 6 month assessment, but this finding may reflect new or different people flowing into the households between assessments. The 6-month assessment shows a 50% increase within 6 months in the percentage of smokers smoking outside the home. Tobacco smoke is a toxic asthma trigger when it reaches children's lungs. Children with asthma who live in smoke-filled homes have more wheezing fits, need more medications, and make more trips to the emergency room than other asthma patients their age.<sup>8</sup>

---

**Table 9. Tobacco Use in the Healthy Residents, Healthy Homes Project at Baseline and 6 months<sup>1</sup>**

Characteristic	Baseline		6-Month Assessment	
	Number	Percent-Yes	Number	Percent-Yes
Households with smoker <sup>2</sup>	34	50.7	34	50.7
Current smokers <sup>3</sup>	43	23.8	44	24.3
Smokers attending a quit smoking program <sup>4</sup>	--	--	4	9.1
<b>Cigarettes smoked per day in Households with smokers<sup>5</sup></b>				
Only smoke outside	10	29.4	15	44.1
< 6 cigarettes inside home	10	29.4	8	23.5
>= 6 cigarettes inside home	14	41.2	11	32.4

---

<sup>1</sup>Includes ONLY those with baseline and 6-month assessments.

<sup>2</sup>Based on the number of households in the *Healthy Residents, Healthy Homes* project.

<sup>3</sup>Based on the number of participants in the *Healthy Residents, Healthy Homes* project.

<sup>4</sup>Based on number of smokers in the *Healthy Residents, Healthy Homes* project who reported attending a quit smoking program during the study year.

<sup>5</sup>Based on number of households with smokers in the *Healthy Residents, Healthy Homes* project. Percentages may not equal 100% because of missing data.

There is no practical way to eliminate all moisture and molds indoors. The best way to control indoor mold growth is to control moisture in the home. When households participating in the *Healthy Residents, Healthy Homes* intervention had water or mold problems, the Newport Housing Authority Maintenance Office issued a priority work order to address the problem in a timely manner. Findings in Table 10 suggest that the intervention reduced moisture problems. Within 6 months, houses had no visual evidence of a pest problem. There was also progress within the 6-month interval in helping households control environmental triggers, such as eliminating carpeting in the bedroom of the resident with asthma, and using dust mite covers on the asthmatic’s mattress and pillow (Table 10).

**Table 10. Asthma Triggers in the Healthy Residents, Healthy Homes Project at Baseline and 6 Months**

Characteristic	Baseline		6-months	
	Number	Percent	Number	Percent
<b>Total # of households</b>	67		67	
<b>House has cockroaches, mice rats or bedbugs in last 4 months</b>				
Yes	3	4.5	1	1.5
<b>Visual evidence of a pest problem</b>				
Yes	5	7.5	0	0.0
<b>Evidence of water leaks</b>				
Yes	12	17.9	7	10.4
<b>Damp/musty odor in dwelling</b>				
Yes	6	9.0	3	4.5
<b>Carpeting present in any asthmatic resident's bedroom</b>				
Yes	14	20.9	7	10.4
<b>Dust mite covers on mattress or pillows of asthmatic residents</b>				
Yes	5	7.5	15	22.4

<sup>1</sup> There were 67 low-income households with baseline and 6-month assessments, representing 78% of all households that completed a baseline assessment.

Moisture problems were the most common environmental asthma trigger. The interventions reduced moisture problems. As shown in Table 11, larger areas of mold were reduced in both bath and non-bath areas (> 1 foot and > 2 feet, respectively) over the 6-month period.

- ✓ There was a **slight decrease** in the percentage of households that had evidence of mold (> 2 feet) in non-bathroom areas.

- ✓ There was a **53% decrease** in the percentage of households that had evidence of large area mold (> 1 feet) in bathroom areas.

A report published in 2004 by the National Academies' Institute of Medicine (IOM) found sufficient evidence to conclude that the presence of mold is associated with asthma symptoms in sensitized asthmatic persons, and there is some evidence that mold can cause lower respiratory-tract illness in otherwise healthy children.<sup>9</sup>

---

**Table 11. Evidence of mold in bathroom and non-bathroom rooms in the Healthy Residents, Healthy Homes Project at Baseline and 6 Months**

Characteristic	Measures	Baseline		6-months	
		Number	Percent	Number	Percent
Evidence of mold in non-bathroom room	2 ft or more	6	9.0	5	7.5
	<2 feet	19	28.4	19	28.4
	None	42	62.7	43	64.2
Evidence of mold in bathroom	1 ft or more	19	28.4	9	13.4
	<1 foot	15	22.4	21	31.3
	None	33	49.3	37	55.2

Several important findings in Table 12 underscore the short-term success of the *Healthy Residents, Healthy Homes* intervention. Here we show an improvement in asthma outcomes for adults and children. Improvement is calculated as an increase between a baseline percentage and a 6-month percentage divided by the baseline percentage.

#### Asthma symptoms

- ✓ There was a **12% increase** in the percentage of adults and **18% increase** in the percentage of children with asthma who reported that they no longer had asthma symptoms at some time during the week.

#### Interrupted sleep

- ✓ There was a **21% increase** in the percentage of adults with asthma who reported that asthma symptoms no longer interrupted their sleep at night
- ✓ There was a **16% increase** in the percentage of children with asthma who reported that asthma symptoms no longer interrupted their sleep at night.

#### Relief medication

- ✓ There was a **23% increase** in the percentage of adults with asthma who reported that they did not need to use relief medication for asthma symptoms at some time during the week.
- ✓ There was a **50% increase** in the percentage of children with asthma who reported that they did not need to use relief medication for asthma symptoms at some time during the week.

#### Asthma in control

- ✓ There was a **30% increase** in the percentage of adults with asthma who reported that their asthma was in control.
- ✓ There was a **12% increase** in the percentage of children with asthma who reported that their asthma was in control.

**Table 12. Out Of Control Asthma For Persons With Asthma In The Healthy Residents, Healthy Homes Project At Baseline And 6 Months**

Characteristic	Baseline				6-months			
	Number - Adult	Percent - Adult	Number - Child	Percent - Child	Number - Adult	Percent - Adult	Number - Child	Percent - Child
<b>Total # of persons with asthma</b>	53	53.5	36	43.9	53	53.5	36	43.9
<b>Had asthma symptoms</b>								
1-2 times a week	8	15.1	5	13.9	15	28.3	4	11.1
3-6 times a week	10	18.9	6	16.7	10	18.9	4	11.1
Once a day	12	22.6	2	5.6	7	13.2	1	2.8
More than once a day	6	11.3	1	2.8	2	3.8	1	2.8
Not at all	17	32.1	22	61.1	19	35.8	26	72.2
Unknown	0	0.0	0	0.0	0	0.0	0	0.0
<b>Sleep interrupted due to asthma symptoms</b>								
Once or twice a month	9	17.0	7	19.4	12	22.6	4	11.1
Once a week	5	9.4	1	2.8	5	9.4	1	2.8
2-3 nights a week	4	7.5	2	5.6	6	11.3	0	0.0
4 or more nights a week	11	20.8	1	2.8	1	1.9	1	2.8
Not at all	24	45.3	25	69.4	29	54.7	29	80.6
Unknown	0	0.0	0	0.0	0	0.0	1	2.8
<b>Used relief medication for asthma symptoms</b>								
1-2 days a week	6	11.3	10	27.8	14	26.4	3	8.3
3-6 days a week	12	22.6	3	8.3	12	22.6	0	0.0
Every day	18	34.0	3	8.3	6	11.3	3	8.3
Not at all	17	32.1	20	55.6	21	39.6	30	83.3
Unknown	0	0.0	0	0.0	0	0.0	0	0.0
<b>Asthma "out of control"</b>								
Yes	33	62.3	11	30.6	27	50.9	7	19.4
No	20	37.7	25	69.4	26	49.1	28	77.8
Unknown	0	0.0	0	0.0	0	0.0	1	2.8

Percentages may not equal 100% because of missing data.

<sup>1</sup> Asthma out of control is based on an algorithm where someone has asthma symptoms or asthma-related sleep interruptions, or uses relief medication more than twice a week.

Impairment of school- and work-related activities due to asthma has long-term consequences for quality of life as well as economic costs in terms of lost productivity and higher health care use. The Healthy Residents, Healthy Homes intervention was not in the field long enough to have an impact on the number of school and work absences due to asthma or on the number of asthma-related hospitalizations and emergency department visits. In other words, small numbers make it difficult to draw conclusions on missed school days, missed work days, or asthma-related ED visits and hospitalizations. See Tables 13, 14a and 14b. For children, it is worth noting that a drastically smaller number of children missed one or more school days due to asthma in the past year at the 6-month assessment than at the baseline assessment.

- ✓ At the baseline assessment, 13 of the 36 children with asthma had missed one or more school days due to asthma in the past year (36%).
- ✓ At the 6-month assessment, 9 of the 36 children with asthma had missed one or more school days due to asthma in the past year (25%).
- ✓ At the baseline assessment, 9 of the 53 adults with asthma had missed one or more work days due to asthma in the past year (17%).
- ✓ At the 6-month assessment, 4 of the 53 adults with asthma had missed one or more work days due to asthma in the past year (8%).

**Table 13. Missed School and Work Days in the Past Year Due To Asthma for Children and Adults in the Healthy Residents, Healthy Homes Project at Baseline and 6 Months**

Events	Time Period	Type of Assessment	# People w/ asthma	Total # days (sum)	# Asthmatics w/>0 days	Average # days per asthmatic w/>0 days
If <18 years, days school missed	Past year	Baseline	36	154	13	12
		6 months	36	83	9	9
If >=18 years, days work missed	Past year	Baseline	53	90	9	10
		6 months	53	105	4	26

**Table 14a. Health care use (Events) Due To Asthma in the Past Year For Adults in The Healthy Residents, Healthy Homes Project at Baseline and 6 Months**

Events	Time Period	Type of Assessment	# Adults w/ asthma	# Adults w/ asthma w/ 1+ events	# Events	Average # events per asthmatic w/ 1+ events
In-patient hospitalizations	Past year	Baseline	53	3	6	2
		6 months	53	1	2	2
Emergency room visits	Past year	Baseline	53	12	42	4
		6 months	53	9	41	5

**Table 14b. Health care use (Events) Due to Asthma for Children in the Healthy Residents, Healthy Homes Project at Baseline and 6 Months**

Events	Time Period	Type of Assessment	# Child w/ asthma	# Child w/ asthma w/ 1+ events	# Events	Average # events per asthmatic w/ 1+ events
In-patient hospitalizations	Past year	Baseline	36	0	0	0
		6 months	36	0	0	0
Emergency room visits	Past year	Baseline	36	4	7	2
		6 months	36	5	9	2

A central tenant of the *Healthy Residents, Healthy Homes* intervention was that people with asthma need support and information to become effective managers of their own health. Households enrolled in the intervention received help with the following:

- Basic information about asthma;
- Understanding of self-management skills and assistance in helping the person with asthma make action goals for asthma management; and
- On-going support from the Parent Consultant.

Over the course of the intervention, participants in the *Healthy Residents, Healthy Homes* intervention **identified 407 goals and closed and completed 71% of these goals**. See table 15. Shown below is the number of goals completed by category. Moisture and mold repairs represented the largest single group of goals, followed by asthma care, asthma trigger education, social service referrals, and preventative maintenance. Goal categories with the greatest rates of success in terms of obtaining the service, referral or action identified included: pest control (100%), other social services (84%), environmental/housekeeping education (83%), moisture/mold (75%), and assistance in getting a medical home (63%).

Goal codes that proved much more difficult to complete included: smoking cessation (10%), asthma care (46%), and health insurance (35%). In general, actions that could be addressed directly by Housing Authority staff such as maintenance and repairs had a higher rate of having a goal achieved.

**Table 15. Number of Requests Completed between the Baseline and Study End**

<b>Request Category</b>	<b>Number of Household Requests</b>	<b>Number Completed</b>	<b>Percent Completed by Request Type</b>
Remediation of moisture/mold	79	59	75%
Education about housekeeping to reduce asthma triggers	66	55	83%
Access health care for asthma	72	33	46%
Preventative maintenance and other repairs	69	39	57%
Social service referrals for asthma care	57	48	84%
Assistance in getting a medical home	35	22	63%
Smoking cessation education and referral	21	2	10%
Assistance in obtaining health insurance	20	7	35%
Problems with apartment being too cold or too hot	10	6	60%
Pest Control	4	4	100%
<b>Totals</b>	407	288	70.8%

A majority of the participants in the *Healthy Residents, Healthy Homes* intervention indicated that they were at least somewhat satisfied with the help received from the Parent Consultant (98.5%). A similar percentage of participants were at least somewhat satisfied with their efforts to meet their self-identified action steps to improve their health or the health of a family member with asthma (96%). See Table 16.

**Table 16: Level of Satisfaction with Parent Consultant Help and Implementation of Action Plan Goals at 6 Months**

Category	Action Plan			
	6 Months			
	Help	Help Percent	Results	Results Percent
Very Satisfied	41	61.2	33	49.3
Somewhat Satisfied	25	37.3	31	46.3
Somewhat Dissatisfied	0	0.0	2	3.0
Very Dissatisfied	0	0.0	0	0.0
Refused/Unknown	1	1.5	1	1.5

Over the project period, repair costs totaled \$5,571.80. Labor costs represented 74% of the total costs (See Table 17).

**Table 17. Repair costs for the Healthy Residents, Healthy Homes Project**

	Moisture/ Mold	Pest	Heat/ Cooling	Preventative Maintenance/ Other Repair	Total
<b>Total Labor Costs</b>	\$3,761.96	\$113.50	\$55.00	\$188.25	\$4,118.71
<b>Total Material Costs</b>	\$1,276.47	\$33.00	\$73.36	\$70.26	\$1,453.09
<b>Total Costs per Goal</b>	\$5,038.43	\$146.50	\$128.36	\$258.51	\$5,571.80
Average Labor Costs*	\$107.48	\$56.75	\$18.33	\$31.38	\$89.54
Average Material Costs*	\$53.19	\$33.00	\$24.45	\$17.57	\$31.59

\*Average costs are calculated for only those units where data were available (Overall 46 units for labor costs, 46 units for materials costs; data not reported for number of units for each sub-group).

## V. Conclusion

This report provides a summary of the *Healthy Residents, Healthy Homes* intervention. As noted, major goals of the intervention included working with public housing residents:

1. To help household members with asthma access quality health care;
2. To implement environmental interventions shown to reduce the risk of an asthma attack and emergency department use; and
3. Become more proactive in helping household members with asthma managing their disease.

The baseline and 6-month in-home assessments provided valuable information on households participating in the *Healthy Residents, Healthy Homes* intervention. Public housing residents struggle daily with economic insecurity, risk of crime, and poor health. Yet, we found that public housing authority residents were very responsive to working with a Parent Consultant to help them become better advocates for their health and the health of their families. There were important improvements in asthma-related health outcomes between baseline and the subsequent assessments. Based on the 6-month follow up analysis the following has been found:

1. There has been an 50% increase in reports of no use of relief medication in the past week in children, and a 23% increase in adults;
2. There has been a 12% and a 18% increase in the number of adults and children, respectively, who report no daily asthma symptoms;
3. More than 30% of adults reported better asthma control, with data showing that children also have improved asthma control (12%);
4. All children in the program now have health insurance coverage and a regular primary care provider, with adult Primary Care provider coverage increasing by 22%.

Based on 6-month data, the intervention was successful in reducing environmental triggers that increase the risk of having more severe asthma in persons with the disease.

1. There was a slight decrease in the percentage of households that had evidence of mold (> 2 feet) in non-bathroom areas.
2. There was a 53% decrease in the percentage of households that had evidence of mold (> 1 feet) in bathroom areas.
3. There was a 21% increase in the number of households with smokers only smoking outside of the house.

Based on the results shown in this report, several recommendations are made.

## **Recommendations**

1. The *Healthy Residents, Healthy Homes* intervention requires an active and engaged Response Team working with the Parent Consultant to meet residents' needs. The Parent Consultant and the Response Team should meet weekly. The team should include a clinically trained social worker to provide guidance on how to address the potentially complex health problems of public housing residents. An administrator with line authority to handle programmatic issues in public housing developments should also be a team member.
2. The cost of the intervention is not well understood as these costs include professional staff time, which is difficult to capture. Nevertheless, the ongoing commitment on the part of a housing authority to make sure that maintenance performed to reduce indoor asthma triggers do not come back (e.g., eliminating mold and moisture problems) is critical for creating healthy homes in public housing.
3. Based on the 6-month data, there have been positive improvements in health care access and quality of life among public housing residents involved in this intervention. Given this strong evidence, the *Healthy Residents, Healthy Homes* intervention warrants replication in additional public housing authorities in the state of Rhode Island.

It is the long-term goal of the *Healthy Residents, Healthy Homes* intervention that residents who graduate from the program can become lay educators, thus extending the reach of the intervention to more public housing residents beyond those engaged with professional staff. As important, once the *Healthy Residents, Healthy Homes* intervention has a well-established protocol for monitoring environmental repairs and referring participants to community-based services, the intervention can be expanded to address other prevalent health issues, such as obesity and depression. It is hoped that lessons learned from the evaluation of the *Healthy Residents, Healthy Homes* intervention contribute to the sustainability of the project and replication at other public housing authority sites. A toolkit based on the *Healthy Residents, Healthy Homes* intervention is available on line at: <http://www.health.state.ri.us/disease/asthma/healthyhousing/index.php>

## References

---

- <sup>1</sup> National Heart, Lung, and Blood Institute  
[http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma\\_Causes.html](http://www.nhlbi.nih.gov/health/dci/Diseases/Asthma/Asthma_Causes.html)
- <sup>2</sup> Corburn J, Osleeb J, Porter M. Urban asthma and the neighborhood environment in New York City. *Health & Place*. 2006;12:167-79.
- <sup>3</sup> Halfon N, Newacheck PW. Childhood asthma and poverty: Differential impacts and utilization of health services. *Pediatrics*. 1993; 91:56-61.
- <sup>4</sup> US Department of Health and Human Services. (2000) Action Against Asthma A Strategic Plan for the Department of Health and Human Services.
- <sup>5</sup> Levy JI, Brugg D, Peter JL et al. A community-based participatory research study of multifaceted in-home environmental interventions for pediatric asthmatics in public housing. *Social Science & Medicine*. 2006;63:2191–2203
- <sup>6</sup> Rhode Island Department of Human Services. RIte Care, Rhode Island's Medicaid Managed Care Program. <http://www.dhs.state.ri.us/dhs/famchild/shcare.htm>
- <sup>7</sup> Nancy Sutton, RD, MS. Program Manager, Rhode Island Department of Health Asthma Control Program, 401 222 4040, [Nancy.sutton@health.ri.gov](mailto:Nancy.sutton@health.ri.gov)
- <sup>8</sup> Information on exposure to second-hand smoke and asthma in children is available at: American Academy of Allergy, Asthma, and Immunology, 800-822-ASMA.  
<http://www.aaaai.org>
- <sup>9</sup> Damp Indoor Spaces and Health. Institute of Medicine: Committee on Damp Indoor Spaces and Health. The National Academy Press. ISBN 0-309-09193-4. Washington, D.C. 2004.