San Diego Healthy Homes Collaborative FY2007-2010

Evaluation Findings Summary Report

Report prepared by

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Background

The City of San Diego, Environmental Services Department administered a thirty-six (36) month grant from November 1, 2007 to October 31, 2010. The grant funded by the Department of Housing and Urban Development (HUD) and called the "San Diego Healthy Homes Collaborative" (SDHHC) was intended to address housing conditions that threaten the health of residents. Specifically, the grant made it possible to identify environmental and safety hazards in the home and then implement cost effective measures, at no cost to the occupants, to create healthy homes for families and children. The program was available to residents of the City of San Diego including:

- At least 150 housing units that have at least one child less than 17 years of age that has been diagnosed with asthma or has asthmatic symptoms
- At least 75 additional housing units that have either a child less than 17 years of age that has been diagnosed with asthma or has asthmatic symptoms, or a child under the age of six or a pregnant woman.

As part of the SDHHC grant program, an evaluation was conducted by the National Latino Research Center (NLRC) at California State University San Marcos. The evaluation was intended to assess impact of interventions and evaluate the cost effectiveness of the SDHHC strategy in addressing health and safety hazards in San Diego's housing stock. A primary focus of the evaluation was to evaluate the level of reduction in asthmatic episodes created and to evaluate the overall effectiveness of the program's cost benefit achieved through the program's education and renovation activities, and evaluate the sustainability of the these benefits. Through a multi-tiered and collaborative approach, the City of San Diego successfully fulfilled its grant funded objectives and achieved project outcomes. This report

summarizes overall finding of this evaluation.

Quality Control and Assurance

In order to ensure that program staff was correctly and accurately implementing the intervention protocols, Quality Control was achieved by field monitoring of project staff and assessment of implementation of major project activities. The principal components associated with data quality are precision, accuracy, representativeness, completeness, and comparability. In this project each component was addressed to assess analytical performance and data quality. Specifically, the quality assurance and data validation was assessed by conducting ongoing field audits of data collection for sampling units, tracking of time to completion for all units, and data validation. Self assessment, audits, and peer reviews provide an overall picture of the conformity with the standards outlined in the quality assurance plan.

Precision and accuracy of data collection procedures was observed through field audits from enrollments and follow-up assessments conducted by field inspectors and health educators. The quality assurance inspector was properly introduced to project participants and the nature of the evaluation was disclosed. The field inspectors followed the required protocol. No violations were observed in the dust allergen composite sampling procedures. Similarly, a visual inspection for mold and excessive moisture was thoroughly performed throughout each room in the sampled residence. Overall precision performance for data collection is considered more than acceptable. In fact, this project has shown that a tailored environmental indoor intervention can reduce asthma symptoms.

Representativeness is a qualitative measure expressing the degree to which the data accurately and precisely represent the conditions intended to be examined. Recruitment for inclusion in the project followed precise criteria established in the quality assurance plan. The demographic characteristics of the participants of the project met all the criteria for inclusion in the project. The project manager has done an excellent job of ensuring that the targeted population is appropriately represented in the project.

For data collection, the completeness is expressed as the percentage of participants who have successfully completed all components of the project as scheduled in the quality assurance plan. Even though during the first six months of the project, data collection was slower than expected, the project manager has ensured that data collection smoothly advance to meet all targeted dates. At the start of the project, several assessment questionnaires were not fully completed by inspectors and health educators due to lack of familiarity from MS ACCESS database. Thus, incomplete data were being submitted to the evaluation team. However, after specific staff trainings data collection efficiently resumed.

Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this project, comparability of data can be established through the use of the National Healthy Homes model; other HUD funded Healthy Homes projects, and empirical publications. The Centers for Disease Control and Prevention's (CDC) Task Force on Community Prevention Services recently published reviews and evaluations on asthma education and environmental inventions. The CDC found that "the combination of minor to moderate environmental remediation with an educational component provides a good value for the money invested based on improvements in symptom-free days, savings from averted cots of asthma care, and improvement in productivity."[1]

Participant Demographics

In order to qualify for the Healthy Homes program, the unit must either have at least one child less than 17 years of age who has been diagnosed with asthma or suffer from asthmatic symptoms or a child less than 6 years of age, and have a household income no greater than 80% of the area median income. 392 families (housing units) contacted the SDHHC grant program and 283 households were subsequently determined to be qualified for enrollment in the grant. 267 of these units were evaluated for household health and safety issues. Intervention activities began with 230 participating households. 2 of these households were removed from the program after minor cleaning and extermination services were conducted due to the residents moving. 228 households completed the intervention activities during the

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[1] Nurmagambetov T, et al. *Economic Evaluation of Home-Based Environmental Interventions to Reduce Asthma Morbidity.* December 2, 2009. Webinar sponsored by EPA's Communities in Action for Asthma Friendly Environments, "Economic Evaluation of Homes based Environmental Interventions."

grant. These units housed 512 adults, 379 children ages six to seventeen, and 277 children less than six year of age. 212 children with asthma or other respiratory illness were living in 160 of these households.

A glimpse of health issues such as asthma prevalence and participant demographics illustrate the severity of health disparities present in low income and diverse communities. During the initial visit, results of the asthma assessment indicate that 95% of the children had been prescribed asthma medication prior to the intervention and Table 1 provides demographic data representing the participating households (n=230).

Table 1: Summary of Demographic Characteristics of Participating Households (N=230)	
Indicator(s)	**Description of Analysis**
Ethnicity	2.2% self-identified as Asian 0.8% self-identified as Asian and White 1.3% self-identified as African American and White 6.1% self-identified as Black or African American 8.3% self-identified as 'Other' 80.9% self-identified as White 0.4% refused to answer
Hispanic/ Non-Hispanic	79.1% self-identified as Hispanic 20.9% self-identified as non-Hispanic
Primary Language at Home	67% reported Spanish as their primary language at home 28.7% reported English as their primary language at home 4.3% reported other languages as their primary language at home
Household Annual Income	4.3% reported less than $10,000 15.2% reported $10,000-14.999 17.4% reported $15,000-19,999 12.2% reported $20,000-24,999 13.9% reported $25,000-29,999 9.1% reported $30,000-34,999 5.7% reported $35,000-39,999 7.8% reported $40,000-49,999 4.3% reported $50,000-59,999 1.7% reported $60,000-74,999 1.3% reported $75,000 or more 7.1% refused to answer
Type of Housing Units	78.3% were tenants 21.3% were homeowners 0.4% were unknown

The majority (80.9%) of study participants were White, but those who self-identified as White include Hispanic (79.1% Hispanic and 20.9% Non-Hispanic). Indeed, 67% of the study participating families reported that they speak Spanish as a primary language at home, and 4.3% speak languages other than Spanish or English such as Korean and Vietnamese at

home. More than 65% of the households made less than $30,000 annually (the majority of participating families had 4-5 individuals living in a household), and this seems significantly lower than the federally defined low-income family level[2]. It is also noticeable that only 21.3% of the study participating families were homeowners while the majority (78.3%) were tenants.

99% of the children who received a household intervention responded "Yes" to having medical insurance at the time of the initial household interview. The following chart provides the percentage of participating families by type of healthcare coverage:

Figure 1: Type of Healthcare Coverage
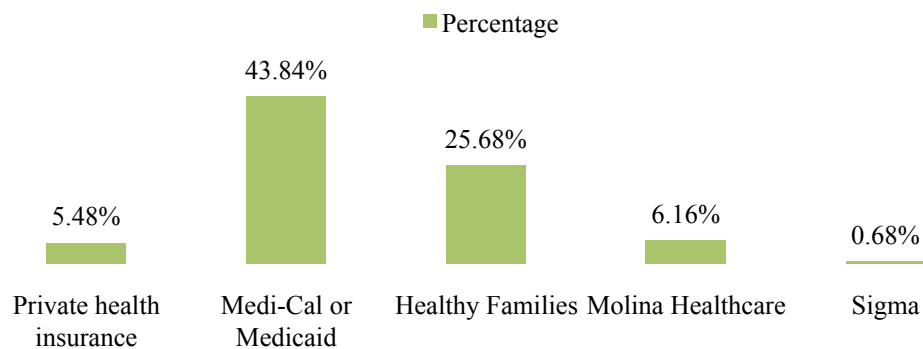
Only 5.5% of participating households had private health insurance, and 15 participating families reported that they were not insured. As shown in Figure 2 and 3, more than half of the households that received the intervention had 4 or 5 individuals living in one household
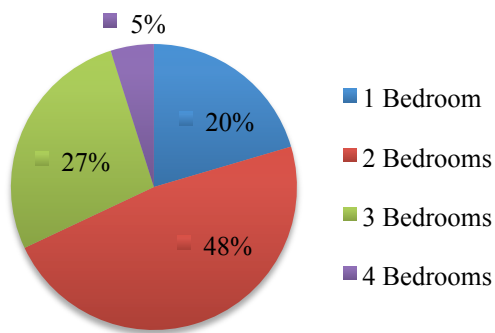

Figure 2: Number of bedrooms in unit
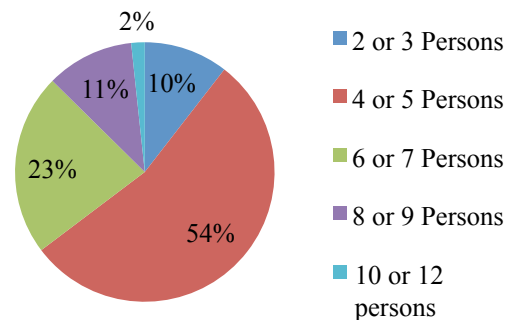of qualifying household

Figure 3: Number of persons residing
in qualifying household

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[2] As of January 11, 2010, the federally defined low-income family level is annual household income of $33,525 for families with 4 individuals living in a household.

and almost a fourth of the households had 6 or 7 individuals living in one household. Moreover, almost half of the units that received the intervention had only 2 bedrooms and nearly a quarter of the units had only one bedroom; many of the participating households are dealing with crowded living conditions.

Renovation Activities

Although the rehabilitation activities conducted for each household depended on the severity of the housing conditions noted in the evaluation, some basic renovations were prevalently conducted. Fungal growth, moisture damage, and plumbing leaks were identified as the most common problem. 196 units had mold or moisture problems visually identified. Numerous bathrooms had visible mold growth and required repair of caulking that was damaged allowing water intrusion to areas susceptible to fungal growth. It was also common to find mold accumulation around window components, indicating poor ventilation was a common problem. The need for implementing Integrated Pest Management (IPM) was the second most common problem. 185 household reported problems with roaches, 63 households reported mice problems, and 35 reported problems with rats. Typical IPM renovations consisted of: patching of access holes in walls; application of caulking to areas where insects could gain access to the interior of the property such as beneath baseboards and small cracks in the walls; hiring pest control services to knock down roach infestations and provide rodent elimination services; education of resident on IPM methodology including proper use of gels and baits, and sources of food and harborage; and providing residents tubes of bait gels. Other common remediation's included installation of smoke alarms; installing child safety latches on cabinetry and toilets; replacing broken or missing window panes or screens; installing GFI outlets or outlet covers, replacement or cleaning of kitchen stove's exhaust grease screens, and eliminating choke hazards for small children by shortening or replacing window blind cords.

Reduction in Asthmatic Episodes

One of the main goals of the evaluation was to determine if the current intervention could reduce the severity of asthma symptoms and the asthmatic episodes for asthmatic children

living in those households. To address this goal, an asthma assessment questionnaire was administered at the beginning of the intervention (i.e., before the intervention) and approximately 180 days after the completion of the intervention. The asthma questionnaire asked parents to report on their child's asthma symptoms experienced within the two weeks previous to administration of the questionnaire. Specifically, parents were asked: "In the past 2 weeks, how often has your child had day/night time coughing, wheezing, or shortness of breath?" and were instructed to answer with options: 1) Everyday, all the time, 2) Everyday, but not all the time, 3) 3-6 times per week, but not every week, 4) 2 times a week or less and 5) none. Parents were also asked "How many times has your child been seen in the emergency room or urgent care center because of cough, wheezing shortness of breath from his/her asthma?"

Results showed a statistically significant reduction in asthmatic symptoms ($p < .000$; please see Appendix table I). 166 parents (78.3%) reported that their children had asthma or asthmatic symptoms during daytime prior to the intervention. After 180 days, 68.1% of participating families reported that their children did not experience asthma or asthmatic symptoms during daytime within the two weeks previous to the post-intervention assessment. Asthma and asthmatic symptoms experienced during the night were also significantly decreased. It is also important to conclude that, after the intervention, only 28.7% of the evaluation participant children needed to visit emergency room or urgent care center because of their asthmatic symptoms while 49.1% visited emergency room or urgent care center before the intervention.

Sustainability

One of the primary considerations when investing in the establishment of a healthy home is the issue of sustainability. Specifically, the question posed is whether or not a healthy homes intervention will generate meaningful and sustainable changes in household environments.

A total of 228 households received some type of renovation, ranging from improving safety in the home (e.g., installation of safety locks in cabinets containing hazardous chemicals to installing smokes alarms or complete weatherization and removal of mold infestation). As

part of the program intervention to ensure residents sustain a healthy living environment, educational/informational sessions aimed at teaching residents how to assess, create and maintain a healthy home was provided to each household. When mold allergens were found in the home the intervention team worked to remove the mold and teach residents about maintaining a mold free home environment. Residents were also taught how to clean their home with cleaning agents that are less likely to cause asthma episodes. Thus, reducing and or eliminating asthma triggers in the home.

For each of the participating housing units, a household interview and visual inspection were conducted in a pre- and post-test design (see Table 2). The initial household interviews and inspections were used to determine a portion of home health and safety concerns to be addressed for education and intervention methods to be provided for each household. Approximately six months after the renovation activities, similar interviews and assessments were conducted in each household to evaluate if sustainable changes have been made. The household interviews document the household problems as described by the residents (see Table 2). In addition to the self-report, reported or identified issues were also assessed by qualified inspectors.

Table 2: Self-Reported Description of Problems by Unit	
Of the units that received an intervention (N=228) and reported the below issues as a problem during the initial household assessment	Of the units that received an intervention (N= 228) and reported the below issues as a problem post intervention
87% reported Mold/Mildew as a known problem	38% reported Mold/Mildew as a known problem
31% reported Mice as a known problem	14% reported Mice as a known problem
18% reported Rats as a known problem	6% reported Rats as a known problem
86% reported Roaches as a known problem	40% reported Roaches as a known problem
23% reported Dustmites as a known problem	68% reported Dustmites as a known problem*

The outcome of improved household environments clearly presents health benefits for residents. There was a significant decrease in all problems reported by residents, with the exception of dustmites, which rose significantly. The rise in this self-reporting percentage

demonstrates an increase in awareness as residents are educated on dustmites as an allergen and dustmite allergen sample results were provided in the home assessment reports (for asthmatic families when results were obtained). At the initial interview, 82% reported that they did not know if they had a dustmite problem. At the follow-up interview, only 17% reported that they did not know if their residents had a dustmite problem. Mold, rats, mice, and cockroaches are known problems, whereas dustmites are often overlooked as a major problem. Findings suggest significant knowledge gained regarding environmental allergens and asthma triggers.

Improvements were also measured by visually assessing the degrees of mold, cockroaches and rodents (asthma triggers) at time of pre- and post-intervention. Certified inspectors assessed the degree of these problems according to a scale ranging from Bad (3), Major (2), Minor (1) to None (0). There were statistically significant improvements ($p < .05$; see Appendix table II) in terms of the degree of mold, cockroaches and rodents in residents' kitchen and bathroom. After the intervention, the degree of mold problem decreased in such a way that only 5.3% of households still have minor problem in the kitchen and 11% in the bathroom (as compared to 29.8% of households had problem in kitchen and 49.6% in bathroom at the initial inspection). Similar improvement was seen for cockroach problem in residents' kitchen and bathroom. 79.8% of households had some sort of cockroach problem in kitchen and 32% in bathroom while at the post-intervention inspection, only 61 households still had cockroach problem in kitchen and cockroach problem was inspected only in 18 households' bathrooms. The improvement for rodent problem was even more significant. At the post-intervention inspection, inspectors found only minor rodent problems in households.

Cockroach Allergens

During the pre and post data collection sessions held at each home an inspector would collect dust samples from the kitchen floors, living room floors, and from the bedroom in which the asthmatic child slept. Research has shown that exposure to cockroach allergens is a major risk factor for asthma. In fact, several research studies have found that levels of cockroach allergens in the home is one of the best predictors of allergic sensitization and asthma morbidity. For this project, during the pre-test assessment certified inspectors used a vacuum

cleaner to collect household allergens; specifically cockroach allergen (Bla g 1) was collected and analyzed. Results showed that during the pre-test the average presence of allergens collected was 391.52 U/g with a range of .0096 U/g- 7100 U/g. According to research cockroach allergen (Bla g 1) concentrations that exceed 2.0 U/g represent a level significantly associated with allergic sensitization and asthma morbidity. Thus, levels of cockroach allergen (Bla g 1) were categorized into levels higher or lower than 2.0 U/g. Results showed that 28% of households that had a detectable amount of cockroach allergen (Bla g 1) were at levels that exceeded 2.0 U/g. These results show that an alarming amount of households in this project have remarkably high levels of cockroach allergen.

Thus, it was important to compare pre-intervention results with post-intervention results in order to demine if the implemented intervention had any impact on cockroach allergen (Bla g 1). For the post-test assessment the inspectors also used a vacuum cleaner to collect cockroach allergen (Bla g 1). Results showed that during the post-test the average presence of allergens collected was 33.45 U/g with a range of .0012 U/g- 970 U/g. These results showed a drastic improvement in levels of allergens present in the home. However, given that cockroach allergen (Bla g 1) concentrations that exceed 2.0 U/g do represent a harmful level, levels of cockroach allergen (Bla g 1) were once again categorized into levels higher or lower than 2.0 U/g. Results showed that 30% of households that had a detectable amount of cockroach allergen (Bla g 1) were still at levels that exceeded 2.0 U/g. Overall, the cockroach allergen (Bla g 1) levels for most household were decreased. Although, for the homes that had severe cockroach infestation issues their cockroach allergen (Bla g 1) levels did decrease, results showed that households continued to be at levels that exceeded the critical level of 2.0 U/g. It is clear that there is a correlation between cockroach allergens and asthma prevalence and morbidity. Thus, interventions such as this one that aim to decreased cockroach allergens are extremely valuable.

The limitations of this intervention were that often time's residents cleaned their homes immediately before the arrival of inspectors, thus decreasing the probability of collecting enough dust samples to properly analyze to detect significant levels of cockroach allergens. Post-interventions levels of cockroach allergen (Bla g 1) did show a considerable decrease, as

compared to average pre-intervention levels (391.5 U/g Bla g 1 vs. 33.45 U/g Bla g 1). Moreover, recent studies have been able to correlation exposure to cockroach allergen (Bla g 1) with asthma hospitalization rates.

Cost-effectiveness of Intervention

Evidence for the health benefit of this intervention is observed by the significant reduction in frequency and severity of asthma symptoms (see Table 2) and reduced direct (costs of medical treatments) and indirect (loss of work and/or school time due to illness) health care costs. This project demonstrated a reduction in the severity of asthmatic symptoms, as measured by the asthma questionnaires. To estimate the return on investment of the healthy homes program, the Asthma Return on Investment calculator, developed by the Agency for Healthcare Research Quality (AHRQ), was used to calculate realistic expectations for the potential impact of the healthy homes program in San Diego. The AHRQ combines information from at least 52 published asthma studies. The model allowed researchers to incorporate variables specific to the current project such as, City of San Diego demographic profile, medical utilization, cost of asthma, asthma prevalence, total cost of program implementation (e.g. all costs related to staffing, equipment, and materials, etc) to estimate the results of savings, costs, and overall Return On Investment (ROI) by comparing the savings of the program with the costs of implementing the program.

Cost-savings are reflected in the reduction of emergency department visits, overnight hospital visits, and urgent doctor/clinic visits. In order to increase the validity of self-reported measures, participants were asked to reflect on their experiences within the last year and the last 6 months. To assess the return on investment for this project, a pre- and post intervention comparison was calculated. As a baseline measure, participants were asked to report on the number of emergency room visits that had occurred within the last year. To demonstrate behavioral changes participants were asked to report on their experiences within the last 6 months post-intervention. This allows for a direct repeated measures behavioral change model that gives us an opportunity to demonstrate a return on investment without the use of a true control group design. Results showed that at the time baseline measures were collected participants reported an average of 1.5 emergency department visits per year, after

the intervention participants reported an average of .6 emergency department visits. The impact of the program resulted in a 60% change of hospital visits post intervention. At the time baseline measures were collected, participants reported an average of .27 overnight hospital visits within the past year, after the intervention participants reported an average of .14 emergency department visits. The impact of the program resulted in a 48% change of overnight hospital visits.

At the time baseline measures were collected, participants reported an average of 4.01 doctor's office or clinic visits for urgent treatment of worsening asthma symptoms within the past year, after the intervention participants reported an average of 2.23 emergency department visits. Impact of the program resulted in a 44% change of doctor's office or clinic for urgent treatment of worsening asthma symptoms visits.

Health care savings and productivity gains estimate the net gains in healthcare and society at large. Asthma-related medical costs calculated specifically for this project with use of the AHRQ calculator demonstrated strong evidence of effectiveness for this healthy homes intervention. The program impact on emergency department visits showed a 26% cost savings. The program impact on hospital stays showed an 85% cost savings. The program impact on outpatient visits showed a 40% cost savings. The program impact on ancillary services showed a 66% cost savings. The program impact on missed school days per child showed a 52% cost savings. Cost-effectiveness, as measured by costs per symptom-free day typically show gains ranging from $12.00 to $57.00 per day.

Conclusions and Lessons Learned

Overall, results showed that the current healthy homes intervention is indeed cost-effective and it drastically improved household environments thereby improving children's health. Additionally, this project met one of the four vital components of effective asthma management practices outlined by the National Asthma Education and Prevention Program (NAEPP) released in 2007 (i.e., environmental control measures to avoid or eliminate factors ("asthma triggers") that contribute to asthma onset and severity). In sum, the project made successful progress in teaching participants how to effectively manage asthma and maintain a

healthy home environment. Clearly, the project was very important to the community as it provided significant services and opportunities for family empowerment to combat asthma by reducing key environmental triggers inside the home. This project was a stepping stone in helping residents become knowledgeable of the connection between health and housing, and more specifically about the environmental triggers related to asthma management.

Many lessons were learned while implementing this intervention. One lesson learned is that culturally and linguistically responsive education can serve as a method to eliminate many of the linguistic and cultural barriers faced by the participants. Spanish-speaking families comprised 68% of program participants (compared to 31% English-speaking and 1% bilingual (English/Spanish) participants). Research suggests that the best interventions are ones that include culturally and linguistically appropriate instruments and studies have shown that the effectiveness of home-based multi-trigger and multi-component environmental interventions is interrelated to whether the design was tailored to the individual. In addressing such issues, the program utilized bilingual Health Educators who spoke Spanish fluently and were culturally sensitive to the needs of Latino families involved in the program.

One area to improve is to identify strategies to deliver scientific and technical information to families with limited educational attainment. The written assessment reports for each household were prepared in English only. Although Spanish speaking program staff reviewed these reports with Spanish speaking households and translators were utilized for other non-English speaking households, non-English speakers have limited access to the report's information beyond the presentation. Modification of the report could greatly increase family's access to information and translation into Spanish will also enhance the program's cultural and linguistic appropriateness.

There are numerous environmental injustices in low income communities. At the forefront is the lack of resources and knowledge on the healthy homes and its relation to health. Over the past decade the prevalence of asthma-related health disparities among individuals living in substandard conditions has continued to rise despite better understanding of the effects of exposure to toxins such as mold, cockroach allergens, hazardous cleaning agents, and indoor

air quality. Exposure to such toxins is documented as a significant risk factor for asthma. The implementation of this healthy homes project has been well accepted and welcomed by the community. The targeted community was in dire need of this project. An area that could be improved is education of environmental factors in the neighborhood. It would be relatively simple to incorporate additional education and data collection to better understand the environment in the local neighborhood.

As a result of this project, several community based organizations have gained knowledge about relevant issues and have been able to create community empowerment. Currently, community organizations throughout the county are pursuing innovative organizing and advocacy strategies for corrective and preventive action through access to hazard assessment tools and training in their use, technical assistance, strategy advice, and mechanisms for peer to peer support. Simultaneously, the project results have found significant correlations between indoor environmental health hazards in substandard housing and health. This project has been able to compile research finds and best intervention strategies to address environmental health hazards found in the homes. The community was very receptive to learning the preliminary findings of the project. In fact, community members have been extremely eager to volunteer for the project. It is clear that this project has designed in-depth asthma education materials that have increased community awareness about asthma control and management, asthma symptoms, environmental health hazards, and use of asthma medication.

One of the primary reasons that this project was well received by the community is because the most effective community partners were fully supportive and engaged. Project staff was easily able to establish rapport with the community given the level of involvement of all partners. As environmental health research is receiving more attention, researchers, advocates, health professionals, policymakers, funders, and others are asking more questions regarding the connections between substandard housing, indoor environmental health hazards, and health impacts. This project has made significant progress towards adding fruitful results and knowledge to the growing body of literature that is establishing a direct relationship between substandard housing and health while using a cost-effective approach.

Appendices

Appendix table I: Pre- and Post-Intervention Comparison of the Frequency of Asthma Symptoms (Self-Reported)

		Pre-Intervention		Post-Intervention		Test results
		N	%	N	%	
1. Asthma Symptom (Daytime)						
	Every day, all the time	36	17.0%	13	6.1%	t = 7.242 df = 211 p=.000*
	Every day, but not all the time	38	17.9%	26	17.4%	
	3-6 times/wk, but not everyday	27	12.7%	8	3.8%	
	2 times a week or less	65	30.7%	37	17.4%	
	None	46	21.7%	129	60.6%	
2. Asthma Symptom (night)						
	Every day, all the time	75	35.4%	30	14.1%	t = 9.545 df = 211 p =.000*
	Every day, but not all the time	30	14.2%	9	4.2%	
	3-6 times/wk, but not everyday	47	22.2%	29	13.6%	
	2 times a week or less	0	0.0%	0	0.0%	
	None	60	28.3%	145	68.1%	
3. # of Urgent Care						
	10 or more	4	1.9%	1	0.5%	t = 4.851 df =210 p=.000*
	9	0	0.0%	0	0.0%	
	8	1	0.5%	0	0.0%	
	7	2	0.9%	0	0.0%	
	6	4	1.9%	1	0.5%	
	5	4	1.9%	1	0.5%	
	4	5	2.3%	3	1.4%	
	3	11	5.1%	5	2.4%	
	2	28	13.1%	26	12.3%	
	1	44	20.6%	26	12.3%	
	0	109	50.9%	149	70.3%	

*Indicates statistically significant improvements (p < .05) from pre-intervention self-reported asthma symptoms

Appendix table II: Pre- and Post-Intervention Comparison of the Degrees of Mold, Cockroaches and Rodents Inspected at Participants' Kitchen and Bathroom

		Pre-Intervention		Post-Intervention		Test results
		N	%	N	%	
1. Degree of Mold (Kitchen)						
	Bad	11	4.8%	0	0.0%	t = 7.311
	Major	0	0.0%	0	0.0%	df = 227
	Minor	57	25.0%	12	5.3%	p=.000*
	None	160	70.2%	216	94.7%	
2. Degree of Mold (Bathroom)						
	Bad	28	12.3%	1	0.4%	t = 10.030
	Major	0	0.0%	0	0.0%	df = 227
	Minor	85	37.3%	24	10.5%	p=.000*
	None	115	50.4%	203	89.0%	
3. Degree of Cockroaches (Kitchen)						
	Bad	55	24.1%	5	2.2%	t = 17.093
	Major	32	14.0%	1	0.4%	df = 227
	Minor	94	41.2%	55	24.1%	p=.000*
	None	47	20.6%	167	73.2%	
4. Degree of Cockroaches (Bathroom)						
	Bad	19	8.3%	1	0.4%	t = 7.885
	Major	9	3.9%	0	0.0%	df = 227
	Minor	45	19.7%	17	7.5%	p=.000*
	None	155	68.0%	210	92.1%	
5. Degree of Rodents (Kitchen)						
	Bad	8	3.5%	0	0.0%	t = 6.235
	Major	0	0.0%	0	0.0%	df = 227
	Minor	36	15.8%	0	0.0%	p=.000*
	None	184	80.7%	228	100%	
6. Degree of Rodents (Bathroom)						
	Bad	1	0.4%	0	0.0%	t = 2.554
	Major	2	0.9%	0	0.0%	df = 227
	Minor	6	2.6%	2	0.9%	p=.011*
	None	219	96.1%	226	99.1%	

*Indicates statistically significant improvements (p < .05) from pre-intervention visual inspection