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Asthma Management Survey of Participants in an Inner City Asthma Intervention

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Abstract:

Background: The Inner City Asthma Intervention (ICAI) was a national multi-center implementation of an evidence-based intervention to reduce asthma morbidity. *Objective:* This study describes mitigating behaviors and reported outcomes in families with asthma who completed the intervention and a post-intervention survey at one of the ICAI sites. *Results:* Eighty percent (0.72-0.88, 95% confidence interval) of these families made five or more changes to mitigate exposure to environmental asthma triggers. The majority of families (0.84-0.96, 95% confidence interval) reported an improved awareness of asthma symptoms and less school absences, limitations of activity, unplanned doctor visits, and asthma related sleep disruption.

Keywords: Asthma, health intervention, health behavior

JEL Classification: I12, I18, Z13

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Abstract

Background: The Inner City Asthma Intervention (ICAI) was a national multi-center implementation of an evidence-based intervention to reduce asthma morbidity. *Objective:* This study describes mitigating behaviors and reported outcomes in families with asthma who completed the intervention and a post-intervention survey at one of the ICAI sites. *Results*: Eighty percent (0.72- 0.88, 95% confidence interval) of these families made five or more changes to mitigate exposure to environmental asthma triggers. The majority of families (0.84-0.96, 95% confidence interval) reported an improved awareness of asthma symptoms and less school absences, limitations of activity, unplanned doctor visits, and asthma related sleep disruption.

I. Introduction

Asthma is one of the most common chronic illnesses among children in the United States. Childhood asthma affects approximately 8.9% of US children contributing to nearly $13 billion per year spent on direct costs alone for asthma treatment.[1] Nationally the disease burden is especially great in urban areas with high levels of poverty and large minority populations. [2] In Massachusetts, the prevalence of asthma has been estimated to be 9.2% among children aged 17 years old and younger, and inpatient hospitalization for asthma accounts for $55 million in health care costs.[3] The prevalence of asthma is higher among low-income children in Massachusetts than among higher income children: 18.1% of children in families with annual household income less than $25,000 have asthma compared to 8.6% to 9.8% of children in higher income families. In a study of repeat hospital admissions, the probability of having a repeat hospitalization was greater among Blacks and Hispanics compared with Whites when controlling for income and insurance coverage.[4] Non-Hispanic Blacks and Hispanics experienced four times the rate of emergency department visits, twice the rate of inpatient hospitalization rate and four times the mortality rate compared to Non Hispanic whites.[5]

The Inner City Asthma Intervention (ICAI) program was an extension of the National Cooperative Inner City Asthma Study (NCICAS) located at 22 sites nationwide

[1] Weiss K, Sullivan S. The Health Economics of Asthma and Rhinitis, I. Assessing the Economic Impact. *Journal of Allergy and Clinical Immunology*. 2001; 107:3-8.
[2] Centers for Disease Control and Prevention. National Asthma Training Curriculum. cd-rom, Version 1, 2004, Atlanta, Georgia.
[3] Office of Emergency Services. *FY 2002 Massachusetts Inpatient Hospitalization Charges*. Boston, MA. 2003. Department of Public Health Technical Report.
[4] Ash, M., Brandt, S. "Disparities in asthma hospitalizations in Massachusetts." *American Journal of Public Health*. February 2006, Volume 96 number 2.
[5] Massachusetts Department of Public Health. *Health of Massachusetts: Impact of Asthma*. August 2005

where asthma was identified as a public health problem. The NCICAS demonstrated that an individually tailored family centered intervention carried out by masters-level social workers trained in asthma management could reduce asthma symptoms among poor, inner-city children.[6]

This study examines the impact that the ICAI program has by comparing parents' responses to a baseline survey and to a post-intervention survey at one of its implementation sites in Springfield, MA. This research contributes to the literature on health interventions in two ways. First, it describes how families benefited from an asthma intervention designed in a research setting and translated into practice in a community clinic. Second, it suggests an approach to evaluate an intervention retrospectively when project evaluation was not integrated into the initial program design.

II. Methods

Study Setting

The ICAI program targeted children in Springfield, Massachusetts, a city with a population of 144,000. Springfield is a diverse city with 30% of its residents being Hispanic and 22% being African American, and 23% of the population report that Spanish is their primary language. The city faces major economic challenges as 27% of the population lives below the poverty line, ranking the city as the 37th poorest city in the nation. According to the 2000 census statistics, 24% of Springfield residents have less

[6] Evans R. Gergen P, Mitchell H, et al. A Randomized Clinical Trial to Reduce Asthma Morbidity Among Inner-city Children: Results of the National Cooperative Inner-city asthma Study, J Pediatr 1999, 135:332-8

than a high school degree, and only18% have a bachelor's degree or higher, which is much lower than the statewide levels of educational attainments.[7] An internal review of patient billing data at the city's leading hospital, Baystate Medical Center showed that from 1997 to 2000 the number of patients identified with asthma doubled in both the inpatient and ambulatory settings.

Patient Selection and Baseline Survey Description

Children and their caregivers were eligible to participate in the ICAI program if the child was five to eleven years old at the time of enrollment, spoke either English or Spanish, lived in an area in which at least 20% of residents live below the poverty line, and had moderate persistent to severe persistent asthma as defined by the National Heart Blood and Lung Institute criteria.[8, 9] Families were recruited through the Baystate Medical Center's High Street Clinic via direct physician referral to an onsite asthma counselor.

After enrolling in the program, the baseline assessment for each child included the Child Asthma Risk Assessment Tool (CARAT) and allergy testing via RAST or skin test. The CARAT was developed by National Institute of Allergy and Infectious Disease-supported researchers using the results of NCICAS to assess a child's asthma risk profile and was used by all sites in the ICAI program. The CARAT was administered by the Asthma Counselor and consisted of questions related to the child's asthma history,

[7] U.S. Census Bureau. 2004 FactSheet. Available at http://factinder.census.gov. Last accessed 6/25/06.
[8] National Asthma Education and Prevention Program. Expert Panel report 2: guideline for the diagnosis and management of asthma. Bethesda MD: NHBLI;1997
[9] National Asthma Education and Prevention Program: expert panel report: guidelines for the diagnosis and management of asthma update on selected topics -- 2002. J Allergy Clin Immunol 2002;110:Suppl:S141-S219

symptoms and triggers, medications and adherence, environmental conditions at home and psychological well-being. The results of the CARAT were used by the Asthma Counselor to identify each child's asthma risks in order to tailor the intervention to meet each child and family's needs. The main goals of the intervention program include 1) providing each child an asthma management plan and educating the family on how to use the plan 2) educating the family on the use of control and rescue medications and 3) educating the family on reducing environmental asthma triggers.

Since the beginning of the program in 2001 over 200 families have participated in the ICAI program at the Baystate Medical Center's High Street Health Center.

Study Design

The goal of the ICAI program was to implement an asthma intervention outside a research setting, therefore, there was little emphasis on collection or analysis of health outcomes. Instead sites were directed to focus on process evaluation as measured by retention of participants over the course of the intervention. To evaluate the impact of the program on asthma management, researchers at the Springfield site adopted a retrospective study design. We used the health behaviors and health outcomes as measured in the Child Asthma Risk Assessment Tool (CARAT) as the baseline. Baseline CARAT data was available for 189 families at the time of this study began in the fall of 2004. From Fall 2004 to Spring 2005, each of the 189 families that participated in the ICAI program were invited to participate in a post-intervention survey on their experiences. A written invitation was sent by mail and up to three phone calls were made to each family by a bi-lingual program administrator from the High Street Health Center

(all written and verbal communication was in the family's primary language as stated at the baseline). Of the 50 parents successfully contacted, 35 families agreed to participate and 25 families completed the post-intervention survey (50% completion rate). We were not able to document any dissimilarities between families that agreed to participate and completed the survey from those that agreed to participant but did not complete the survey, although in absence of a chart review we cannot definitively state that no dissimilarities exist. The post-intervention survey was conducted in both English and Spanish, and participants that completed the post-intervention survey received a $25 gift certificate.

Development of Post-Intervention Survey

To measure the change in household asthma management and health outcomes, we developed a post-intervention survey. Questions for the post-intervention survey are based on the CARAT and two previously administered surveys: Fresno Asthmatic Children's Environmental Study, 'Living with Asthma: A Survey of Families', and the Baseline Parental Interview of the Asthma Care Quality Assessment Study.[10] The post-intervention survey was developed through a series of seven focus groups of families who had a child diagnosed with asthma in the Fresno, California. The focus groups and interviews were conducted over an eleven-month period, from July 2002 to May 2003. In the late spring of 2003 we conducted nine in-person household behavior surveys and followed each survey with debriefing questions with households that had completed the intervention. A last round of revisions were made to the post-intervention survey that

[10] The study protocol was approved by the Institutional review Boards of both Baystate Medical Center and University of Massachusetts, Amherst.

reflected comments and issues that arose during the in-person surveys. In the summer of 2003, the survey instrument was reviewed by asthma specialists including two economists, a clinician, an epidemiologist and two public health researchers. Based on these intensive interviews and peer reviews, the survey was pilot-tested in Fresno, California. Respondents in the pilot-test, recorded that the survey took between 35-45 minutes to complete. [11, 12] To refine the survey in order to evaluate the Springfield Inner City Asthma Intervention Program, a subset of current participants from the program was interviewed in the fall of 2004.

Description of Post-Intervention Survey

The post-intervention survey has three components, which include basic questions about the child's asthma, demographic and socioeconomic status, and asthma's impact on the family. In the post-intervention survey we repeated questions selected from the CARAT in their original form including: child's primary language, gender, and age; use of daily control and/or rescue medication(s); stress level in the household; use of allergy barriers bedding, environmental tobacco smoke in home, and carpet in home; belief that asthma symptoms can be controlled. Questions new to the post-intervention survey included: additional questions on asthma beliefs and attitudes, change in negative outcomes (number of school days missed, frequency of severe symptoms, unplanned MD visits, nighttime asthma, and activity restrictions) and change in behaviors to reduce

[11] Brandt, S. and M. Hanemann, "Valuing Reduced Asthma Morbidity in Children." Valuing Environmental Health Risk Reductions to Children, US EPA's National Center for Environmental Economics, National Center for Environmental Research and Office. Washington, DC: October 20-21, 2003

[12] Sylvia J. Brandt, PhD**,** W. Hanemann, PhD Households' responses to perceived air pollution and childhood asthma morbidity Presented at American Public Health Association Meetings 2004. Available at: www.umass.edu/resec/faculty/brandt/APHA%202004%20Brandt&Hanemann.ppt -

triggers (frequency of dusting/vacuuming and washing sheet in hot water, use of air filters and air conditioning). For this analysis, we will focus on the third section of questions, those concerning asthma's impact on the family. These types of questions include an assessment of the asthma counselor, things that the caregiver learned as a result of the program, medication usage, and asthma-related outcomes, behaviors and feelings. Parents were asked specifically about how outcomes such as missing school, severe symptoms, changes in activity level and trips to the doctors have changed since before their participation in the ICAI program. Caregivers were also asked about how behaviors, such cleaning habits or improvements in the home environment, have changed as a result of the interactions with the Asthma Counselor. A final set of questions focused on feelings of the parents and child towards their asthma. This section included questions on perceived level of control, ability to manage asthma and the impact that asthma has on the family.

The post-intervention survey was conducted after participants completed the intervention program and was conducted independently of the Inner City Asthma Intervention program.

Data Analysis

The data for this analysis come from two family centered surveys, the baseline survey (Childhood Asthma Risk Assessment Tool - CARAT) and the post-intervention survey described above, completed by a subset of participants after the intervention program. First we summarize the intervention population using the CARAT data. Next we present tests for sample selection of participants who completed the post-intervention survey

using t-tests. Then we summarize the responses to survey questions in two domains: self-reported process outcomes, such as actions to reduce asthma triggers in home, and self-reported change in asthma outcomes. Last we present the participants' evaluation of the asthma program.

III. Results

Demographics

Table 1 describes the primary language, gender and age for the 189 households who completed the CARAT at baseline and the 25 households who completed the post-intervention survey. The individual demographic information at baseline was limited by the scope of the CARAT, which was designed for the purpose of developing an individually tailored intervention not for use for research. All children were from urban neighborhoods where at least 20% of the families live below the poverty line. All participants were patients at the High Street Health Center pediatric clinic. Children ranged in age from 5 to 15 years old (mean of 10.7), and 52% of the children were female. All children in the program had moderate persistent to severe persistent asthma. Spanish was the primary language for 44% of the intervention population. Of the households who completed the post-intervention survey, 40% report Spanish as their primary language, 48% of children were female, and the mean age was 9.38 years.

Asthma Triggers and Management at Baseline

The CARAT was designed to elicit information about exposure to asthma triggers (n=189). Parents reported carpets present in 43% of the child’s bedroom and 46% of the

family/television room. Other possible asthma triggers that were commonly reported include: use of gas stove (42%), presence of mold or mildew on ceiling, walls and/or windows (71%) and presence of cockroaches (37%). These results suggested the need for education on asthma triggers as well as potential for reduction in asthma exacerbation through household changes.

The CARAT elicited information on three areas of asthma management prior to the intervention: continuity of asthma related care, avoidance of asthma triggers and appropriate use of asthma medication. At the time of the baseline when all 189 participants were interviewed, 60% of the participants reported having a regular doctor for their child's asthma. A minority of children had allergy mattress and/or pillow covers (10% and 8%). Parents reported that children were exposed to tobacco smoke in 45% of the homes. Only 6% of the participants used no medication, 50% used both controller and rescue medication, although 11% of parents reported that the child only used the controller medication and 33% reported that that child only uses rescue medications. Over half of all patients did not receive any written instructions for medication use, and the majority (60%-70%) did not have a written asthma plan.

Demographics of Post-intervention Sample

To confirm that the sample of participants who completed the post-intervention survey was representative of the intervention population, we compared the two groups on observable demographics (Table 1). The post-intervention group consisted of 25 families out of the 189 interviewed at the baseline, referred to as the "intervention group". In the intervention population, English was the primary language of 56% of families and

Spanish the primary language for 44% of families, compared to 60% and 40% in the post-intervention sample. In the intervention population, 48% of the children were male whereas 52% were male in the post-intervention sample. The children in the post-intervention survey ranged from 5 to 14 years old and were slightly younger on average than those in the intervention population (mean of 9.4 post-intervention sample versus mean of 10.7 baseline population). We use t-tests for proportions and means to compare the post-intervention sample to the intervention population. At the 5% significance level we do not reject the null hypothesis that the sample has the same proportion of English speakers and male children as the population (p-values of 0.6643 (language) and 0.659 (gender)). We do reject the null hypothesis of equal mean age in the sample and population (p-value=0.0199). Although the children in the sample were on average younger, we do not believe that this difference has substantial qualitative impact of our results. While the two groups appear to be similar to one another based on these observable variables, identification of characteristics that may be better predictors of asthma management remains an open research question, and thus we are not able to test for selection based on these characteristics.

As Table 2 shows, the majority of the participants in the post-intervention sample have a household income below $20,000, lived in single-parent headed-households and parents had completed less than a high school degree. Approximately 23% of the caregivers in the sample were looking for employment. The main focus of the CARAT was to identify household asthma triggers and socio-economic questions were limited due to concerns about such questions limiting participation. As a consequence, we were not

able to compare the income, education attainment and employment status between baseline and post-intervention groups.

Process Outcomes

One major goal of the intervention was to empower families by providing information on asthma triggers in the home and ways they could reduce these triggers.[13] We asked parents about changes that they made as a result of learning about asthma triggers. These process outcomes included: dusting, vacuuming, using allergy barriers in bedding, use of air filter, use of air conditioner, washing sheets in hot water and eliminating environmental tobacco smoke (Figure 1). In the post-intervention sample of 25 families 86% of households reported increasing the frequency of dusting (0.79-0.93, 95% confidence interval) and 60% reported increasing the frequency of vacuuming (0.50-0.70, 95% confidence interval) to reduce triggers. Use of bedding with allergy barriers increased from 18% to 92% (statistically significant difference before and after intervention at the 1% level, $p<0.01$) and the percentage of households with environmental tobacco smoke in the home fell from 45% to 24% (statistically significant difference before and after intervention at the 5% level, $p=0.017$). Of those families in the post-intervention that had carpets prior to the intervention, 21% removed carpeting after the intervention (0.13-0.29, 95% confidence interval). The majority (0.72- 0.88, 95% confidence interval) of the post-intervention group made five or more positive changes to reduce environmental exposure.

We explored several factors which we hypothesized may be associated with adoption of asthma management. These factors included household socio-economic

[13] National Asthma Education and Prevention Program, July 1997.

characteristics (household income, housing type, educational attainment, single-parent household, self-reported parental health, primary language at home), attitude and beliefs (specifically “is the child upset about having asthma?” “does the child feel limited by asthma?” and “does the child feel that having asthma is unfair?”), and household stress and coping skills (e.g. parents were asked “does having asthma cause stress for your child?” “has your child’s asthma caused stress in your family?”, “are you confident that you can handle a severe attack of your child’s asthma?” “do you feel that asthma can be controlled so that children can be symptom-free almost everyday?” and “do you feel that your child having asthma is unfair?”). We could find no consistent family characteristics that predicted the extent of reported behavioral change after the intervention.

Medication Use

A second major goal of the ICAI program was to encourage families to use medication as prescribed and to use proper inhaler techniques to bring the child’s asthma under control and allow the child to live as normal a life as possible. Only children with moderate persistent to severe persistent asthma as defined by the National Heart Blood and Lung Institute criteria were eligible to participate in this program. Given the asthma severity of participating children, the guidelines suggest that a majority of these children should be on controller medications; however baseline data suggest an over-reliance on rescue medication and under-utilization of controller medication. Although the difference between the sample before and after the intervention is not statistically significant, parental report of using controller and rescue medications together as part of the management plan rose from 50 to 62% after the intervention period ($p=0.24$). There was

a statistically significant difference between the proportion of the sample using controller medication only or rescue medication only before and after the intervention. Caregiver reports of utilizing only controller medication increased from 11% of children to 23% of children (p=0.028). Over-reliance on rescue medication decreased from 33% of children to 15% of children in this sample (p=0.028). The percentage of parents reporting no medication use after the intervention dropped for 6% to zero.

Change in Asthma Outcomes

We found evidence that the change in process outcomes such as trigger reduction in homes and use of control medications did translate to substantial changes in health outcomes in our post-intervention group of 25 families (Figure 2). After participating in the program, families reported a decrease in negative outcomes including the number of missed school days, frequency of severe symptoms, and frequency of unplanned doctor's visits for asthma. Families reported that the children had fewer problems with nighttime asthma and less activity limitation in terms of everyday activities. Before participating in the Inner City Asthma Intervention program, asthma was reported as an additional stress and emotional burden to these children and their families, and most (76%) of the parents reported feeling some stress to feeling stressed all of the time. After the intervention these reports of family stress decreased to 68% of intervention parents, but this was not a statistically significant change, (p=0.17).

Nearly 90% of post intervention parents reported that the family was doing better now compared to before the program (0.84-0.96, 95% confidence interval). Over 90% of the post-intervention sample reported that the asthma counselor: explained things in an

clear manner, showed respect for the family's needs, and explained things to child in a way they could easily understand (0.84-0.96, 95% confidence interval).

IV. Discussion

This report details some of the behavior changes enacted by families participating in the ICAI program in Springfield, MA. In this study, families reported adopting behavioral changes to reduce exposure to potential asthma triggers. In addition to reported behavioral changes there were improvements in outcomes as measured by self-reported missed school days, amount of severe symptoms, limitation of activity, interrupted sleep and frequency of unplanned doctors visits for asthma. Families reported less stress and an overall improvement in the child's health and well-being

Additionally, parental reports of medication utilization had improved. Children were using daily controller medications more frequently and rescue medications appropriately. Children learned the importance of the medications as well as the proper techniques to affectively take medication. Parents felt that they learned more about the differences between the medications and when and how to administer them properly to their children.

The reduction of self-reported stress in participating families might be an important benefit of this program as chronic stress has been documented to play a role in asthma severity.[14, 15] At baseline, 75% of parents reported feeling stressed as a result of

[14] Wright, R.J., Wright, R.J., Weiss, S.T., Cohen, S., Hawthorne, M., & Gold D.R. (1996). Life events, perceived stress, home characteristics and wheeze in asthmatic/allergic families. American Journal of Respiratory and Critical Cardiac Medicine, 153, A420

[15] Wright, R., Rodriguez, M., & Cohen, S. (1998). Review of psychosocial stress and asthma: An integrated biopsychosocial approach. Thorax, 53, 1066-1174.

the child's asthma. After the program, when asked if they felt stressed, 68% of parents reported feelings some level of stress, although about half of parents did not attribute the child's asthma to feeling stressed.

Parental worries regarding the use of daily medications have been associated with poor medication adherence in urban children.[16] Mansour et al. (2000) conducted a study among black patients and identified health beliefs, family characteristics, and the social and physical environment as the major barriers to quality asthma care. They argued that these factors were more important than access to medical care, health insurance, and continuity of care.[17] The level of comfort that families reported in getting asthma information and accessibility of the asthma counselor may have played a role in this population in improved use of controller medications and reports of decreased parental stress.

Behavioral change leading to successful environmental remediation was also achieved in this group. These results show that implementing strategies to reduce indoor allergens and triggers, among high-risk populations, is associated with sustained improvements in self-reported, asthma-related morbidity. Generally speaking, making changes around the home has lead to observable improvements in asthma-related outcomes and quality of life.

V. Limitations of Study

[16] Conn, KM, Halterman, JS, Fisher, SG, Yoos, HL, Chin NP, Szilagyi, PJ, Parental Beliefs about Medications and Medication Adherenc Among Urban Children with Asthma. Ambulatory Pediatrics 2005; 5:306-310

[17] Mansour, M., Lanphear, B., DeWitt, T., (2000). Barriers to asthma care in urban children: Parent perspectives. Pediatrics, 106, (3), 512-519

As is common to public health programs that target low income, urban families, the addresses and phone numbers of participants change frequently. Of the 189 families that participated in the ICAI program, 50 families were successfully contacted, primarily due to difficulties of locating families after the intervention. The use of a post-intervention survey and difficulty in reaching participants create the possibility of sample selection such that families that had a less than favorable experience with the program or the High Street Health Center are under-represented. While we were able to verify that this sample is not statistically different from the population of families that participated in the ICAI program based on the observable characteristics of age, race and language primarily spoken, we were not able to rule out sample selection based on experience with the program.

In addition to sample selection bias, recall bias may also be introduced into this study, as all of the data collected were self-reported. Using self-reported data forces us to rely on parent's perception and ability to accurately recall events. Other studies have shown that reports of school absences due to asthma tend to be over estimated in children with asthma when relying solely on self-reported data.[18] Additionally, as with any post-intervention survey, there is the risk of respondents modifying their responses so as to provide "socially desirable" replies; however, we believe this risk was reduced by having the survey completed by an interviewer who was not associated with the asthma program or the Baystate Medical Center. The structure of this study, being conducted after program completion, forced us to rely solely on self-reported data. However it is important to recognize that much of the information collected, such as feelings of towards

[18] S. Bonilla et al, School Absenteeism in Children with Asthma in a Los Angeles Inner City School, J Peds 2005 Volume 147 no 6 pp802-806

the asthma or changing behaviors within a household can only be measured in this manner. Therefore we find it necessary to acknowledge these potential areas for bias in our results, but not to speculate how the bias will impact the results as the primary focus of this research is not to examine bias, but rather to examine how changes in behaviors affecting asthma outcomes were attributable to participation in the ICAI program.

VI. Conclusion

This study shows that caregivers who participated in the ICAI program and post-intervention survey felt knowledgeable about asthma and subsequently more comfortable with managing the child's asthma at home and in working with health care professionals to maintain adequate asthma care. These families also reported adopting behavior changes to reduce the exposure to asthma triggers and also improvements in the use of controller and rescue medications. The report shows how families responded to an asthma intervention originally designed in a research setting.

Table 1: SUMMARY OF CARAT SURVEY AND LWA POST-INTERVENTION SURVEY

		CARAT POPULATION		LWA POST INTERVENTION SAMPLE	
		Frequency	Proportion	Frequency	Proportion
PRIMARY LANGUAGE	English	105	0.56	15	0.60
	Spanish	83	0.44	10	0.40
	Unknown	1	0.01	0	0
	TOTAL	189		25	
GENDER	Male	90	0.48	13	0.52
	Female	98	0.52	12	0.48
	TOTAL	189		25	
MEAN AGE		10.7 YEARS		9.38 YEARS	

Note: P-values for differences by language, gender and age are 0.664, 0.659 and 0.020, respectively.

Table 2: DEMOGRAPHICS OF LWA POST-INTERVENTION SAMPLE

		Proportion
Income	Less than $10,000	0.38
	$10 to $20,000	0.38
	$20 to $30,000	0.12
	$30 to $40,000	0
	Declined to answer	0.12
Educational Attainment	Less than HS Diploma	0.58
	HS diploma or GED	0.23
	College	0.15
Employment Status	Full or Part-Time	0.38
	Looking for work	0.23
	Not Employed and Not Looking	0.38
Single-Parent headed Household	Yes	0.73

Table 3: CHANGE IN MEDICATION UTILIZATION

	CARAT POPULATION (%)	LWA POST INTERVENTION SAMPLE (%)	P-value
No medication	6	0	
Daily medication only	11	23	0.028
Rescue medication only	33	15	0.028
Daily and rescue mediation	50	62	0.24
N	189	25	

Figure 1

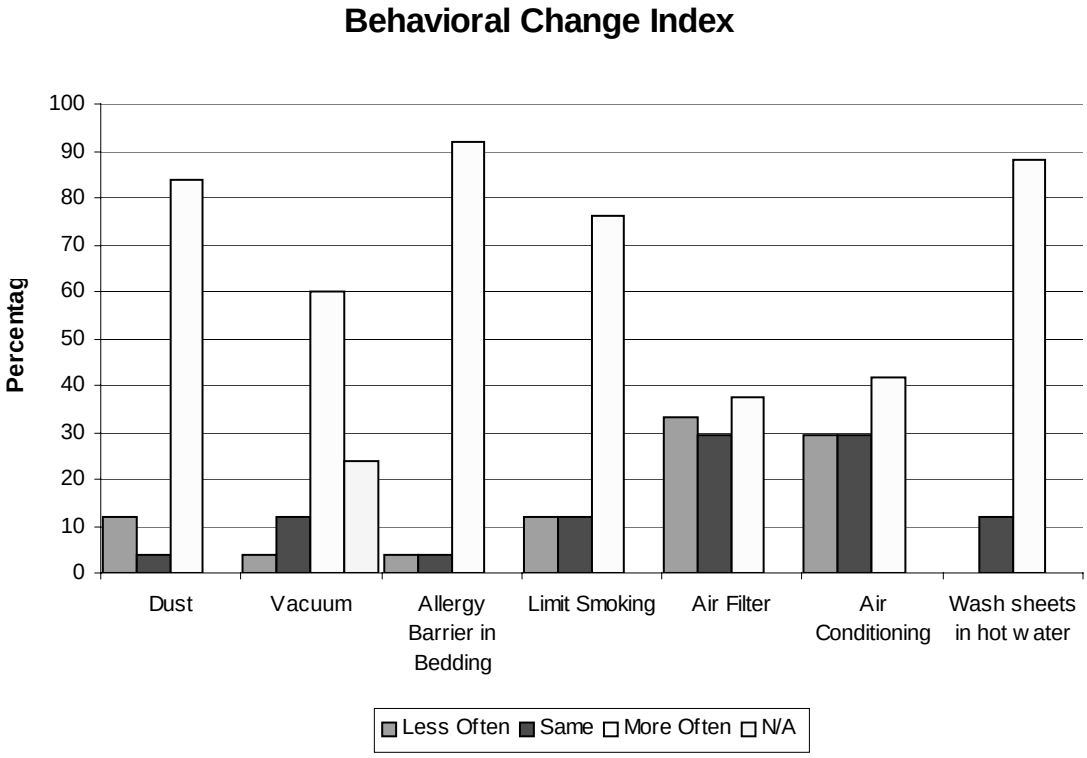
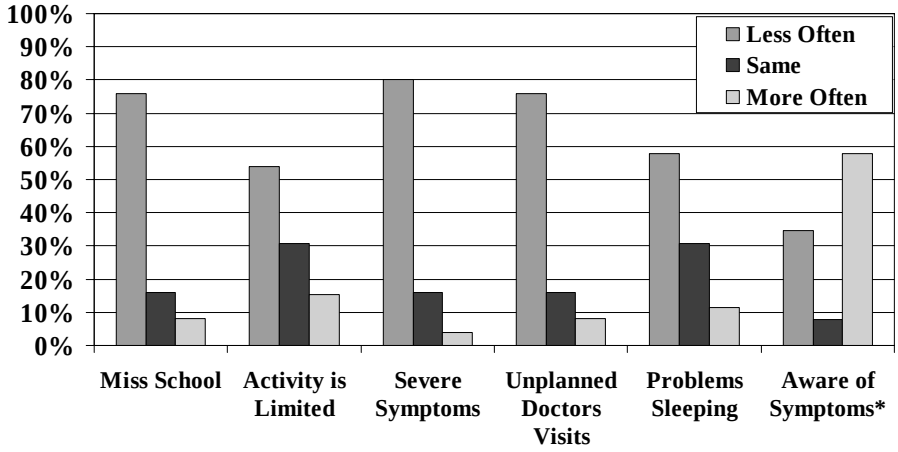

Behavioral Change Index
Percentag
100
90
80
70
60
50
40
30
20
10
0
Dust
Vacuum
Allergy Barrier in Bedding
Limit Smoking
Air Filter
Air Conditioning
Wash sheets in hot w ater
Less Often
Same
More Often
N/A

Figure 2

Changes in Outcomes Resulting from Participation in the Inner City Asthma Intervention Program

Responses to the question: "Compared to before the Intervention program, how often does the child…"



*Note that we would expect all of the responses to the questions to be less often, except being aware of symptoms, which we would expect to be more often than before.

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