ASSESSING EFFECTIVENESS OF EDUCATIONAL INTERVENTIONS ON SUBPOPULATIONS OF PRIMARY CARETAKERS FROM PITTSBURGH ENVIRONMENTAL ASTHMA STUDY BASED ON KAB SURVEY SCORES

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Maybe someday I will come back to the University of Pittsburgh's Graduate School of Public Health for that DrPh!

Conrad D. Volz, DrPh, MPH

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Abstract

The goal of this study is to identify vulnerable subpopulations of primary caretakers who will need supplementary educational interventions in future public health applications of this study design. We assessed the effectiveness of educational interventions received during the Pittsburgh based Environmental Asthma study on vulnerable subpopulations of primary caretakers. The educational interventions consisted of information on asthma basics, home environment inspection and remedial recommendations and how to care for a child with asthma. Educational interventions should have a positive impact on knowledge, attitudes, and beliefs of the primary caretakers by an improvement in overall scores from Pre-intervention Knowledge, Attitudes and Beliefs Questionnaires (KAB) to Post-intervention KAB. We also assessed improvement from Pre-intervention KAB to 6-Month Post-Intervention KAB taken at the conclusion of the study. Method: During the study, several educational interventions were conducted by Healthy Homes Resources (HHR) community workers. KAB Questionnaire surveys were given to primary caretakers at three different time intervals - Pre-intervention, Post-intervention and

Final. Responses were used to determine how well education improved their knowledge of asthma, management of in-home triggers and asthma prevention techniques. Answers were scored using the Likert Scale and were based upon total scores of each survey. Data collected from caregivers who finished each segment of the program were entered into a SPSS 16.0 database and analyzed statistically using Minitab 15. Results: Post intervention KAB scores of the entire group of primary caretakers increased significantly by 19.7 points over pre-intervention scores ($p = 0.000$). Post-intervention KAB did not show any statistical difference ($p = 0.606$) from 6-Month Post-Intervention scores indicating that caretakers retained information and the program has persistence of effect. The 6-Month Post-Intervention scores did increase significantly over Pre-Intervention KAB scores by 26.55 points ($p=.004$). Several vulnerable subpopulations of primary caregivers were identified by statistical differences of their KAB survey scores. These subpopulations include: smokers, caretakers ≤ 30 years of age and those ethnically white. Conclusion: The public health relevance of this study is that similar asthma interventions should target these vulnerable subpopulations of primary caregivers by providing different and additional educational interventions to aid in increasing knowledge, attitudes, and beliefs, regarding their ability to care for their asthmatic children.

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PROBLEM STATEMENT:

Asthma incidence has been on the increase; one in four urban children has been diagnosed with this respiratory ailment. The incidence of asthma appears to be highest among children living in lower socio-economic situations where their homes are often located near industrial areas and highways. These poorer housing arrangements lead to increased outdoor exposures to diesel exhaust from close proximity to highways and factory pollutants. Often these lower socio-economic housing areas are located in higher violent crime areas and children are kept indoors a greater period of time. Prolonged time spent indoors increases exposure to house dust mites, fungi, cockroaches and environmental tobacco smoke which are known indoor allergens (*Mayo Clinic, 2008).*

PUBLIC HEALTH SIGNIFICANCE:

Asthma is commonly defined as a chronic inflammatory condition of the lungs that upon introduction of environmental stimuli, makes it difficult to breathe. The inflammation worsens and produces chest tightness, coughing and wheezing which can lead to an asthma attack (*American Lung Association, 2008*). Asthma is one of the most common childhood chronic ailments now diagnosed in American children with nearly 12.2% of the population's children being diagnosed with asthma (*National Institute of Environmental Health Sciences, 2006*). Asthma has always had a genetic link but recently it has come to light that environmental factors also play a role in its etiology and exacerbation. Indoor environmental factors include but are not limited to cat and dog dander, fungi, bacteria, rodents, house dust mites, cockroach

allergens, environmental tobacco smoke and even psychological stress factors such as violence in the home, thus the new term "environmental asthma".

Figure 1 taken from the CDC and the National Health Interview Survey Annual Data 2001-2004 notes that asthma rates were stable for White non-Hispanic boys and girls and African American non-Hispanic girls. However, it can be noted that a trend for African American non-Hispanic boys' asthma rates are on the increase.

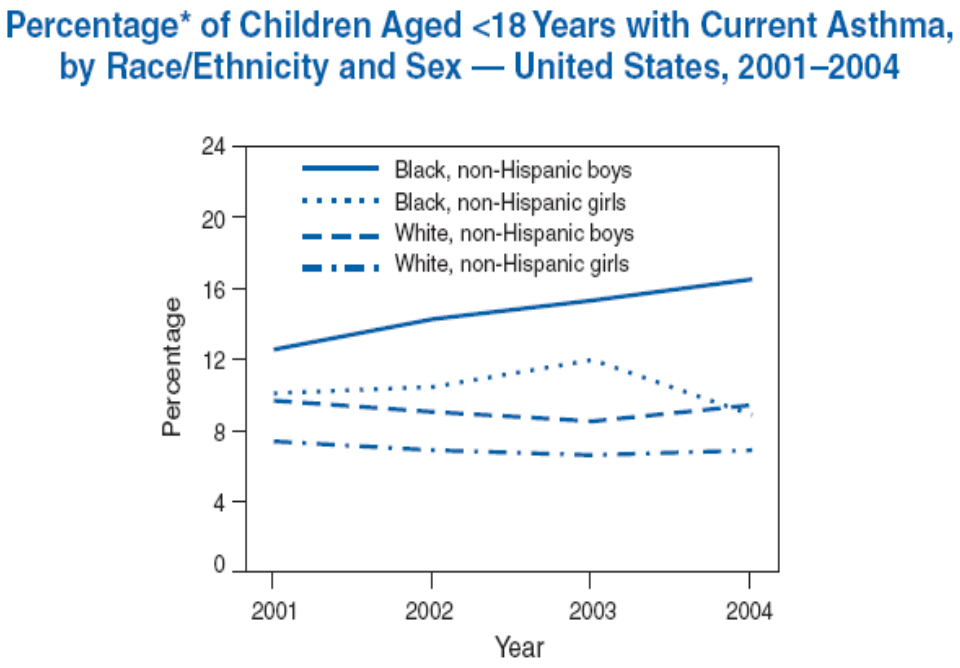
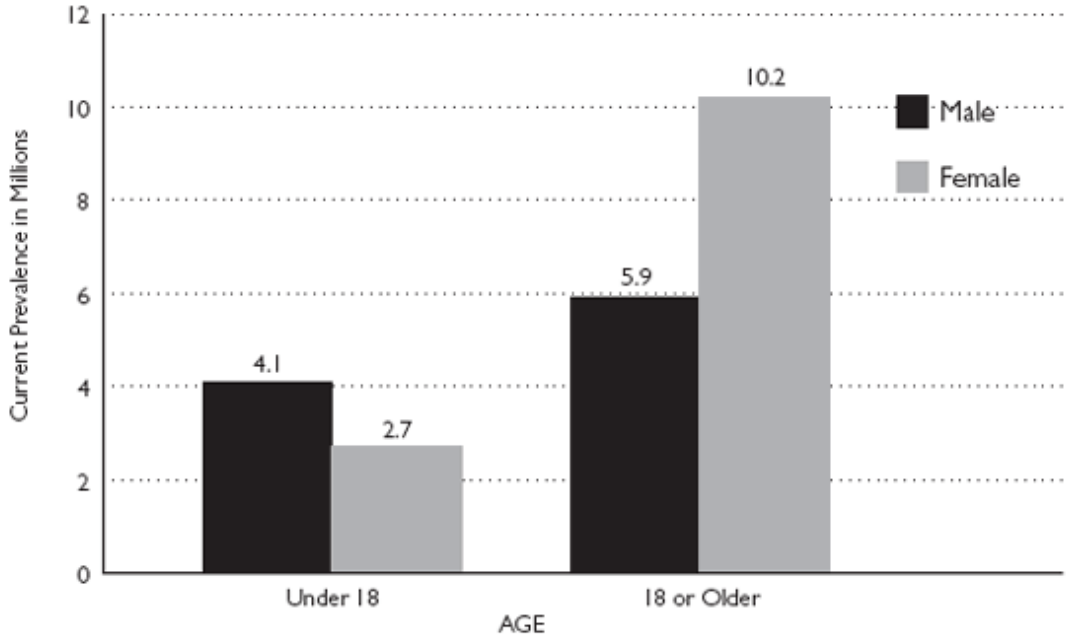


Figure 1: CDC Data – 2006 National Health Survey Annual Data 2001-2004.

Current statistics can be alarming. Figure 2, taken from the American Lung Association's website (www.lungusa.org) notes the current asthma prevalence by age and sex in 2006. Early childhood rates indicate that asthma is more common in boys than girls. But, women exceed men in the development of asthma later in adulthood.

This may occur because they stay at home with the children more than men and are exposed to these environmental triggers at a higher level.

Ethnicity also appears to play a role in differences in asthma development. African Americans suffer disproportionately from asthma. Asthma prevalence rates are almost 24 percent higher among African Americans (94.2 per 1,000) than Whites (76.1 per 1,000), (*American Lung Association, 2008*). These numbers may make asthma appear a racial concern but it really focuses on the urbanization of asthma. Often ethnic pockets of society are situated around urban areas which contribute a great deal too environmental asthma triggers. Suburbia is dominated by their own ethnic groups that seem to have lower frequency to issues associated directly to living the urban life. These issues include such items as close proximity to factories and highways which can lead to increase air pollution risks, poor quality rental housing with moisture, fungi and rodent activity, rundown neighborhoods and schools, lower family income, and poor health care attention. All these items feed upon each other to create an often overwhelming situation of poverty that seems to be leading to an increase in childhood asthma.



Source: Centers for Disease Control and Prevention. National Center for Health Statistics. National Health Interview Survey, 2006. Analysis by the American Lung Association, Research and Program Services Division using SPSS and SUDAAN software.

Notes:

1. Current prevalence is defined as answering yes to both "Have you EVER been told by a doctor or other health professional that you had asthma?" and "Do you still have asthma?"

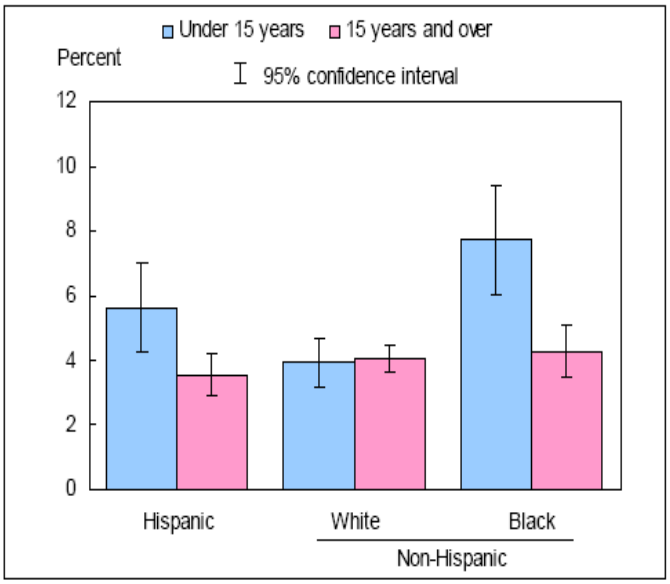
* **Comparisons should only be made between groups and diseases using rates, not number of cases, as these do not take into account differences which may exist in population size or demographics.**

Figure 2: Asthma – CDC Current Prevalence by Age and Sex, U.S., 2006

Why should we worry about asthma? Here are some startling statistics. Asthma is the third leading cause of hospitalization among children under the age of 15 with African American children being admitted 3.8 times more than White children. In 2003, Asthma was responsible for 12.8 million school days lost. The cost of treating asthma for those less than 18 years of age is estimated to be $3.2 billion per year (*American Lung Association, 2008*). This is a huge medical expenditure on a society that is already strained financially. Many of these lower income families also do not have access to healthcare.

Figure 3, taken from the CDC's early release of data from the National Health Interview Survey for 2007, notes that non-Hispanic White children under the age of 15 have less asthma episodes than non-Hispanic Black children and Hispanic children. However, Non-Hispanic Black children experienced the highest rates of asthma episodes in the last twelve months. Figure 4, also from the CDC notes how asthma prevalence is on the increase in the African American population while the White population remains steady.

Sex-adjusted percentage of persons of all ages who experienced an asthma episode in the past 12 months, by age group and race/ethnicity: United States, 2007



NOTES: Information on an episode of asthma or asthma attack during the past 12 months is self-reported by adults aged 18 years and over. For children under age 18 years, the information is collected from an adult family member, usually a parent, who is knowledgeable about the child's health. The analyses excluded 46 persons (0.1%) with unknown asthma episode status.

DATA SOURCE: Based on data collected in the Sample Adult and Sample Child Core components of the 2007 National Health Interview Survey. Data are based on household interviews of a sample of the civilian noninstitutionalized population.

Figure 3: Sex-Adjusted Percentages of Asthma Episodes – CDC 2007

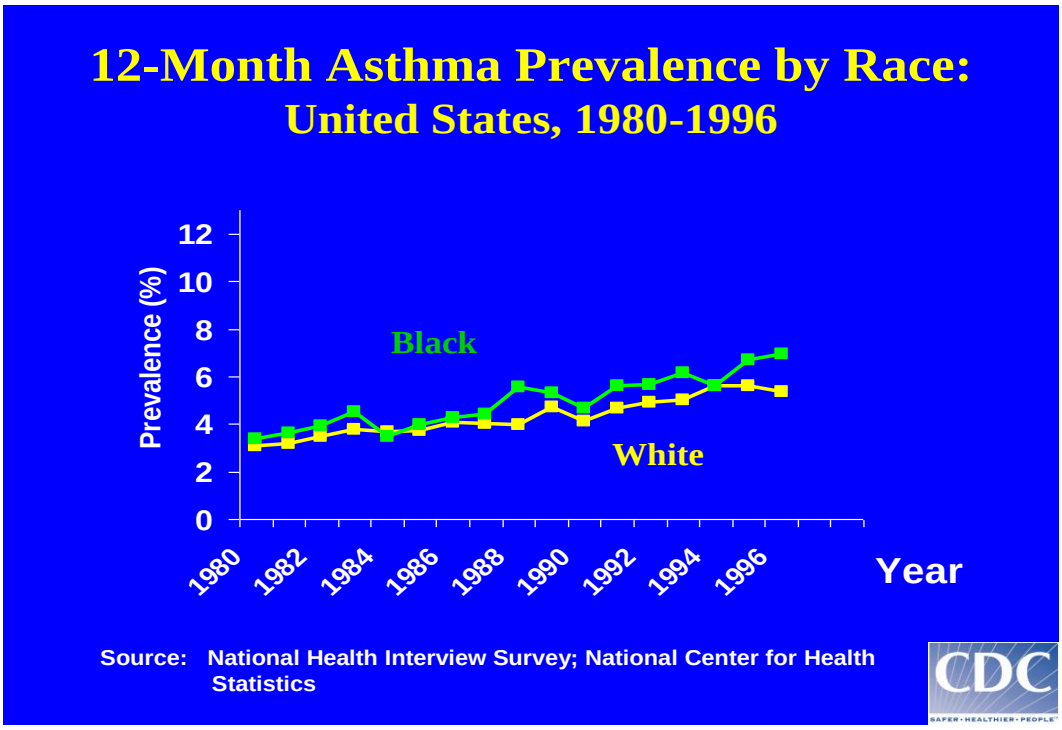


Figure 4: 12 Month Asthma Prevalence by Race in United States - CDC

The following graph, Figure 5, illustrates on how asthma is treated by the health care program via age, sex and race. Physician office visits, Outpatient Clinics and Emergency Room Visits are on the rise in children. This chart also demonstrates that White people visit the family doctor more often than African Americans but African Americans use the services of Outpatient Clinics and the Emergency Room more frequently. This could be viewed that African Americans have less health care and need to use the services of clinics more often than White people.

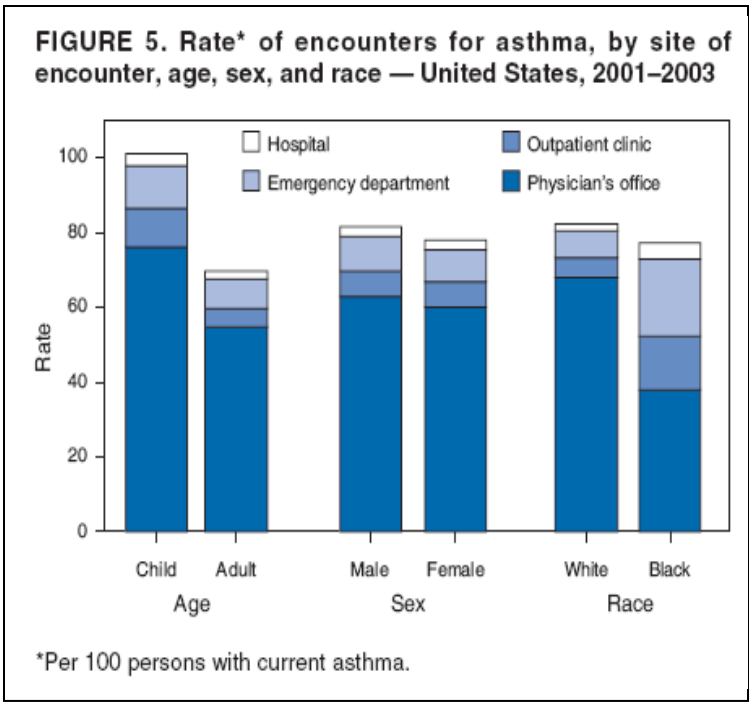


Figure 5: Rate of Encounters for Asthma – CDC Survey 2004 Source

Below in Figure 6 and Figure 7 are several graphs and charts indicating prevalence of asthma by race and poverty status. These graphs were recovered from the CDC's National Health Interview Survey from 2004. These charts indicate that based on race and ethnicity, asthma prevalence is higher in African American population than the White or Hispanic population. Asthma is also higher in children living in the lowest levels of poverty (*CDC, 2004).*

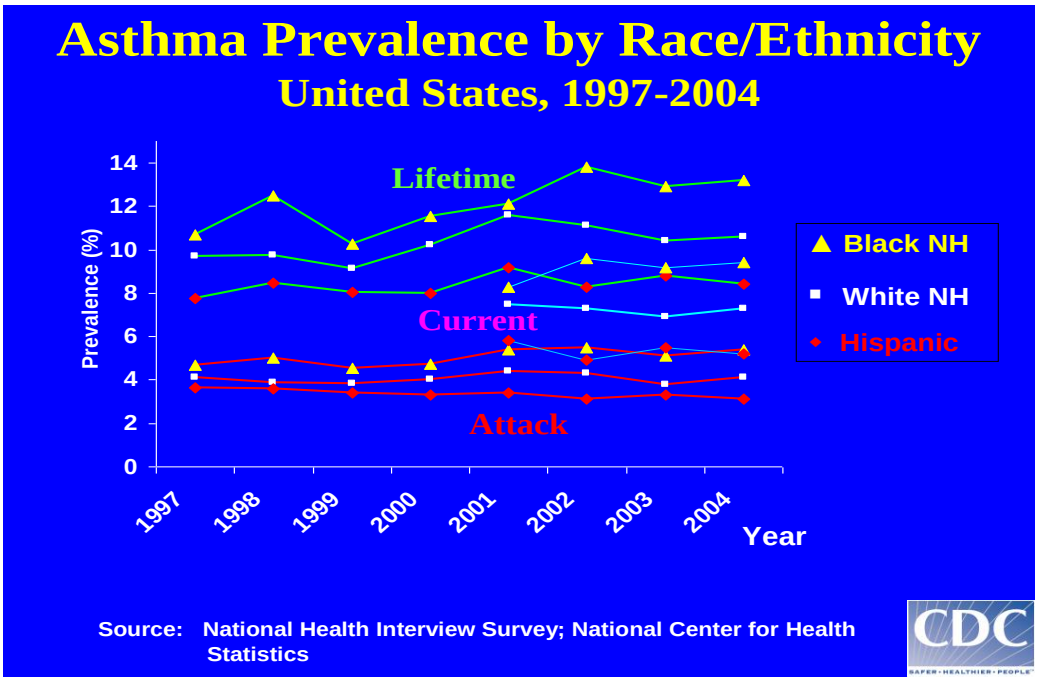


Figure 6: Asthma Prevalence by Race/Ethnicity – CDC 2006

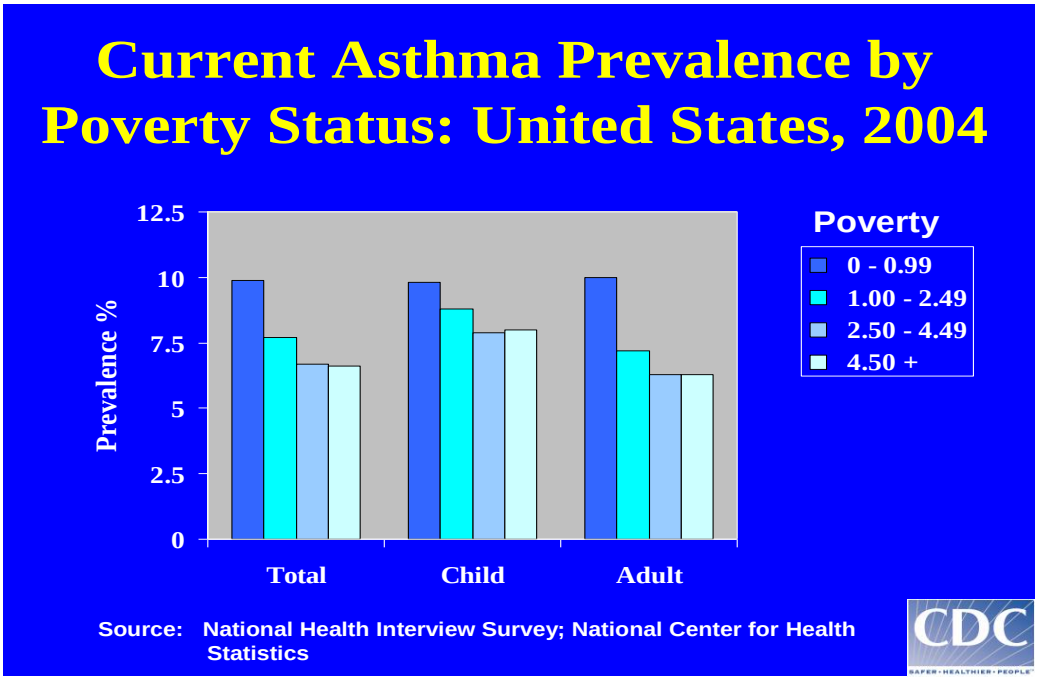


Figure 7: Asthma Prevalence by Poverty Status – CDC 2006

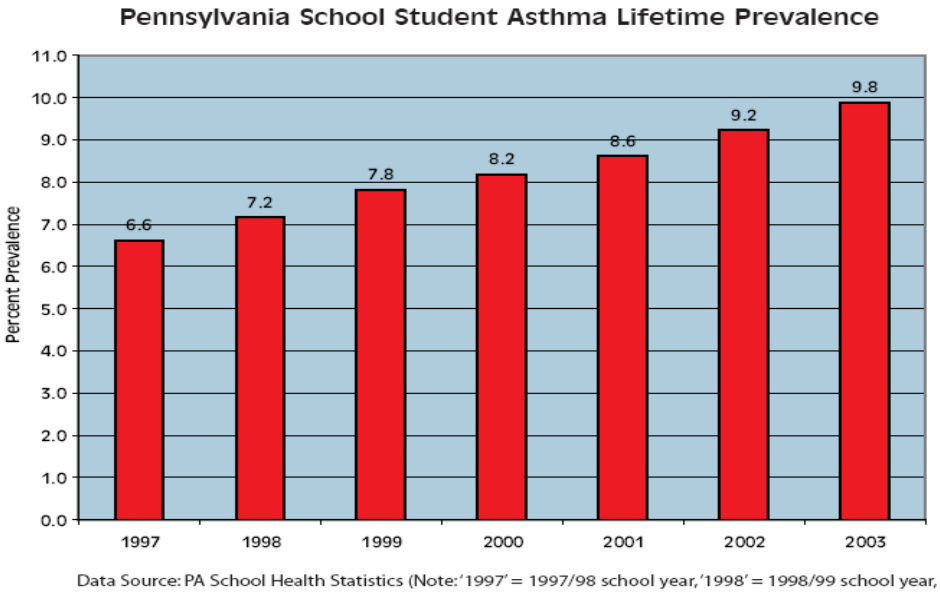


Figure 8: 2007 Pennsylvania Asthma Focus Report
Prevalence & Beyond: Measures of Asthma Management & Control

According to 2003 data from the U.S. Department of Health and Human Services, nearly 4 million children missed a total of 12.8 million school days due to asthma attacks. The states with the highest percentage of childhood asthma were Massachusetts, Hawaii, Oklahoma, Maryland and Rhode Island (*CDC, 2006 Press Release*). In Figure 8, a seven-year period from 1997-2003 noted an increase in prevalence of asthma in school children in Pennsylvania. The increase from 6.6% in 1997 to 9.8% in 2003 is startling. Asthma is being diagnosed earlier in life for children 10 and under having the highest percentage rate of 32.1%. In Figure 9, the Pie chart also shows that the rate that asthma is diagnosed in children 17 and under is 51.7% compared to adults 50 years and older which is only 11.5% (*PA Department of Health, 2007*).

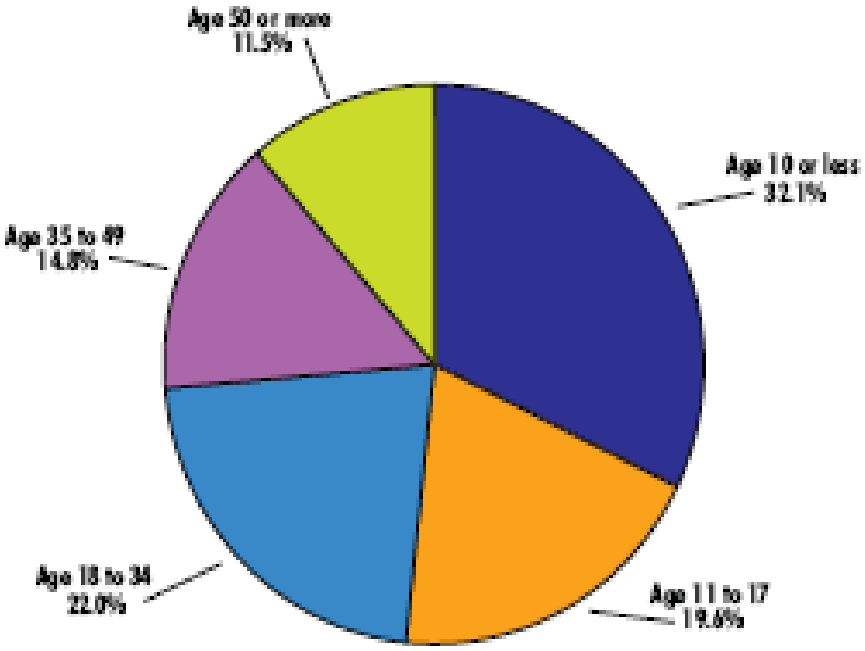


Figure 9. Pie Chart Rate of Asthma Diagnosis (*PA Department of Health, 2007*)

So what exactly are some of the environmental triggers that can sensitize a child into developing asthma? These environmental factors can be divided into two categories; indoor and outdoor exposures. Outdoor exposures include air pollutions from factories and plants, automobile exhausts, ozone, and pollen. These pollutants may enter into the home through window and foundation leaks. The most obvious indoor exposures include fungi development from damp basements or water leaks, dog and cat dander, house dust mite allergens, cockroach allergens, environmental tobacco smoke, cleaning chemicals, formaldehyde from wood products and glues, and poorly maintained HVAC systems (heating, ventilation, air conditioning) in a home.

LITERATURE SEARCH:

The development of environmental asthma is divided into two categories: indoor and outdoor pollutants. This section will touch briefly on outdoor exposures and how these factors could exacerbate asthmatic conditions. Outdoor exposures include diesel exhausts, air pollution from factories and industry, elevated pollen levels, and ozone. Factory soot and diesel exhausts send particulate matter into the air causing an increase in asthma attacks. Ozone is a byproduct of tailpipe pollution from traffic when exhausts react with oxygen and sunlight (*PA Department of Health, 2008*).

Most importantly and the issues we deal with here are the indoor allergens. The ones of interest are dust mites, cockroaches, fungi and cat and dog allergens. Each of these will be explained in depth on why they are an asthma "trigger". Most of these dusts and dander enter the air currents by vacuuming or sweeping of floors. Rugs hold much of the dander in place and can accumulate over time. These particles are small enough to enter the breathing zone of the asthmatic person. Poor housekeeping is often the best friend of indoor allergens!

Any animal with fur or feathers can be considered a source of indoor allergens. This includes cats, dogs, rabbits, hamsters, guinea pigs, ferrets and birds. The allergens from their saliva, skin dander and urine from these animals remain in house dust and can be carried to other locations on the clothing of the house occupants. Hair is not the cause of allergens from these animals. More people are sensitive to cat dander than dog dander, perhaps because dogs are bathed more often than cats. Also since cats bath themselves with saliva, the saliva helps the dander

stick to surfaces such as the HVAC system. Cat and dog allergens have been found in settled house dust from homes where no pets have been housed for several years (*Macher, 1999*).

Cockroaches cause problems from their skeletal remains, egg shells, saliva and droppings. Dirty dishes, clutter, food left on counters and standing water are attractive hideouts for roaches (*American Lung Association, 2008*). Their thirst for water indicates that they are most often located in the kitchen or bathroom. Their droppings and remains are associated with particles >5 μm become part of the house dust and can be breathed by asthmatic individuals when the room is disturbed (*Macher, 1999*). Nearly two-thirds of American homes have detectable levels of cockroach allergens (*National Institute of Environmental Health Sciences, 2006*).

House dust mites are closely related to spiders and are considered a member of the arthropods. They are often found in bedding, carpeting, curtains, and upholstery where human skin cells are largely accumulated as this is their food source. Both food and water are needed by the dust mite to survive indoors. Homes where moisture and humidity are greater than 50% provide a perfect climate for dust mites to survive. Dust mite droppings and chitin from their skeletal remains are a major source of allergens for children with asthma (*Macher, 1999*).

Fungi has had increased awareness over the past years with many celebrities clamming injury from toxins produced by such fungi as *Stachybotrys chartarum* However, any fungi species can illicit a response from a sensitized individual. Where there are fungi there is also a water source, such as leaky roofs, pipes or downspouts or damp basements. Fungi also needs a source of food which is often provided in the

home by cellulose containing compounds such as particle board, upholstery, wallpaper paste or carpeting. People are exposed to fungi by inhalation of the spores which are a perfect size to be inhaled or by exposure to fungal VOCs. These VOCs can produce a noxious odor which could exacerbate an asthmatic condition (*Macher, 1999*).

HYPOTHESIS:

I tested the hypothesis that this study will identify vulnerable subpopulations of primary caretakers who will need supplementary educational interventions for future public health applications of this study design. I assessed the effectiveness of educational interventions received during the Pittsburgh based Environmental Asthma study on vulnerable subpopulations of primary caretakers based on their KAB scores.

BACKGROUND:

It all began with The Healthy Home Resources, a non-profit organization, who partnered with the University of Pittsburgh Graduate School Of Public Health, Department of Environmental & Occupational Health Sciences, and the American Respiratory Alliance of Western Pennsylvania who wanted to conduct a research study to determine the effects of the home environment on children with asthma. The At Home program was designed to positively influence the health of asthmatic children by reducing environmental triggers found in the home. A statement form Healthy Homes Resources notes that "The asthma triggers of concern include cockroach, rodent, pet, and dust mite allergens, and pollens, fungi, moisture levels,

environmental tobacco smoke, combustion gases, dust, and household chemicals. In addition, other in-home environmental and safety hazards, such as lead, asbestos, child injury prevention and take home from work hazards will be addressed when assessment warrants" (*Healthy Homes Resources, February 2006).*

The original evaluation proposal for the program was prepared by Conrad Daniel Volz, DrPH, MPH; from the Graduate School of Public Health (GSPH), University of Pittsburgh. Dr. Volz was installed as the principle investigator (PI) for evaluation of the project. The project began with the hopes to evaluate trends in asthma severity, in-home environmental trigger levels, education to the occupants of the homes and a change in knowledge, attitudes and beliefs about the triggers of asthma. In order to fulfill these expectations, a "Knowledge, Attitudes and Beliefs Questionnaire" (KAB) and a SPSS Database system for statistical monitoring needed to be developed. The PI would be responsible for reviewing monthly data and writing a quarterly summary containing program implementation status, trends involving asthma triggers and project improvement recommendations. Due to a tight project budget, Healthy Homes Resources was to provide an internal QA/QC program to ensure training and credentials of the home health educators and the remediation personnel as well as documentation of training and home visits.

The 18 month pilot study was initially funded by the Heinz Endowment to conduct in-homes environmental interventions to low income housing tenants thereby improving the health of the asthmatic children who live in these homes. However, Healthy Homes Resources was awarded an additional grant of $925,000 in January of 2005. The grant monies were to fund the program through October 1, 2007. The

grant proposal was prepared by Co-Principal Investigators', Evelyn Majoris of Healthy Homes Resources (HHR) and David Skoner, M.D. of Allegheny General Hospital and Evaluation Principal Investigator, Conrad Volz, DrPH of GSPH/EOH from the University of Pittsburgh. This grant was to evaluate the ongoing study and place an additional 100 children into the study.

The project began with the hopes to evaluate trends in asthma severity, in-home environmental trigger levels, education to the occupants of the homes and a change in knowledge, attitudes and beliefs about the triggers of asthma. The study projected to recruit children from the north side communities of the City of Pittsburgh who were determined to have environmentally induced asthma. This factor was determined by skin tests. The children also underwent pulmonary function testing along with pre-evaluation outcome measurements such as: use of rescue inhaler, lost school days, emergency room visits for asthma related incidences, and the number of asthma related symptom days. Once all baseline evaluations were finished the primary caregivers received a knowledge, attitude and belief (KAB) Questionnaire to determine pre-study knowledge and beliefs and attitudes regarding their ability to care for their asthmatic children.

Recruitment into the program was based on families that were below 200% of the 2007 poverty level. Recruitment sources into the program were mainly from clinics associated with Allegheny General Hospital. However, the study was having difficulty in recruiting participants into the study. HHR was assisted by GSPH who activated its Center for Minority Health to help identify organizations on the North Side that could help recruit participants. A meeting was arranged by Christine Lewis,

Program Evaluator, with the North side Christian Health Center whose physicians know the community members by name to find families that were appropriate to this study. Other alliances were with the North Side Boy Scouts of America and the North Side Health Fair. One important meeting organized by the North Side Leadership Conference (a community gatekeeper) provided information on key people in the community, introduced decision makers to the program and let program organizers understand some of the communities main environmental health concerns with the HHR Asthma Program. In October 2005, recruitment letters were sent to organizations that serve the needs of children and care-givers in the Pittsburgh North Side area explaining the need for such a study to be held in their community. The project also solicited recruitment through the *Pittsburgh Post Gazette, Tribune Review* and the *Pennysaver*. The study recruited a total of 286 children, of which 114 children were retained in the study through the 1-Month Post Intervention phase and received the second KAB survey. This indicates a 40% drop out rate through this portion of the study. Only 30 children finished the entire program through to the 6-Month Post-Intervention.

SURVEY METHODOLOGY AND THE AT HOME INTERVENTION:

A survey instrument known as the Knowledge, Attitude and Beliefs (KAB) Questionnaire was designed to assess knowledge of asthma and its causes and attitudes and beliefs of the primary caretaker regarding their ability to care for their asthmatic child. The "Knowledge, Attitudes and Beliefs Questionnaire" and a SPSS Database system for statistical monitoring were developed by the University of

Pittsburgh's Graduate School of Public Health. The final version was developed in October 2005. The KAB consisted of questions involving: general information on the child with asthma, the caretaker and others living in the home, smoking status of caregiver and others living in home, ethnicity or race, asthma basics and understanding their child's asthma, asthma and the environment, and actions within the home. Thoughts, feelings and beliefs about caring for their child were also questions on the survey (Appendix 1: KAB Questionnaire).

During the study, several educational interventions were conducted by HHR community workers. Three KAB Questionnaires were given to primary caretakers - Pre-intervention, Post-intervention and Final. Responses were used to determine how well education improved their knowledge of asthma, management of in-home triggers and asthma prevention techniques. Responses were scored using the Likert Scale and were based upon total scores. Data collected from caregivers who finished the program were analyzed using SPSS 16.0.

Abbreviations of specific measurements in this study are defined as:

KAB – Knowledge, Attitudes and Beliefs Questionnaire, Final version - October 2005
EA – Environmental Assessments
RETA – Residential Environmental Trigger Assessment
PFT – Pulmonary Function Test
Spirometry – noninvasive test measurement of lung function which exposes the maximum amount of air inhaled and exhaled. Two measurements can be collected from a Spirometry – FVC and FEV_1.
FVC - Forced Vital Capacity.
FEV_1 - Forced Expiratory Volume and measures the maximum amount of air that can be exhaled in one second. *(Mayo Clinic, 2008)*

The study began with the primary caretaker answering the questions on the Pre-Intervention KAB Questionnaire. After the survey, the initial scores were tallied and used as a baseline score for the research. The primary caretakers then began several educational programs to identifying environmental triggers in their homes. These environmental triggers included: dust mites, cockroach allergens, pet hair and dander, fungi, and rodent droppings. Environmental assessments (EA) inside and outside the home were provided by a walk-thru interviewer asking questions to the caretaker and/or making self observations using the Residential Environmental Trigger Assessment (RETA). EA protocols for measuring allergens, fungi spores and pollens were achieved using the American Industrial Hygiene Association's (AIHA) *Field Guide for the Determination of Biological Contaminants in Environmental Samples*, and from the American Conference of Governmental Industrial Hygienists' *Bioaerosols: Assessment and Control*. Indoor Air quality measurements of relative humidity, carbon monoxide and carbon dioxide levels and temperature were preformed in the home. Lead and asbestos hazards were also measured. Once identified to be present in the home, these triggers were removed by a remediation team. This often involved air sampling for fungi and air allergens to evaluate effectiveness of cleaning and the removal of the triggers after they were indentified.

The interventions of the RETA, EA and blood and allergy tests were used to tailor the intervention strategy per individual households. These interventions involved "Asthma-Friendly Cleaning Tips" instructions, pest management services, safety and hazard control education as well as provisions for allergen bed covers, HEPA vacuum cleaners, HEPA air filters, dehumidifiers, doormats and cleaning

supplies. The education was provided by the HHR and the American Respiratory Alliance. Education for the AT Home program included HHR community worker studies, In-home participant asthma education and In-home participant environmental triggers and cleaning education. These In-home studies offered information on: how to remove triggers from home, asthma facts, risk factors, smoking as a trigger, information about control and testing for asthma, explanation of air sampling methods, and how to clean a home with an asthmatic child.

Once all the interventions, remediation projects and educational sessions were finished in a home, the second or 1-Month Post-Intervention KAB was given to the primary caretakers. This was to test the primary caretaker's knowledge after educational interventions to see if there was improvement in overall KAB scores from the Pre-intervention KAB. At the end of the study, a 6-Month Post-Intervention was given to primary caretakers. This was approximately six months after their 1-Month Post-intervention KAB and was used to determine if the caretaker retained the information gained from the educational interventions over time.

DATA COLLECTION:

The same KAB questionnaire was given to each primary caretaker three times over the course of the study. This was so that the answers could be compared to examine the extent of knowledge learned and retained by the primary caretaker over the course of the study. The KAB questionnaire was filled out by the primary caretaker of the child with asthma. Healthy Homes Resources personnel were available if there was confusion about a question and the caretaker needed assistance.

The initial KAB was administered to the primary caretaker before any educational sessions were initiated. This accounted for the Baseline KAB. A Pre-intervention KAB Total Score was calculated and documented in the database. Many training and educational sessions occurred with the primary caretaker after the initial KAB was administered. These educational sessions were used for testing educational knowledge and retention in the primary caregiver. The home was investigated by a certified environmentalist to establish if there were any environmental triggers present in the home. The primary caretaker assisted the environmentalist in the home inspection. This review of the home was considered part of the educational process. Remediation of environmental triggers within the home was performed to remove/repair the triggers. After this process, a 1-Month Post-remediation KAB questionnaire was administered to the primary caregiver. A KAB Total Score was calculated and documented in the database. This part of the study lasted roughly 4 months. The primary caretaker received no further additional educational sessions after this period. At the conclusion of the study several months later, a 6-Month Post-Intervention questionnaire was issued to the primary caretaker. The Total Score was calculated and the resulting score entered into the database.

MEASURES:

The results of the three KAB questionnaires given to the primary caretakers were scored using a Likert Scale. The segments of the questionnaire that were rated on the Likert Scale was asthma basics, asthma and the environment, actions in the house, and thoughts, feelings and beliefs about caring for your child. These sections

asked the primary caretaker to circle the answer that best fit how they felt or believed or how they agreed or disagreed with the question asked. The answers to choose from were strongly agree, agree, disagree, strongly disagree or don't know.

These answers were then scored with a numerical equivalent. The scale was measured using a 1-to-5 rating scale where:

- 1 = Don't know
- 2 = Strongly disagree to the concepts given
- 3 = Disagree to the concepts given
- 4 = Agree to the concepts given
- 5 = Strongly agree to the concepts given

The sums of the scores from the ratings were tallied for a final total score. These scores were used as a comparison of educational retention of the primary caregivers. The outcome variables relates to Teaching = Success.

The main hypothesis tested was that this study will identify vulnerable subpopulations of primary caretakers who will need supplementary educational interventions for future public health applications of this study design. I assessed the effectiveness of educational interventions received during the Pittsburgh based Environmental Asthma study on vulnerable subpopulations of primary caretakers based on their KAB scores.

Several different subpopulations of caregivers based on demographic variables were chosen to see if additional education is required to improve KAB by the study's conclusion. The following describes the associated sub-hypothesis:

- Primary caregivers as a group will have improvement on KAB scores after educational interventions.

- Hypothesis: Educational interventions will have a positive impact on thoughts, feelings, and beliefs of the primary caretakers by a significant improvement in overall KAB scores from Pre-intervention Knowledge, Attitudes and Beliefs Questionnaires (KAB) to 1-month Post-intervention KAB.
- Hypothesis: There should be significant improvement in scores from Pre-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating a persistence of effect in the retention of knowledge of the primary caretaker.

♦ Primary caregivers with asthma vs. caregivers without asthma.

- Hypothesis: Primary caretaker who themselves have asthma will have higher Pre-KAB scores because of previous knowledge than the primary caretaker who does not have asthma but, there will be no significant difference between these two groups after educational intervention.
- Hypothesis: There should be no significant change in scores from 1-month Post-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating retention of knowledge.

♦ Parents with asthma vs. parents without asthma. This is similar in structure to primary caregivers. However, not all primary caregivers are the parents so this is a different population to analyze.

- Hypothesis: A parent who has asthma will have higher Pre-KAB scores because of previous knowledge than the parent who does not have asthma

but, there will be no significant difference between these two groups after educational intervention.

- Hypothesis: There should be no significant change in KAB scores from 1-month Post-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating retention of knowledge.

- Primary caregivers who smoke vs. non-smokers.
  - Hypothesis: A primary caretaker who smokes may be in denial that smoking is an environmental trigger to children with asthma and will have lower total Pre-KAB scores than a caretaker who does not smoke but, there will be no significant difference between these two groups after educational intervention.
  - Hypothesis: There should be no significant change in KAB scores from 1-month Post-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating retention of knowledge.
- Caregiver ethnicity or race.
  - Hypothesis: There will be no significant difference in total KAB scores because of the race or ethnicity of the primary caregiver after educational intervention.
  - Hypothesis: There should be no significant change in KAB scores from 1-month Post-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating retention of knowledge.

- Caretakers age - ≤30 years old vs. >30 years old. I chose this cutoff because thirty is often when an individual is considered a true adult.
    - Hypothesis: Older primary caretakers will have higher Pre-KAB scores because of previous knowledge than a younger caretaker but, there will be no significant difference between these two groups after educational intervention.
    - Hypothesis: There should be significant change in KAB scores from 1-month Post-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating retention of knowledge.
- Caregiver has other children in home with asthma vs. caretaker with only one child.
    - Hypothesis: A primary caretaker that has more than one asthmatic child in the home will have higher Pre-KAB scores based on previous knowledge because several children are sick in the home than a caretaker with only one asthmatic child but, there will be no significant difference between these two groups after educational intervention.
    - Hypothesis: There should be significant change in KAB scores from 1-month Post-intervention KAB to 6-Month Post-Intervention taken at the conclusion of the study demonstrating retention of knowledge.

ANALYSIS:

The KAB surveys were given to the primary caretakers at three different time intervals – Pre-study (Time 1), 1-Month Post-intervention (Time 2) and at the

conclusion of the study - 6-Month Post-Intervention (Time 3). The scored results were entered into the SPSS 16.0 software package database designed by the University of Pittsburgh's School of Public Health. The results were analyzed and compared at each time interval using Minitab statistical software package. Descriptive statistics were performed for each group for each time interval determining the sample size, mean, standard deviation, standard error and quartiles. A 2-sample T-test was performed for each group of subpopulations of primary caregivers at each time interval. The 2-sample T-test represents an independent-sample design because the parameters compare two completely different subpopulations of primary caretakers. This analysis was performed to determine if there was improvement between each demographic subgroup. The outcome variables test the hypothesis that: H_0: $\mu_1 = \mu_2$ vs. H_1: $\mu_1 \neq \mu_2$.

Paired *t*-tests were performed on the caregiver subgroups because they are measured values of two different paired populations, which are then compared to determine it they are significantly different from each other. Each data point from the first sample was matched to the corresponding point of the second sample. It is assumed that the paired differences are independent and normally distributed. 95% confidence intervals were used to determine the significance level at which the two subgroups differ (*Rosner, 2006).* The outcome variables test the hypothesis that: H_0: $\Delta = 0$ vs. H_1: $\Delta \neq 0$. The paired T-tests compare improvement within each group between Time 1 and Time 2 (Pre to 1-Month Post educational intervention) and between Time 2 and Time 3 (1-Month Post-intervention to study final – 6-Month Post-Intervention). A 2-sample T-test between the deltas or the differences of each of

these time frames for each group was also performed to denote improvement within each group over time.

RESULTS:

Participation

286 children were identified through the recruitment sources. However, only 114 Pre-Intervention KAB surveys were administered to primary caregivers. Educational interventions about environmental asthma triggers, household environmental triggers and remediation of environmental triggers in the home were given to the primary caretakers. A 1-month Post-Intervention KAB was given to all 114 primary caretaker participants. The study was completed 6-Months later with only 30 primary caregivers participating in the 6-Month Post-intervention KAB survey (Figure 10).

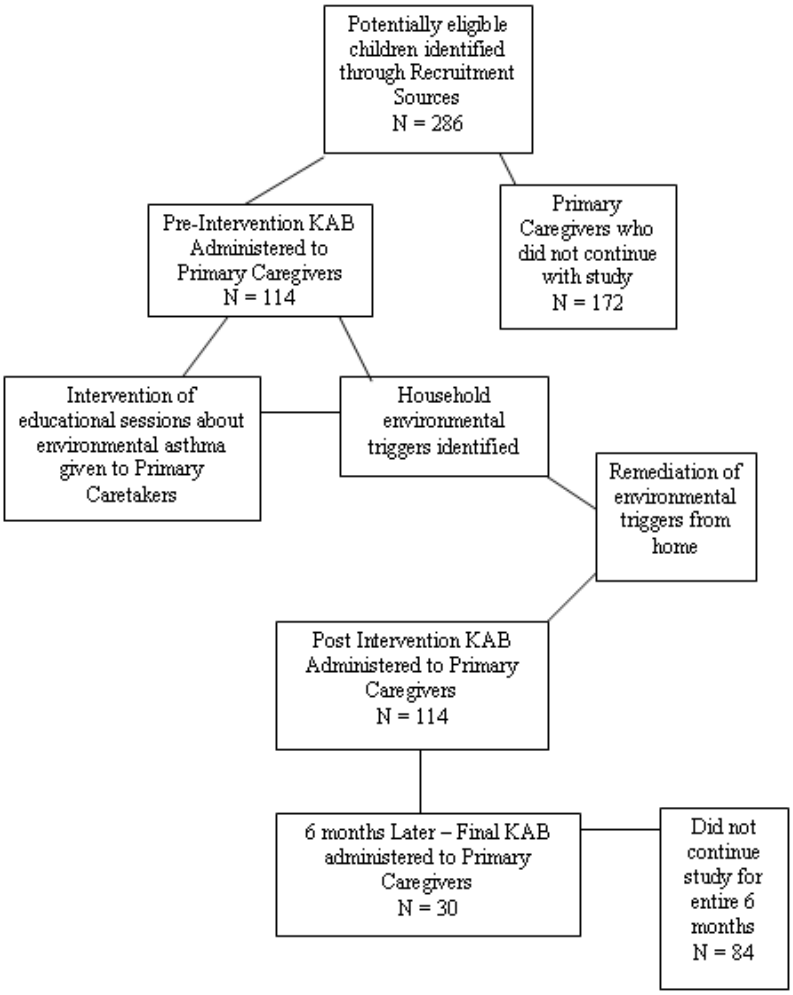


Figure 10: Flow of Participants through the Study

The primary caretakers were divided into several demographic variables (Table 1). The caretakers who participated in this program were mostly African American (63.2%) compared to White (23.7%). Caretakers who were older than 30 years of age represented 69.3% of the total caretakers retained in the study; with the majority of the caretaker's being the mother (87.7%). Caretakers with asthma and those who were smokers represented 36.8% and 24.6% of the study population, respectively.

Table 1: Baseline Demographics of Study Participants

Demographic Characteristics	
Child's Age (Mean Years)	9.1
Child's Gender (%) Male	51.8
Female	45.6
Caregiver's Ethnicity (%) African American	63.2
White	23.7
Hispanic	1.8
Other	4.4
Age of Caretaker (Mean Years)	36.7
(%) ≤29 Years	20.2
≤30 Years	69.3
Caretaker of Record (%) Mother	87.7
Father	.9
Grandmother	7.0
Aunt	2.6
Caretaker has Asthma (%) Yes	36.8
No	59.6
Caretaker Smokes (%) Yes	24.6
No	71.9
Parents Have Asthma (%) Yes	43.9
No	49.1
Which Parents Have Asthma Mother	26.3
Father	11.4
Both	5.3
Grandmother	2.6
Child's Age of Onset of Asthma (Mean Years)	3.15
Other Children in Home with Asthma (%) Yes	35.1
No	63.2

Primary Outcomes

Since there were many subpopulations of caretakers, each statistical difference per group will be discussed and evaluated to see if there is indeed a vulnerable subpopulation that is in need of additional educational interventions for future studies. However, when the subgroups of primary caretakers are divided into two different sub-groups, the number of participants in each group often gets very small making

true statistical comparisons often questionable because this group of caretakers was lost to follow-up.

- Overall KAB scores for entire group of primary caretakers (Table 2).

1-Month Post-Intervention KAB scores improved over Pre-Intervention KAB scores by 19.7 points which was a significant difference in scores (CI = 12.56, 26.83; p = 0.000). This suggests that entire study population had effective educational interventions. The 1-Month Post-Intervention KAB and the 6-Month Post-Intervention KAB did not have a significant change in survey scores (p = 0.606). This shows a persistence of effect after the educational interventions to the completion of the study. For completeness, the overall scores from Pre-Intervention KAB to 6-Month Post-Intervention noted a significant increase in test scores (CI = 9.79, 45.74; p = 0.004). Overall, this demonstrates the effectiveness of the educational interventions and that information learned in the study was retained.

Table 2: Overall Caretaker Group KAB Scores

KAB Scores Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention 1-Month Post-Intervention	114 114	275.7 295.4	38.3 31.1	P = 0.000	(12.56, 26.83)
1-Month Post-Intervention 6-Month Post-Intervention	30 30	298.0 302.2	30.9 37.4	P = 0.606	NS
Pre-Intervention 6-Month Post-Intervention	30 30	274.5 302.2	39.2 37.4	P = 0.004	(9.79, 45.74)
Change in Delta 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention KAB 1-Month Post Intervention KAB	114 30	19.7 4.2	38.5 44.1	P = 0.059*	(-0.61, 31.59)
1-Month Post Intervention KAB 6-Month Post Intervention KAB	30 30	4.2 27.8	44.1 48.1	P = 0.053	(-47.4, 0.3)

AS = Achieved Significant
* Nearly significant
NS = Not Significant

- Caregivers with asthma vs. non asthma (Table 3).

Primary caretakers who have asthma have a slightly higher mean on their Pre-Intervention KAB than caretakers without asthma, possibly from prior knowledge (277.98 compared to 275.74). However, the two sample t-test between these two groups does not show a significant difference in scores ($p = 0.762$). Both groups show significant increases in their KAB scores from Pre-Intervention to 1-Month Post-Intervention (Asthma – CI = 7.64, 29.6; $p = 0.001$ and without Asthma – CI = 12.45, 32.34; $p = 0.000$) showing that they learned new information gathered from the study.

In comparing 1-Month Post-Intervention KAB and the 6-Month Post-Intervention KAB, many caretakers were lost to follow-up. Interpretations from these secondary analyses, due to the small numbers are not reliable. Refer to Table 3 to see that there are small numbers with shifting subgroups that make the numbers invalid. However, for this subpopulation I will demonstrate that if the participant numbers were greater, there could have been beneficial information gained from these comparisons. Between 1-Month Post-Intervention KAB and 6-Month Post-Intervention KAB, there was not a significant difference in KAB test scores ($p = 0.245$; $p = 0.818$, respectively) indicating a persistence of effect. Overall for completeness, primary caretakers with asthma for Pre-intervention and 6-Month Post-Intervention noted no significant difference in their persistence of effect ($p = 0.159$) while caretakers without asthma noted a significant increase in KAB scores from Pre-Intervention to 6-Month Post-Intervention (CI = 6.8, 49.4; $p=0.012$). This suggests real change in knowledge and attitudes of the primary caretaker without asthma or

that the numbers of those with asthma were not large enough to find a difference that really exists. Therefore more work needs to be done to retain caregivers in future studies to have a sufficient number of cases to have the power to find the differences.

Table 3: Caretakers with Asthma vs. Caretakers without Asthma

Caretakers with Asthma Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	42	277.9	34.4	P =	(7.64, 29.6)
1-Month Post-Intervention	42	296.6	34.4	0.001	
1-Month Post-Intervention	10	289.6	33.2	P =	NS
6-Month Post-Intervention	10	315	36.3	0.125	
Pre-Intervention	10	287.9	43.8	P =	NS
6-Month Post-Intervention	10	315.0	36.3	0.159	
Caretakers without Asthma Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	68	275.7	39.5	P =	(12.45, 32.34)
1-Month Post-Intervention	68	298.1	30.1	0.000	
1-Month Post-Intervention	20	302.3	29.8	P =	NS
6-Month Post-Intervention	20	295.9	37.2	0.477	
Pre-Intervention	20	267.8	35.94	P =	(6.8, 49.4)
6-Month Post-Intervention	20	295.9	37.2	0.012	
Caretakers with Asthma vs. Caretakers without Asthma 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention Asthma	42	278.0	34.4	P =	NS
Pre-Intervention without Asthma	68	275.7	39.5	0.762	
1-Month Post-Intervention Asthma	42	296.6	34.4	P =	NS
1-Month Post-Intervention without Asthma	68	298.1	30.1	0.806	
6-Month Post-Intervention Asthma	10	315.0	36.3	P =	NS
6-Month Post-Intervention without Asthma	20	295.9	37.2	0.191	
Change in Delta 2-Sample T-Test Pre-Intervention Delta 1-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Caretakers with Asthma	42	18.6	35.2	P =	NS
Caretakers without Asthma	68	22.4	41.1	0.622	
Change in Delta 2-Sample T-Test 1-Month Post-Intervention Delta 6-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Caretakers with Asthma	10	25.4	47.4	P =	NS
Caretakers without Asthma	20	-6.4	39.4	0.062	

AS = Achieved Significance
NS = Not Significant

- Parents with asthma vs. parents without asthma (Table 4).

Parents with asthma have a slightly higher mean on their Pre-Intervention KAB than parents without asthma possibly from prior knowledge (279.56 compared to 276.00). Yet, the two sample t-test between these groups does not have a significant difference ($p = 0.634$). Both groups show significant increases in their KAB scores from Pre-Intervention to 1-Month Post-Intervention (Asthma – CI = 8.30, 27.83; $p = 0.001$ and without Asthma – CI = 6.91, 29.05; $p = 0.002$). Refer to the data table to see that interpretations from the secondary analysis, due to the very small numbers are not reliable between the 1-6 month Post Intervention comparisons.

Overall for completeness, parents with asthma for Pre-intervention KAB and 6-Month Post-Intervention time periods noted no significant difference in persistence of effect ($p = 0.463$) while parents without asthma noted a significant increase in KAB scores from Pre-Intervention to 6-Month post-intervention (CI = 10.2, 58.9; $p = 0.008$). This suggests real change in knowledge and attitudes of the parent without asthma or that the numbers of those with asthma were not large enough to find a difference that really exists. Therefore more work needs to be done to retain caregivers in future studies to have a sufficient number of cases to have the power to find the differences.

Table 4: Parents with Asthma vs. Parents without Asthma

Parents with Asthma Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	48	279.6	33.0	P =	(8.30, 27.83)
1-Month Post-Intervention	48	297.6	30.7	0.001	
1-Month Post-Intervention	11	304.3	30.0	P =	NS
6-Month Post-Intervention	11	300.2	38.8	0.800	
Pre-Intervention	11	288.5	37.7	P =	NS
6-Month Post-Intervention	11	300.2	38.8	0.463	
Parents without Asthma Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	56	276.0	41.6	P =	(6.91, 29.05)
1-Month Post-Intervention	56	293.9	31.2	0.002	
1-Month Post-Intervention	17	289.8	30.4	P =	NS
6-Month Post-Intervention	17	298.9	37.3	0.384	
Pre-Intervention	17	264.4	40.4	P =	(10.2, 58.9)
6-Month Post-Intervention	17	298.9	37.3	0.008	
Parents with Asthma vs. Parents without Asthma 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention Asthma	48	279.6	33.0	P =	NS
Pre-Intervention without Asthma	56	276.0	41.6	0.634	
1-Month Post-Intervention Asthma	48	297.6	30.7	P =	NS
1-Month Post-Intervention without Asthma	56	294	31.2	0.551	
6-Month Post-Intervention Asthma	11	300.2	38.8	P =	NS
6-Month Post-Intervention without Asthma	17	298.9	37.3	0.933	
Change in Delta 2-Sample T-Test Pre-Intervention Delta 1-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Parents with Asthma	48	18.1	33.6	P =	NS
Parents without Asthma	56	18.0	41.3	0.991	
Change in Delta 2-Sample T-Test 1-Month Post-Intervention Delta 6-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Parents with Asthma	11	-4.1	52.1	P =	NS
Parents without Asthma	11	9.1	42.0	0.466	

AS = Achieved Significance
NS = Not Significant

- Caregivers who smoke vs. non-smokers (Table 5).

Primary caretakers who smoke had lower mean Pre-Intervention KAB scores (274.13) than non-smokers (277.66) but there was not a statistical difference ($p = 0.667$). There was no significant improvement in Pre-Intervention KAB scores to 1-Month Post-Intervention KAB scores in smokers ($p = 0.231$). On the other hand, between Pre-Intervention KAB and 1-Month Post-Intervention KAB scores of non-smokers there was a significant increase in survey results (CI = 14.41, 31.57; $p = 0.000$). A two-sample T-test between 1-Month Post-Intervention KAB scores of smokers and non-smokers note a significant difference between the two groups with non-smokers having higher scores than the smokers (CI = -30.86, -5.23; $p = 0.006$). There appeared to be a persistence of effect between the 1-Month Post-Intervention and the 6-Month Post-Intervention between the smokers and the non-smokers with each group maintaining their scores ($p = 0.203$, $p = 0.979$, respectively). Overall, for completeness, primary caretakers who smoke noted no significant change in persistence of effect between Pre-intervention KAB and 6-Month Post-Intervention KAB scores ($p = 0.237$). Caretakers who are non-smokers noted a significant increase in KAB scores from Pre-Intervention to 6-Month post-intervention KAB scores (CI = 2.2, 48.3; $p = 0.033$). Conversely, the change in deltas between the 5 smokers who continued through to the end of the study appeared to have retained information on the same level as the non-smokers illustrating a nearly significant difference ($p = 0.082$). This puts into doubt the experience proposed above for smokers. Greater numbers of smokers are needed to verify if there was a true persistence of no change for the smoking group. Refer to the data table to see that

interpretations from the secondary analysis, due to the very small numbers are not reliable between the 1-6 month Post Intervention comparisons.

Table 5: Caretakers who Smoke vs. Caretakers who are Non-Smokers

Smokers Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention 1-Month Post-Intervention	30 30	274.13 282.60	34.62 35.29	P = 0.231	NS
1-Month Post-Intervention 6-Month Post-Intervention	5 5	295.4 299.2	37.1 36.8	P = 0.203	NS
Pre-Intervention 6-Month Post-Intervention	5 5	278.8 299.2	29.0 36.8	P = 0.237	NS
Non-Smokers Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention 1-Month Post-Intervention	82 82	277.7 300.7	39.6 28.3	P = 0.000	(14.41, 31.57)
1-Month Post-Intervention 6-Month Post-Intervention	25 25	298.6 298.8	30.5 37.5	P = 0.979	NS
Pre-Intervention 6-Month Post-Intervention	25 25	273.6 298.8	41.4 37.5	P = 0.033	(2.2, 48.3)
Smoker's vs. Non-Smokers 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention Smoker Pre-Intervention Non-Smoker	30 82	274.1 277.7	34.6 39.6	P = 0.667	NS
1-Month Post-Intervention Smoker 1-Month Post-Intervention Non-Smoker	30 82	282.6 300.6	35.3 28.3	P = 0.006	(-30.86, -5.23)
6-Month Post-Intervention Smoker 6-Month Post-Intervention Non-Smoker	5 5	299.2 298.8	36.8 36.837.5	P = 0.984	NS
Change in Delta 2-Sample T-Test Pre-Intervention Delta 1-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Caretakers who Smoke Caretakers who are Non-Smokers	30 82	8.5 23.0	37.9 39.1	0.082	NS
Change in Delta 2-Sample T-Test 1-Month Post-Intervention Delta 6-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Caretakers who Smoke Caretakers who are Non-Smokers	5 25	3.8 0.3	5.59 51.5	0.881	NS

AS = Achieved Significance
NS = Not Significant

- Caregiver's ethnicity or race (Table 6).

For our purposes here Non-White includes African Americans, Asian and Hispanic ethnic groups. There was similar means between white and Non-White groups of Pre-Intervention KAB scores (277.0 compared to 274.1). The two-sample T-test between groups was not significant ($p = 0.731$). Pre-Intervention KAB scores and 1-Month Post-Intervention KAB scores for White caretakers was not significant ($p = 0.117$) while Pre-Intervention KAB to 1-Month Post-Intervention KAB scores for Non-White caretakers noted a significant increase is scores (CI = 13.38, 29.06; $p = 0.000$). Refer to the data table to see that interpretations from the secondary analysis, due to the very small numbers are not reliable between the 1-6 month Post Intervention comparisons.

For completeness, primary caretakers who are White noted no significant change in persistence of effect from Pre-Intervention to 6-Month Post-Intervention ($p = 0.244$). However, the caretakers who are Non-White noted a significant increase in KAB scores from Pre-Intervention to 6-Month post-intervention (CI = 8.8, 51.0; $p = 0.008$). This suggests real change in knowledge and attitudes within the Non-White subgroup or that the numbers of those in this subpopulation were not large enough to find a difference that really exists. Therefore more work needs to be done to retain caregivers in future studies to have a sufficient number of cases to have the power to find the differences.

Table 6: Caretakers Ethnicity or Race

White Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention 1-Month Post-Intervention	27 27	277.0 292.5	47.4 27.6	P = 0.117	NS
1-Month Post-Intervention 6-Month Post-Intervention	8 8	293.9 294.6	29.9 29.1	P = 0.961	NS
Pre-Intervention 6-Month Post-Intervention	8 8	266.3 294.6	53.9 29.1	P = 0.244	NS
Non-White Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention 1-Month Post-Intervention	79 79	274.1 295.4	34.4 32.4	P = 0.000	(13.38, 29.06)
1-Month Post-Intervention 6-Month Post-Intervention	21 21	300.7 307.1	32.2 38.5	P = 0.536	NS
Pre-Intervention 6-Month Post-Intervention	21 21	277.2 307.1	34.2 38.5	P = 0.008	(8.8, 51.0)
White vs. Non-White* 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention White Pre-Intervention Non-White	27 79	277.0 274.1	47.4 34.4	P = 0.731	NS
1-Month Post-Intervention White 1-Month Post-Intervention Non-White	27 79	292.5 295.4	27.6 32.4	P = 0.672	NS
6-Month Post-Intervention White 6-Month Post-Intervention Non-White	8 21	294.6 307.1	29.1 38.5	P = 0.415	NS
Change in Delta 2-Sample T-Test Pre-Intervention Delta 1-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
White Non-White	27 79	15.5 21.4	49.7 34.3	0.497	NS
Change in Delta 2-Sample T-Test 1-Month Post-Intervention Delta 6-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
White Non-White	8 21	0.8 6.4	41.5 46.4	0.767	NS

*Non-White includes African American, Hispanic and Asian populations
AS = Achieved Significance
NS = Not Significant

- Caretakers whose ages are ≤30 vs. >30 years (Table 7).

Pre-Intervention KAB scores of caretakers who are ≤ 30 years of age had the lowest starting mean of the entire study (265.07). The Pre-Intervention KAB scores of the >30 yrs of age group had the highest starting mean of the entire study (281.0). The comparison between Pre-Intervention ≤30 KAB scores and Pre-Intervention >30 KAB scores is close to significance (CI = -32.61, 0.48; p = 0.057). Within the ≤30 age group, the Pre-Intervention KAB and the 1-Month Post-Intervention showed statistically significant increases in KAB scores (CI = 6.06, 32.98; p = 0.006). The Pre-Intervention >30 KAB and 1-Month Post-Intervention > 30 KAB scores also had a significant difference (CI = 10.51, 29.60; p = 0.000). At the 1-Month Post-Intervention KAB, it was noted that ≤ 30 years of age still had a lower mean (284.6) than 1-Month Post-Intervention KAB >30 years (301.2). This was demonstrated by a significant difference between the two groups (CI = -29.93, -3.29; p = 0.015). This indicated that older participants retained more information than the younger participants. Refer to the data table to see that interpretations from the secondary analysis, due to the very small numbers are not reliable between the 1-6 month Post Intervention comparisons.

Primary caretakers ≤30 years of age noted no significant change in persistence of effect from Pre-intervention KAB to 6-Month Post-Intervention KAB scores (p = 0.260). For completeness, the caretakers >30 years of age noted a significant increase in KAB scores from Pre-Intervention to 6-Month post-intervention test scores (CI = 9.06, 49.3;

p = 0.007).

Table 7: Caretakers whose age is ≤ 30 years old vs. Caretakers > 30 years old

Caretaker ≤ 30 years Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	29	265.1	36.2	P =	(6.06, 32.98)
1-Month Post-Intervention	29	284.6	32.2	0.006	
1-Month Post-Intervention	4	314.5	32.4	P =	NS
6-Month Post-Intervention	4	293.5	43.3	0.310	
Pre-Intervention	4	309.5	22.5	P =	NS
6-Month Post-Intervention	4	293.5	43.3	0.260	
Caretaker > 30 years Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	73	281.1	38.7	P =	(10.51, 29.60)
1-Month Post-Intervention	73	301.2	29.9	0.000	
1-Month Post-Intervention	20	302.9	29.7	P =	NS
6-Month Post-Intervention	20	304.8	36.7	0.845	
Pre-Intervention	20	275.6	40.1	P =	(9.06, 49.3)
6-Month Post-Intervention	20	304.8	36.7	0.007	
Caretaker ≤ 30 vs. >30 years 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention ≤ 30 years	29	265.1	36.1	P =	(-32.61, 0.48)
Pre-Intervention > 30 years	73	281.1	38.7	0.057*	
1-Month Post-Intervention ≤ 30 years	29	284.6	32.2	P =	(-29.93, -3.29)
1-Month Post-Intervention > 30 years	73	301.2	29.9	0.015	
6-Month Post-Intervention ≤ 30 years	4	293.5	43.3	P =	NS
6-Month Post-Intervention > 30 years	20	304.8	36.7	0.589	
Change in Delta 2-Sample T-Test Pre-Intervention Delta 1-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
≤ 30 years	29	19.5	35.4	0.951	NS
> 30 years	73	20.1	40.8		
Change in Delta 2-Sample T-Test 1-Month Post-Intervention Delta 6-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
≤ 30 years	4	-21.0	34.5	0.317	NS
> 30 years	20	1.8	41.7		

* Nearly significant
AS = Achieved Significance
NS = Not Significant

- Caregiver with more than one child in home with asthma vs. single child with asthma (Table 8).

The caregiver with several children with asthma versus the single asthmatic child, the KAB mean scores between both Pre-Intervention groups were not significant (p = 0.813). Still, both groups had significant increases in KAB scores between Pre-Intervention and after 1-Month Post-Intervention (Multiple children – CI = 7.44, 35.21; p = .004 and single child – CI = 11.23, 27.69; p = 0.000). Refer to the data table to see that interpretations from the secondary analysis, due to the very small numbers are not reliable between the 1-6 month Post Intervention comparisons.

Caretakers with more than one child in the home with asthma noted no significant change in persistence of effect from Pre-intervention KAB scores to 6-Month Post-Intervention KAB scores (p = 0.096). For completeness, caretakers with only one child in the home with asthma noted a significant increase in KAB scores from Pre-Intervention to 6-Month post-intervention (CI = 3.52, 44.78; p = 0.024).

Table 8: Caregiver with more than 1 child in home with asthma vs. single child in home with asthma

Other children with Asthma Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	40	274.18	45.6	P =	(7.44, 35.21)
1-Month Post-Intervention	40	295.5	30.3	0.004	
1-Month Post-Intervention	9	278.1	28.5	P =	NS
6-Month Post-Intervention	9	293.6	36.7	0.337	
Pre-Intervention	9	255.8	53.4	P =	NS
6-Month Post-Intervention	9	293.6	36.7	0.096	
Single Child with Asthma Paired T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention	72	275.9	33.7	P =	(11.23, 27.69)
1-Month Post-Intervention	72	295.4	32.1	0.000	
1-Month Post-Intervention	20	306.6	29.2	P =	NS
6-Month Post-Intervention	20	307.7	38.1	0.913	
Pre-Intervention	20	283.6	29.6	P =	(3.52, 44.78)
6-Month Post-Intervention	20	307.7	38.1	0.024	
Other children with Asthma vs. Single child with Asthma 2-Sample T-Test	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Pre-Intervention other Asthma	40	274.2	45.6	P =	NS
Pre-Intervention single Asthma	72	276.0	33.7	0.813	
1-Month Post-Intervention other Asthma	40	295.5	30.3	P =	NS
1-Month Post-Intervention single Asthma	72	295.4	32.1	0.991	
6-Month Post-Intervention other Asthma	9	293.6	36.7	P =	NS
6-Month Post-Intervention single Asthma	20	307.7	38.1	0.358	
Change in Delta 2-Sample T-Test Pre-Intervention Delta 1-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Other children with Asthma	40	21.3	43.4	P =	NS
Single child with Asthma	72	19.5	35.0	0.805	
Change in Delta 2-Sample T-Test 1-Month Post-Intervention Delta 6-Month Post-Intervention Delta	**N**	**Mean**	**Std Dev**	**AS**	**Confidence Interval**
Other children with Asthma	9	15.4	45.3	P =	NS
Single child with Asthma	20	1.1	44.2	0.430	

AS = Achieved Significance
NS = Not Significant

DISCUSSION:

Overall, the goals of the study were met. The educational interventions appeared to have had a persistence of effect that included retention of information which was realized by increased KAB scores throughout the study. The general population of primary caretakers noted that KAB scores remained at the current level attained from the educational interventions. With the scores remaining the same after the educational interventions suggest that there was some positive change in knowledge, attitudes and beliefs of the primary caretaker that they retained over the course of the study.

The caregiver's were then divided into subpopulations based on demographic distributions of interest. All subgroups demonstrated that they gained valuable educational information. Nevertheless, some subgroups did not learn as much as their counterparts and these are the groups that should be targeted for additional educational interventions in future studies.

Caretakers with and without asthma both increased their KAB scores after the educational interventions. The information was retained by both subgroups noting a persistence of effect throughout the study. The caretakers without asthma had significant overall improvement suggesting a positive change in knowledge, attitudes and beliefs of this group. This same effect was also demonstrated in the group of parents with asthma and parents without asthma. Parents without asthma had significant overall improvement suggesting a positive change in knowledge, attitudes and beliefs within this subgroup. A similar effect was also noted in the caretakers who had more than one child in the home with asthma compared to a caretaker who

only had one child. Perhaps the caretaker who has gone through this problem of asthma with other children is more set in their perceived level of knowledge. The caretakers with only one asthmatic child had significant overall improvement suggesting a positive change in knowledge, attitudes and beliefs of this group.

Within the subgroup of smokers and non-smokers there is room for controversy. The overall scores of the smoking group indicate that they did not change their perceived beliefs throughout the entire study. However, due to the small numbers who actually finished the study, there is doubt that this group did indeed learn, just not as much as the non-smoking group. The non-smoking group showed a persistence of effect that they learned information and retained that information through to the conclusion of the study. This suggests that there were positive changes in knowledge, attitudes and beliefs of the primary caretaker who does not smoke.

Within the subgroup of White and Non-White primary caretakers, it appears that the White subgroup did not change their perceived attitudes and beliefs throughout the course of the study. The Non-White caretakers showed a persistence of effect that they learned information and retained that information throughout the study. This suggests that there were positive changes in knowledge, attitudes and beliefs of the Non-white caretaker.

It appears that the younger caretakers ($\leq$ 30 years of age) started out at a much lower KAB score than the older caretakers (> 30 years of age). Even though the difference was not statistically significant at $p = 0.05$, the younger group did not retain as much information after the educational interventions were given. Then again, both groups did show a persistence of effect through to the end of the study.

The older group had a persistence of effect that they learned and retained information given to them. This suggests that there were some positive changes in knowledge, attitudes and beliefs of the older primary caretaker.

LIMITATIONS:

There were many barriers to overcome in this program. One of the main issues was recruitment problems into the study. Several modifications to the program were discussed and approved. The original 18 month pilot program was thought to have been to time consuming and HHR had difficulty in following the children for that period of time through to the end of the study. The recommendations of the Fourth Advisory Group was to change the program by : expansion of the Target Recruitment Area to include a larger demographic area of the North Side of Pittsburgh, inclusion of Multi-family homes, residency time spent in a home to 4 days per week and shortening the pilot program to 12 months. Still, with this being such a transient population, it was very hard for HHR to find the participants and follow up with them at the conclusion of the study. The program did not have a good success rate of contacting the study participants for the 6-Month post-intervention follow-up.

Other issues with the study itself were the training levels of the workers. It was stressed to the workers that they must use a common, plain language to explain to the families about environmental asthma interventions in the home. Other issues involved the community itself. Community knowledge about environmental asthma was low. Community members also felt that they were being blamed for child's asthma by not taking proper care of the inside of their home. Due to these issues, one

of the major limitation to this study is that the data has low statistical power from the small sample sizes between the different subpopulation of primary caretakers from the 1-Month Post-intervention to the 6-Month Post-Intervention because only 30 caretakers were retained for the entire 6-Month study.

Several other factors limit this study. On the KAB Questionnaire it was not stated what educational level was attained by the primary caretaker, one did not know the marital status of primary caretaker or if the primary caretaker worked outside of the home. The reasons these issues were not on the KAB was the sensitive population of the primary caregivers who did not want to divulge this information and risk loosing their government assistance.

CONCLUSIONS:

Conclusions that can be drawn from this study are that there are several subpopulations of primary caretakers that would benefit from the use of additional educational interventions to improve their KAB scores. These subpopulations include caretakers who are smokers, caretakers who are racially White and caretakers who are under the age of 30 years old. By increasing their scores on the survey, it would demonstrate that there was a persistence of effect on the retention of information learned throughout the study for all subpopulations. It would also suggest a positive change in their knowledge, attitudes and beliefs about caring for their children with environmental asthma.

The information discovered in this study could be used as a starting point in similar research programs that focus on education and the primary caregiver in a

lower income setting. These subpopulations could be targeted directly from the start of the study so as to save valuable time, input and monies. Multiple visits to these vulnerable subpopulations may be needed to provide extra education interventions.

The public health relevance of this study is that similar environmental asthma interventions early on in their studies can target vulnerable subpopulations of primary caregivers by providing additional educational interventions to aid in increasing their persistence of effect throughout the study.

APPENDIX

Appendix: KAB Survey Questionnaire

University of Pittsburgh
Graduate School of Public Health
Knowledge, Attitudes and Beliefs (KAB) Questionnaire
For
Healthy Home Resources Inc.
Asthma Trigger Home Evaluation (AT HOME$_{SM}$) Program

To be filled in by Healthy Home Resources Personnel prior to questionnaire administration.
Group number_____ Family number _____ Zip Code _____

The questions about to be read to you will ask you for information, which will be used to find out if the Healthy Home Resources Inc., Asthma Trigger Home Evaluation (AT HOME$_{SM}$) Program is working for your child. These questions will also tell us if we are doing a good job teaching you about Asthma, what makes it worse and what you can do to make it better. It is important that you answer each question, if you don't know the answer just say "don't know". If you need help answering a question or do not understand it please ask the Healthy Home Resources interviewer for help. Your identity will never be known by the person evaluating this project. The answers that you give may be used to help doctors and public health professionals better understand how in-home conditions can "trigger" Asthma and what can be done about these conditions.

A **General Information** - **To be filled out by the primary caretaker.** Please let us know some information about your child, yourself and others in your home. (Instructions for HHR Facilitators-If there are two or more children from a family use a new form for each child.)

1. Age of child in program. _____ 2. Gender of child in program. ____male ____female

3. School grade of child in program._____ 4. Did child attend or does child now attend Head Start? ____yes ____no

5. Child's height _____ feet _____ inches 6. Child's weight _____pounds

7. Child's age when a doctor first said that your child had breathing problems. _____

8. Are there any other children in the home with Asthma? _____yes _____ no

9. If yes, how many? _____

10. Are there any adults in the home with asthma? _____yes _____ no

11. If yes, how many? _____

12. Does child share a bedroom with others? _____ yes _____ no

13. Does child share a bedroom with a smoker? _____yes _____ no

14. Total number of children 12 years of age or younger in household. _____

15. Total number of people in household. _____

16. What is your relationship to the child? _____ 17. What is your age? ____

18. List the medications your child uses every day to control Asthma (write don't know if you are unsure)?

_____

19. What medication does your child use during an Asthma attack (write don't know if you are unsure)? _____

20. Circle the race or ethnic group you consider your child to be?

African-American	Wh	Hispanic	Asian	Other (specify)_____

21. Do you have Asthma? _____ yes _____ no 22. Do you smoke cigarettes, cigars or a pipe? _____ yes _____ no

23. If you smoke check the line that best fits the amount that you smoke per day.

_____ Less than 5 cigarettes per day.

_____ 5 to 10 cigarettes per day.

_____ 11 to 15 cigarettes per day.

_____ 16 to 20 cigarettes per day.

_____ 21 to 30 cigarettes per day.

_____ 31 to 2 packs of cigarettes per day.

_____ Greater than 2 packs of cigarettes per day.

_____ Cigars.

_____ Pipe.

_____ Don't know.

17. How many smokers live in the household? _____ 18. Do either of the child's parents have asthma? _____ yes _____ no

19. If you answered yes to question 18, which parent(s) have asthma? _____ Mother _____ father _____ both

20. Does the child have any other health problems? _____ yes _____ no

21. If you answered yes to question 20, please list other health problems.

_____

22. Do you have a vacuum cleaner? _____ yes _____no

B. **Asthma Basics** - These questions let us know if our program gives you the information that you need to better understand your child's asthma. Please listen carefully to each question or statement and tell the interviewer how much you know, believe or feel that you agree or disagree with it. If you do not know or have no belief or feeling about a question or statement than say "I don't know". Please answer all questions.

1. Asthma is a disease that affects the passages that carries air into and out of the lungs?
Strongly Agree Agree Disagree Strongly Disagree Don't Know

2. Dirty air can make my child's Asthma worse?
Strongly Agree Agree Disagree Strongly Disagree Don't Know

3. Asthma symptoms include

a. poor eyesight Strongly Agree Agree Disagree Strongly Disagree Don't Know

b. coughing Strongly Agree Agree Disagree Strongly Disagree Don't Know

c. fever Strongly Agree Agree Disagree Strongly Disagree Don't Know

d. foot pain Strongly Agree Agree Disagree Strongly Disagree Don't Know

e. wheezing Strongly Agree Agree Disagree Strongly Disagree Don't Know

f. chest tightness Strongly Agree Agree Disagree Strongly Disagree Don't Know

g. difficulty breathing Strongly Agree Agree Disagree Strongly Disagree Don't Know

h. numbness in fingers Strongly Agree Agree Disagree Strongly Disagree Don't Know

i. excessive mucus in lungs
Strongly Agree Agree Disagree Strongly Disagree Don't Know

4. Asthma symptoms are often worse at during the day than in the morning.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

5. Substances in the air can cause the lungs airways to narrow and fill with mucus.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

6. My child's Asthma can be worse than other children's Asthma.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

7. There are medicines called controllers that are used everyday by my child to prevent asthma attacks.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

8. Asthma can be controlled by following a plan developed by your child's doctor.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

9. Relievers, also called rescue medications, are used when asthma symptoms become severe.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

10. I should make sure that my child takes their controller medication everyday, even if they aren't having trouble breathing. Strongly Agree Agree Disagree Strongly Disagree Don't Know

11. Asthma that is poorly controlled over many years may lead to permanent airway damage.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

12. Controllers work by reducing airway inflammation.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

13. Controllers can help stop bad stuff in the air from making my child's Asthma worse.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

14. Once your child's asthma is under control you can expect your child -

a. To never need their controller medication again.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

b. To run and play more like other children.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

c. To never have to see the doctor again.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

d. To sleep more through the night without waking-up.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

e. To never need their rescue medication again.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

e. To miss less school. Strongly Agree Agree Disagree Strongly Disagree Don't Know

f. To be more free of coughing, wheezing and shortness of breath.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

g. To never have Asthma attack again.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

C. **Asthma and the Environment** - These questions let us know if our program is giving you the information that you need to better understand the things that can "trigger" your child's asthma. Please listen carefully to each question or statement and tell the interviewer how much you know, believe or feel that you agree or disagree with it. If you do not know or have no belief or feeling about a question or statement than say "I don't know". Please answer all the questions.

1. Triggers are substances in the indoor or outdoor environment cause asthma attacks.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

2. Different people are sensitive to different triggers.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

3. Rate the list below, according to your knowledge, belief, or feeling of their ability to cause an asthma attack. Please fill in all questions.

a. Eating Vegetables. Strongly Agree Agree Disagree Strongly Disagree Don't Know

b. Cockroaches or their parts. Strongly Agree Agree Disagree Strongly Disagree Don't Know

c. Using Public Toilets. Strongly Agree Agree Disagree Strongly Disagree Don't Know

d. Cigarette smoking in your home.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

e. Being around other children. Strongly Agree Agree Disagree Strongly Disagree Don't Know

f. Being around a dog or cat. Strongly Agree Agree Disagree Strongly Disagree Don't Know

g. Microscopic dust mites in the sofa or carpet.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

h. Watching television. Strongly Agree Agree Disagree Strongly Disagree Don't Know

i. Being bitten by mosquitoes. Strongly Agree Agree Disagree Strongly Disagree Don't Know

j. Breathing air fresheners. Strongly Agree Agree Disagree Strongly Disagree Don't Know

k. Outdoor air pollution from cars and trucks
Strongly Agree Agree Disagree Strongly Disagree Don't Know

l. Holding hands crossing the street.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

m. Being around mold, mildew or fungi.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

n. Getting a cold or the flu. Strongly Agree Agree Disagree Strongly Disagree Don't Know

o. Breathing pollen. Strongly Agree Agree Disagree Strongly Disagree Don't Know

p. Breathing smoke from a fireplace or a stove.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

q. Mice or rats in the house. Strongly Agree Agree Disagree Strongly Disagree Don't Know

r. Breathing cold air. Strongly Agree Agree Disagree Strongly Disagree Don't Know

s. Strong Exercise. Strongly Agree Agree Disagree Strongly Disagree Don't Know

t. Too much humidity in the house. Strongly Agree Agree Disagree Strongly Disagree Don't Know

u. Household products with strong odors.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

v. Eating candy. Strongly Agree Agree Disagree Strongly Disagree Don't Know

w. Smoking cigarettes or cigars. Strongly Agree Agree Disagree Strongly Disagree Don't Know

x. Breathing Cleaning Products. Strongly Agree Agree Disagree Strongly Disagree Don't Know

y. Going to School. Strongly Agree Agree Disagree Strongly Disagree Don't Know

z. Car exhaust. Strongly Agree Agree Disagree Strongly Disagree Don't Know

aa. Breathing fresh clean air. Strongly Agree Agree Disagree Strongly Disagree Don't Know

D. **Actions in Your House -** These questions let us know if our program is giving you the information that you need to better control your child's asthma. Please listen to each question or statement carefully and let the interviewer know how much you know, believe or feel that you agree or disagree with it. If you do not know or have no belief or feeling about a question or statement than say "I don't know". Please answer all the questions.

1. Have you ever heard of a HEPA filter? Yes No

2. Is your vacuum cleaner equipped with a HEPA filter? Yes No

3. There are things that I can do in and around the house to reduce my child's asthma attacks.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

4. Circle your level of belief or knowledge that the following actions will help control your child's Asthma. If you do not have any knowledge or belief about the statement, than circle don't know.

a. Spray air freshener in the child's bedroom as often as possible.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

b. Remove materials, including carpets, which are damp or musty.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

c. Damp mop floors often to remove dust.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

d. Keep moisture levels low, especially in the child's room.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

e. Vacuum carpets often. Strongly Agree Agree Disagree Strongly Disagree Don't Know

f. Wash the child's sheets, pillow cases and mattress cover, weekly, in very hot water.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

g. Dry sweep floors very often. Strongly Agree Agree Disagree Strongly Disagree Don't Know

h. Dust surfaces and objects with a wet rag at least once a week.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

i. Dust surfaces and objects using scented household cleaners very often.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

j. Keep furry and feathered pets out of the child's room.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

k. Put plastic covers over pillows, mattresses and box springs.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

l. Dust surfaces and objects using Lemon Pledge very often.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

m. Remove stuffed animals from your child's room.

Strongly Agree Agree Disagree Strongly Disagree Don't Know

n. Use strong cleaning solutions, which leave chemical odors in the house.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

o. Remove Plants from your house.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

p. Keep food in sealed containers in the kitchen.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

q. Allow your child to eat in front of the TV and in their bedroom.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

r. If live or dead cockroaches are seen, use an approved exterminator to spray pesticides.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

s. Keep many plants in throughout your house to freshen the air.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

t. Seal mouse or rat entrances and set traps to kill them.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

u. If possible, put a HEPA air cleaner in your child's room.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

E. **Your Thoughts, Feelings and Beliefs About Caring for Your Child** - These questions let us know how you are thinking and feeling about caring for your child. Please listen to each question or statement carefully and let the interviewer know how much you know, believe or feel that you agree or disagree with it. If you do not know or have no belief or feeling about a question or statement than say "I don't know". Please answer all the questions.

a. My child's asthma symptoms can be controlled.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

b. Changes in cleaning methods can improve my child's asthma symptoms.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

c. I feel like I cannot help my child control their asthma.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

d. It is the doctor's job to fix my child's asthma.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

e. I have the support I need to help control my child's asthma.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

f. My child is sleeping through most nights.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

g. I know where to go to get help with my child's asthma.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

h. I know what to do if my child has difficulty breathing.

Strongly Agree Agree Disagree Strongly Disagree Don't Know

i. Dust Mites on my child's uncovered pillows may make their Asthma worse.
Strongly Agree Agree Disagree Strongly Disagree Don't Know.

j. I get enough sleep at night. Strongly Agree Agree Disagree Strongly Disagree Don't Know

k. Cockroaches can be a major cause of making my child's asthma worse.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

l. I need to tell my friends and relatives not to smoke around my child.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

m. My child's asthma symptoms have improved in the past month.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

n. I have the resources that I need to help control my child's asthma
Strongly Agree Agree Disagree Strongly Disagree Don't Know

o. No one should smoke in my home.
Strongly Agree Agree Disagree Strongly Disagree Don't Know

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