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An Examination of the Risk Factors Associated With Asthma Prevalence Among a Sample of
Displaced Public Housing Residents in Atlanta, Ga.

By

Matthew C. Jackson

B.A., (Philosophy) GEORGIA STATE UNIVERSITY

A Thesis Submitted to the Graduate Faculty
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MASTER OF PUBLIC HEALTH

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An Examination of the Social & Behavioral Risk Factors Associated With Asthma Prevalence
Among a Sample of Displaced Public Housing Residents in Atlanta, Ga.

By

M.C. Jackson

Approved:

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___April 25, 2013_____

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ABSTRACT

Background: Asthma is a chronic illness that affects people of all age groups. Approximately 12% and 9% of children and adults, respectively, have asthma in Georgia. Asthma affects groups of people differently, with African Americans being twice as likely to be hospitalized for asthma. Hospitalizations related to asthma cost Georgians over $100 million dollars. The symptoms of coughing and wheezing can have a detrimental effect on the productivity of the asthmatic as well as lead to exorbitant medical costs for the asthmatic. This study examines the associations between known risk factors and asthma prevalence in a displaced housing population in Atlanta, GA.

Methods: Researchers recruited residents of former public housing communities BEFORE/ AFTER demolishment. Data were collected by interview by research staff supported by the Georgia State University Partnership for Urban Health Research Center. The second set of interviews were collected from the same sample population, no additional recruiting was done. This second cross-sectional wave (out of 4 total) of interviews is the data source analyzed in this study. Chi-square tests were run to examine associations of risk factors with having an asthma diagnosis within the last 12 months.

Results: There were 310 complete interviews obtained with public housing residents during the second wave of data collection. Results showed that 13% (n= 40) of respondents reported an asthma diagnosis within the last 12 months. Chi-square analyses demonstrated statistically significant associations between the following variables: Presence of Leaky Roof, Presence of Mice and Rats, and Going Without Necessary Medication.

Conclusions: Results of this study reveal important relationships between risk factors associated with asthma among public housing residents recently displaced from their communities. Risk factors representative of individual, interpersonal, and community levels of influence demonstrate clear associations with asthma for this vulnerable population. Continued investigation on the predictive value of risk factors related to asthma among residents of public housing communities is warranted. Deepening understanding of how a person, the environment, and their behaviors are connected will inform more sensitive public housing decisions—that ultimately, hold the promise of improving asthma prevalence, maintenance, and outcomes for the 1,000s of sufferers in Georgia alone.

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Chapter I
INTRODUCTION

1.1 Background

Asthma is a chronic illness that affects millions of people worldwide. The Centers for Disease Control's page on asthma states that asthma affects the airways of the lungs and manifests in a variety of symptoms such as coughing, wheezing, chest tightness, and shortness of breath. It also says that a common misconception is that there is only one cause of these symptoms, but in reality there are two main causes. The one commonly felt by asthma sufferers is a tightening of the chest, the result of muscles around the airways tightening, making it hard to breathe; this is also called, "bronchoconstriction." The other cause, which is not always noticed, is inflammation. An asthmatic's lungs are always inflamed, but when they swell and become abnormally irritated, the amount of air taken in by the lungs decreases and makes it harder to breathe. In addition, thick mucus may be produced, partially blocking the airways and adding to the difficulty of breathing. Asthma is a severe chronic illness, but it is manageable ("CDC," 2011). Coughing and wheezing may seem like a minor inconvenience, but to the asthmatic, it leads to loss in productivity, higher medical costs, as well as millions of dollars in healthcare and productivity costs to society as a whole. Moreover, when not properly controlled, asthma can lead to hospitalization and even death.

Asthma places a large public health burden on society, as it is one of the most common and costly diseases in the United States. Currently, asthma sufferers represent approximately 20 million people in the US alone, totaling 8% of the adult population ("CDC," 2011). In addition, asthma affects approximately 4.8 million children and is responsible for 2 million emergency room visits, 500,000 hospitalizations, and 5000 deaths a year (O'Connell, 2004).

The number of people with asthma points to a significant economic burden on the healthcare system, asthma sufferers, and even those without the disease. It is a drain on both resources and productivity among US citizens. Direct and indirect costs associated with asthma are estimated to reach 14 billion dollars. The cost of asthma for the asthmatic averages $4912.00/yr, with the majority of those costs including pharmaceuticals (Cisternas et al., 2003).

Asthma sufferers are put at greater risk of asthma exacerbation and attack from a variety of risk factors. They may be certain characteristics of the built environment or the behaviors of the individual as well as the people in the community in which one lives (Institute of Medicine (US) Committee on Health and Behavior: Research, 2001). Research has shown that a continuum of risk exists for the asthmatic, beginning with the behavior of the mother to the toxins in the atmosphere. For instance, maternal smoking can have adverse pulmonary effects lasting into the child's teenage years (Baccarelli & Kaufman, 2011). Research into the effect pollution may have on the asthmatic has shown that not only can it exacerbate current conditions, it may also contribute to the onset of the disease (Perez et al., 2012). The size and number of health and economic burdens placed on society, as well as the vast array of risk factors, demonstrates a need for research into which associations may be strongest.

1.2 Purpose of Study

The purpose of this study is to examine which risk factors are most closely associated with a diagnosis of asthma in a displaced public housing population. The sampled population consists of residents throughout multiple public housing units in the Atlanta area. Close to 400 residents were asked to participate in the study. All study participants were over 18 and had to be living in one of the pre-selected public housing units. Participants were interviewed before the relocation and then after, once they were established in their new living situation. The data this

study uses are from the 2nd interview (n=310), after the relocation. The interview consisted of items related to health, living conditions, as well as economic status along with a host of other factors. Chi-square tests will be used to determine whether significant associations exist between a diagnosis of asthma within the last twelve months and factors such as presence of cockroaches as well as several other risk factors known to be associated with asthma.

The population selected for this study is part of a growing controversy in public policy regarding the health of the residents living in public housing units. In the following cases, poor health was used, in part as a rationale to demolish units and then move residents to government subsidized private quarters. However, it has been shown that in some circumstances, public housing may provide a "protective effect" as well as not be as harmful as the effect housing may have on those living in private quarters (Fertig & Reingold, 2007a). The original study, from which the secondary data used in this study was derived, reported similar findings. That is, results showed that not only did living in a public housing unit not contribute to ill health, but it may have provided a protective effect. Specifically, researchers found no associations between public housing physical structures and the five chronic conditions tested for (Ruel, Oakley, Wilson, & Maddox, 2010).

Other research has shown, however, that public housing populations are often more susceptible to poorer health. A study in Boston, reported much higher asthma prevalence rates, as well as a variety of other health conditions such as hypertension, among a public housing population (Digenis-Bury, Brooks, Chen, Ostrem, & Horsburgh, 2008). This seeming contradiction points to the necessity of studies such as this one and those like it. It will hopefully begin to uncover the reasons why public housing provides a safety net in some instances and not in others. One possible explanation is that even within singular populations, those typically

lumped together, there are nuanced differences that have a strong impact on health. The above study, for instance, reported that public housing residents self-reported more risky behaviors such as smoking, drinking, and marijuana use. Populations are often linked together, and associated with risk factors such as risky behaviors, but the contradictions within public housing research illuminate the need for further investigation. Although the particular etiological associations are too large for the scope of this paper, this study is the first step in examining how risk factors may adversely affect unique populations.

This study also adds to the literature in that it is a glimpse of the health outcomes of a recently, and *forcefully,* relocated population. The population used in this study is primarily female, African-American, and very poor with severe health issues and represents a very unique subset of the general population. Researchers hoping to develop interventions to mitigate asthma may use these findings to inform their programs.

Finally, few studies have been conducted that assess the general health of residents in public housing units, and even less on those involuntarily relocated. Stress is a risk factor commonly associated with a variety of health outcomes from heart disease to obesity as well as asthma. Research has shown that relocations often create more stress for those displaced (Keene & Geronimus, 2011). It could be expected then, that this particular population demonstrates higher asthma prevalence and that those forcefully relocated may experience higher negative health outcomes. By examining the associations between asthma prevalence rates and the displaced population, results will begin to give insight into how the two situations compare to one another as related to asthma. The next step, in light of this, will be to examine the associations between known risk factors, asthma, and the living conditions of the recently displaced.

1.3 Research Questions

A plethora of risk factors have been shown to contribute to asthma prevalence in diverse subpopulations in the US. The theoretical underpinning of this study is the Socioecological Model (SEM), which posits that there are several levels of influence that affect the health outcomes of individuals. Most SEM's posit five levels of influence: 1) Individual 2) Interpersonal 3) Organizational 4) Community 5) Public Policy (Damis, 2011). Levels are organized from most proximal (individual) to the most distal (public policy).

The purpose of the model is not to oversimplify the impact of one variable, bur rather to examine the risk factors related to a given condition or illness as they exist in relation to one another. That is, the SEM aims to explain how the individual behaviors as well as the environment in which they exist, affect health outcomes.

Chapter 2 more explicitly covers how determinants fit into the SEM. In most cases, no one level is sufficient to explain an outcome, and levels often interact with one another. Research shows that there are risk factors related to asthma at each of these levels. The following research questions were chosen as each one corresponds to risk factors found in at least one of the SEM levels. Table 1.1 lists the SEM domains and their corresponding questions.

Table 1.1 List of Research Questions & SEM Level/ Domain

SEM Level/ Domain	Research Questions
Individual	Do items related to level of income associate with asthma?
Individual	Do items related to general prescription medication usage associate with asthma?
Interpersonal	Do items associated with Social Capital Associate with asthma?
Organizational	Do items related to housing quality associate with asthma?
Public Policy	Do items related to access to healthcare associate with asthma?

The questions are related to levels in the SEM in hopes of demonstrating associations of risk factors throughout the model within a unique population of displaced public housing residents. That is, this study hopes to show that risk factors related to asthma diagnosis are found throughout the individual's environment.

Some of the questions/ variables' relationships to the SEM levels are clearer than others. Social capital, for instance, is contingent on relationships between peers as well as others throughout the community. The characteristics of social capital make it an easy fit into the Interpersonal/ Community domain. Quality of housing, however, straddles both the organizational and public policy domains, and thus its categorization is more complex. This is because the condition of one's home is contingent on both public policy (local zoning laws, etc.) and organizational settings (the actual physical environment of the sampled population). This is of no consequence to this study, however, in that the purpose is not to demonstrate relationships

between levels. Rather the separation of variables into domains as they relate to SEM, will demonstrate the distribution of risk factors throughout the continuum of the SEM. No importance, consequently, should be given to order among individual questions. Chapter 2 will cover research related to the risk factors mentioned as well as how they fit into the previously prescribed domains.

Chapter II
REVIEW OF THE LITERATURE

2.1 Theoretical Framework

The SEM is an offshoot of a theory, created by the psychologist, Urie Bronfenbrenner, the Ecological Framework for Human Development. Ecological models, in general, are used to explain the complex relationships between individual behavior and environmental contexts. That is, they serve a useful purpose in helping increase understanding regarding the effect ecological systems have on behaviors, and their health outcomes. The point is not to reduce the ecological system, and its effects, to a single concept, but rather to demonstrate the relationships between different areas of an individual's environment in hopes of understanding how one area affects the other (DeBate, Bryant, & Zwald, 2010). The SEM is often used in public health to explain the effect an individual's environment has on health behaviors and their outcomes in hopes of advocating for interventions or policy change.

The SEM is, conceptually, a good fit in that the risk factors that will be examined exist throughout the continuum of an individual's environment, or ecology. That is, there are risk factors associated with every level of the SEM. Different SEM models have different levels. The SEM model chosen for this study was adapted from the National Environment Health Promotion Network's model (Damis, 2011). It was chosen due to the coalition's focus on health in substandard housing, and includes five levels of influence. Figure 1 shows the adapted model with the layers of interest from the SEM. In addition, each domain has the allocated research questions listed. The terms layers and domains should be considered interchangeable for the purposes of this paper.

Each layer of the SEM contains risk factors from different areas of an individual's life. The individual domain captures items such as income and personal behavior. The interpersonal

domain includes the relationships between a person's friends, family, and other community members or neighbors. The organizational domain might refer to elements of the physical environment as well as the policies and practices of the organization of interest. The community domain may refer to the relationships between members as well as coordinated efforts by the community leaders and members. Finally, public policy is the largest domain and incorporates the usage of local, state, and national polices to influence change when it comes to healthy outcomes. Each one of these domains, comprises a host of risk factors previously associated with asthma. These domains can be found in most SEM's, although different models exclude or include varying domains. The underlying concept, however, is that the SEM aids researchers and interventionists in determining which domain is most appropriate to focus on, depending on the illness/ condition in question (McLeroy, Bibeau, Steckler, & Glanz, 1988).

The relationship between risk factors, the SEM, and asthma make it a good method by which to examine the prevalence of asthma in the sampled population. The SEM has been used in the past to inform both asthma research as well as interventions. Researchers in Oakland, CA, for instance, used the SEM to study the effect air pollution has on asthmatics as well as address the issue of pollution from various layers of the SEM, with a focus on public policy. Researchers determined, based on previous research conducted at UCLA that certain populations were susceptible to a host of chronic conditions, including asthma. This research showed that African-Americans had higher rates of asthma (20.1%) than other populations and that Latino populations, while not showing disproportionately higher rates, did represent a large population of Californians with asthma (1.4M) (Wallace, Lee, & Aydin, 2008).

Combining this research with what is known about asthma-related risk factors found in the same study, the Regional Asthma Management and Prevention (RAMP) collaborative was

created to reduce asthma burdens through a wide and comprehensive approach. Efforts to reduce the asthma disparities included elements associated with all levels of the SEM, from clinical management to environmental protection policy (Lamb, Ervice, Lorenzen, Prentice, & White, 2011). RAMP utilized the SEM to frame its advocacy efforts, which included reaching out to health departments to increase access as well as, more recently, work on policy changes to reduce diesel exhaust emissions. Advocacy efforts such as RAMP, which focus on asthma mitigation through various risk factors throughout the SEM have proven to be effective. The full effect of health benefits from the program is yet to be felt. The effects of the California Air Resources Board (CARB) led diesel exhaust initiative alone was estimated to save 18-26 billion dollars in costs from avoided deaths and associated health care costs; Including 840 fewer hospital admissions as well as 110,000 cases of asthma and other respiratory problems (California EPA, 2007).

Other asthma-related research has shown that factors found across the SEM model, such as the individual and socioeconomic background, affect ethnicities differently. Researchers, hoping to develop methods of mitigating the asthma burden, studied several factors found throughout the SEM. Researchers compiled data from several other studies and found links between asthma prevalence and a host of determinants such as health literacy, attitudes and beliefs, and experiences with healthcare. (Davidson, Liu, & Sheikh, 2010). That is, the disparities in the asthma prevalence between ethnicities were in part the result of differences in factors found through the SEM. Researchers in this study concluded that a multi-pronged approach would be necessary to reduce the asthma burden.

Research related to health in general, utilizing SEM concepts has shown that the environment, and the risk factors it comprises, often leads to poorer health outcomes.

Researchers at Cornell University, in the Department of Design and Environment Analysis, demonstrated the cumulative effect of environmental risk factors on poorer health outcomes in general. Researchers investigated the effect of environmental factors, found throughout the SEM, on a population of predominantly white, low-income children. The cross-sectional study included 216 children (3rd-5th grade) and looked at risk factors such as noise levels, housing quality, and overcrowding (rooms filled with more people than designed for). Results showed that physiological stress significantly increased as exposure to different factors increased (Evans & Marcynyszyn, 2004). That is, the more risk factors the children were exposed to, the more physiological stress they experienced.

All of these studies demonstrate the usefulness and validity of looking at asthma, and its risk factors, through the SEM lens. The complexity of its origins, as well as the interrelatedness of the associated risk factors, necessitate a theoretical framework by which to ground research. This research has shown that it may take more than examining individual behaviors, and risk factors, to understand the true causes of asthma, and that studying it within the contexts of communities and socioecological models, may be the best way to ameliorate the health burdens associated with asthma (Wright & Subramanian, 2007).

The SEM has proven to be a chosen method for asthma intervention development, in addition to being a useful tool by which to frame research. One organization, California Breathing, a program based at the California Health Department, used a SEM to guide its intervention efforts in reducing asthma disparities among different communities (Kruetzer & Tobacman, n.d.). In addition, programs in such diverse places as Mississippi and Boston have utilized the SEM as a framework for their interventions. The Community Asthma Initiative (CAI), in Boston, approached their intervention from a variety of risk factors, such as in-home

living environment factors and proper asthma maintenance. This multi-faceted approach helped them achieve reductions in asthma-related ER visits as well as see a return of investment of $1.50 as a result of their efforts (Woods et al., 2012). That is, for every dollar spent on the program, the surrounding community saved fifty cents in medical costs. The savings to the surrounding community, as well as the decline in asthma-related ER visits, elucidate the benefits of examining asthma burdens within the context of a network of risk factors versus one at a time.

This literature review, consequently, focuses on risk factors associated with the prevalence of asthma as well as segregates them according to their place within the SEM. Each subheading within the literature review lists the SEM domain and its associated risk factors. This is done for a couple of reasons. The first reason is that one goal of the study is to illuminate the existence of risk factors throughout the SEM. The thought is, that by demonstrating associations across the board, support will be given to the claim that multi-faceted interventions are what are needed. Secondly, the division of risk factors into categories, as well as an appropriate theoretical framework, aid in the reporting of results as well understanding next steps in research. That being said, risk factors should not be seen as more or less important due to their place in the literature review.

Finally, a considerable amount of asthma research is child-specific. The sample for this study consisted entirely of adults, but the following synthesis of previous research is relevant for all age groups as asthma is not a condition that disappears after childhood. The factors examined have the potential to equally affect children and adults. The first part of the literature review pertains to the general population and the associated risk factors. The risk factors and their relationship to the sampled population are discussed at the end of the chapter.

Fig. 1 – Adapted SEM

2.2 Individual Domain (Socioeconomic Status (SES) and Prescription Drug (Rx) Usage)

SES is a combination of factors including education, income level, and work experience, that when combined, add up to the individual's overall standing within the context she lives. SES can be found in a few of the domains throughout the SEM, but most closely associates with the individual level within the context of this study, due to the focus on economic indicators. The use of the Women, Infants, and Children (WIC) programs and food stamps as economic indicators is justified in that an individual must be below a certain income level to receive assistance. Research involving all the characteristics of SES and its effect on asthma is complex, and not always clear. Patterns, however, can be seen when investigating the net effect that SES has on asthma (Antó, 2012).

Overall SES has been shown to be related to national asthma hospitalization rates. Researchers in the Department of emergency medicine at the Colorado Denver School of Medicine looked at related data from the National Hospital Ambulatory Medical Care Survey, 1993-2005. Data included 23,800,00 asthma related ER visits, which accounted for 1.8% of all visits. The data showed that, even though the asthma-related ER visits stopped rising from 1993-2005, disparities between individuals in different SES levels persisted (Ginde, Espinola, & Camargo, 2008).

The above study examined the effect of SES as a collection of factors, including level of income as well as race and education. The research questions for this study however focus primarily on income and its resulting privations of medication, etc. Level of income, however, even as an individual component of SES, has been shown to adversely affect the asthmatic's health. A study conducted at the University of Washington, for instance, looked at the Asthma Insights & Management Survey (AIM) to examine the connection between controlled asthma and varying risk factors. The sampled population included 2,500 patients, over the age of 12, who had been diagnosed with asthma. Results showed that those reporting lower income were less likely to report sufficient asthma control, which also meant they were at increased odds (ORs ranging from 14 to 34) of reporting that asthma had limited their daily physical activities. Studies such as these demonstrate that the individual SES component, income level, is associated with asthma outcomes.

Research has shown that low-income and minority children are at higher risk of asthma-related health problems (Fox et al., 2007). What is interesting, however, is that the mere perception of being low-income can have an effect on low-income children. Researchers at the New York Academy of Medicine conducted a study examining the effect of perceived financial

burden on childhood asthma. Researchers used previously gathered data from the school system in Detroit, Michigan. The sample included the parents of 835 children aged 2-14, from 14 elementary schools, throughout Northwest Detroit. Measures examined included perceived financial burden, asthma-related ER visits, and missed school days. Results showed that parents who demonstrated a higher perceived financial burden were more likely to visit to use the ER and miss school (Patel, Brown, & Clark, 2012).

Rx drug adherence has been linked extensively to asthma control and asthma outcomes and also belongs in the individual level of the SEM. This is because it is directly related to attitudes and beliefs. There are several reasons why an individual may, or may not, use control medication. For example, she may not have access to a support network that both encourages drug adherence as well as possesses the knowledge needed to follow regimens. It is also possible that the surrounding communities may have pharmacies and health departments staffed with knowledgeable and helpful personnel.

There are several reasons why patients sometimes do not adhere to regimens. Asthma is an expensive disease and those who do not have disposable incomes may find it difficult to justify spending the money during asymptomatic periods. Research has shown in fact, that one reason for non-compliance is a belief that the disease has abated during periods without symptoms (Dolovich et al., 2008). That is, one of the barriers to Rx drug adherence is the patient's own beliefs concerning asthma.

Beliefs concerning the necessity of medications are not the only barriers to Rx drug compliance. Inhalers are the most common form of treatment for asthmatics, and are often complicated due to their variety and purpose (Melani, 2007). This poses a particularly problematic barrier for asthma control as it is often closely associated with access to correct

information related to its control (Clark & Nothwehr, 1997). One may have the medications, but without proper instructions, these may be rendered useless.

Reasons for non-compliance notwithstanding, research demonstrates associations between those adhering to their asthma regimens are less likely to experience negative asthma-related health outcomes. A study conducted in Australia examined the effect of a training program delivered through community pharmacists. The pharmacists were asked to approach those diagnosed with asthma and solicit their participation in a two-week program. The criteria for inclusion was they had to be 14 years of age, have a diagnosis of asthma, be an English speaker, and be independently able to operate the devices as designed. The sampled population included 116 people and each was given a 2.5-minute demonstration on the device prescribed to them. Researchers saw educational benefits as well as health outcome gains as a result of the intervention. Results taken at 3 months indicated statistically significant differences in Asthma-related quality of life as well as perceived asthma control (Basheti, Reddel, Armour, & Bosnic-Anticevich, 2007). Studies such as this, and the ones mentioned above, demonstrate the need for Rx drug adherence related to asthma.

2.3 Interpersonal Domain (Social Capital)

Social Capital (SC) is a collection of risk factors often associated with asthma, which fits into the interpersonal level of the SEM. It is often defined as a concept that measures the norms of neighborhood reciprocity, social ties between residents, and overall civic engagement (Pearlman, 2009). The elements of SC represented in the research questions are feelings of safety, too much crime, and overall feelings of belonging when at home. These factors fit best into the interpersonal domain due to their association with the overall dynamics between community members, in general, and not coordinated efforts between community members. SC

can also be affiliated with the community domain of the SEM, but for the purposes of this study, is thought of mainly in terms of interpersonal.

Research into SC and asthma reveals some significant associations. Researchers in Chicago, IL, for instance, conducted a cross-sectional survey, comprising several previous studies, and examined how factors related to SC, such as neighborhood violence, affected levels of asthma reporting. Researchers collected 45,177 surveys completed by parents of children aged K-8th grade and then geocoded them into 287 corresponding neighborhoods. The large sample and geocoding yielded a stratified sample, representing four race-income groups. This was done to compensate for differences in income and race. Results were somewhat mixed in that, those neighborhoods reporting high-income potential and community vitality also reported lower asthma prevalence rates. Conversely, high prevalence rate neighborhoods generally reported more interaction and stability. (Gupta, Zhang, Sharp, Shannon, & Weiss, 2009). These findings are particularly important for the interventionist as they demonstrate how the individual constructs of a concept can have contravening effects.

Research related to SC and asthma, within adult populations, finds similar ties between elevated levels of SC and asthma prevalence. Collective efficacy, which can be defined as a measure of a resident's trust of his/her neighbors, has been shown to be associated with asthma and breathing problems. Researchers in Chicago examined 338 neighborhoods, by combining three data sources from the 1990's. Statisticians used data from the Metropolitan Chicago Information Center Metro Survey, the Decennial Census, and the Project on Human Development in Chicago in a multi-level statistical approach, which eliminated individual factors as confounders. After controlling for individual behavioral factors, results showed that those reporting higher levels of trust, experienced lower levels of reported asthma and breathing

problems (Cagney & Browning, 2004). These results demonstrate associations between elements of SC, both inside and outside the context of this study.

2.4 Organizational Domain (Housing Quality (HQ))

The immediate living conditions surrounding an individual have been associated with higher prevalence rates of asthma. Living conditions can be directly related to the quality of housing in which someone resides. "Housing Quality Standards," which are those minimum requirements any structure must meet, are instituted by the U.S Department of Housing and Urban Development (HUD) and are locally enforced at the state level (Donovan, 2013). The research questions, related to mold (structure & materials) and indoor air quality, in this study are part of the 13 standards set forth by HUD.

Elements of HQ most closely align with the characteristics of the organizational domain of the SEM. That is, an individual's living environment (often referred to as in-home living environment (IHE)) is a reflection of the physical properties of her community as well as the policies of the living establishment of interest. The following studies relate to the variables of interest in this study.

The presence of roaches and mice are related to HQ standards as elements of sanitation and the physical environment, and have both been associated with elevated levels of asthma. Researchers in New York City conducted a case-control study of asthmatics in hopes of determining if there was an association between exposure to allergens and asthma prevalence. Allergens of particular interest included bed dust, cockroach, cat and dog dander, as well as mice allergens. Researchers pulled their sample from children admitted to local hospitals for asthma-related conditions. All participants were enrolled in an HMO typically associated with middle-income families, of which very few reported incomes below the poverty line. Researchers then

divided them geographically into high asthma prevalence neighborhoods (HAPN) and low asthma prevalence neighborhoods (LAPN). LAPN participants' (n=119) asthma prevalence rates were then compared to HAPN participants (n=120). The results, while not showing a significant correlation between all allergens, did demonstrate a relationship, most strongly, between cockroach and mice allergens with asthma prevalence among the sampled populations. (Olmedo et al., 2011) Furthermore, the same study showed associations between cockroach allergens levels (exposure) and sensitization to these allergens and increased risk for asthma were shown (Olmedo et al., 2011).

The above study was child specific, but the same results can be seen in studies with adult populations. The National Institute of Health's Environmental Health Sciences division conducted a cross-sectional study of 831 housing units, consisting of 2,456 individuals. Researchers found associations between increased mouse urinary protein (MUP) levels and higher asthma prevalence rates (Salo, Jaramillo, Cohn, London, & Zeldin, 2009). These two studies show the connection between mouse allergens and asthma prevalence in both young and old populations.

Another factor associated with IHE factors and asthma prevalence is dampness and mold. Researchers at the Finnish Institute of Health examined the relationship between 521 recently diagnosed adults (ages 21-63). The results showed that mold in the workplace increased the risk of adult-onset asthma and that 35.1% of asthma was attributable to exposure to workplace mold exposure (Jaakkola et al., 2002). Other studies show similar associations when exposed to mold and dampness at home. Researchers in the UK found that, not only was there a positive relationship between damp housing and asthma, there was a dose response relationship as well

(Williamson, Martin, McGill, Monie, & Fennerty, 1997). That is, those asthmatics living in damp conditions – often the cause of mold – experienced higher prevalence rates.

2.5 Public Policy and Access to Healthcare (ATH)

Barriers preventing adequate access to care exist in many forms. Lack of access to sufficient and correct preventive health information, certain features of the built environment, and socioeconomic conditions are all barriers that may prevent one from receiving the care he/she needs. The variables in this study, however, most closely resemble those characteristics found in the public policy domain. That is, items such as distance to public transportation and access to health insurance are reflections of the policies governing the area in which one lives. For instance, if the Medicaid expansion is approved, then many of the participants in these studies may then be able to get insurance.

Research on access to care that is directly related to asthma is scarce. However, looking at other chronic illnesses and how they are related to asthma may provide some insight. Research in cancer prevention reveals cancer to be particularly susceptible to barriers throughout the community in which one lives. For instance, researcher Chu, et al., demonstrated links between a person's access to proper treatment and health outcomes. They specifically examined socio-economic and environmental factors. They learned that both serve as barriers to adequate knowledge and treatment procedures (Chu & Springfield, 2008). Asthma is similar to cancer, as the previous research shows, in that it requires adequate knowledge and access to maintenance drugs to control.

One area in asthma research related to access that has been covered is the dissemination of inhaler technology. Inhalers are the typical method by which most asthmatics control their illness. These inhalers are often complicated and expensive and may serve as impediments to

adherence. Health insurance, for instance, in one study was shown to be associated with certain inhaler adherence. Researchers examined the use of two different types of medications with varying costs, by looking at 3,799 matched pairs of asthma patients to determine which group suffered the highest asthma burden. The groups were divided into fixed-dosed combinations of drugs and longer term acting B-agonists users. Those using the less expensive inhaler were less likely to be report asthma symptoms, but ER visits were higher with those using the less expensive (Hagiwara, Delea, & Stanford, 2013). This study demonstrates the need for further investigation into how access, related to cost, affects adherence.

Research related specifically to associations between asthma and proximity to a doctor and/or a public transportation hub is completely absent. That being said, urban sprawl has often been associated with poor health in general. There is no singular definition of sprawl, as conditions dictate different operational definitions, yet one common element among varying versions is accessibility of the street network and the mix of homes and useful services (Frumkin, Frank, & Jackson, 2004). Sprawl is related to health due to its effect on how well someone is able to get around. It is a logical assumption that those with easier methods of getting around, will be more inclined the services offered to them.

2.6 Summary

The research cited above examines the associations between asthma and the known risk factors throughout the general population. The population used in this study is a unique subset of the general population in two different ways. For one, they are former residents of public housing units. Secondly, those residents have recently been voluntarily, and involuntarily, relocated.

Research related to the overall effect of public housing living conditions on health is

mixed. This is because, as some claim, the factors related to health and certain conditions within a public housing community may offset one another. That is, crime and violence may be higher, but lower rents may allow for more resources to be used for medical needs (Fertig & Reingold, 2007b). These issues become more important as policy makers continue to use health concerns as rationale for massive relocations, which often leave residents in poorer health than before the move.

The literature review demonstrated that risk factors exist throughout the SEM and that this model is an effective way of both framing research and developing interventions. The only domain not specifically discussed was community, but as mentioned, a few of the variables could have potentially been placed into this domain. This type of analysis is important due to the often-contradictory nature of research surrounding this particular population. Studying these factors and their place in the SEM domains will help illuminate nuanced associations that may be missed by conceptually broader studies.

Chapter III
METHODS AND PROCEDURES

The primary data collection, the questions from the original data used in this study, the

sample population, as well as methods and procedures used are described in the following

sections.

3.1a Data Source

The data for this thesis was derived from a previous prospective longitudinal study

conducted by PI's Ruel and Oakley under the auspices of the Partnership for Urban Health

Research at GSU. The purpose of the study was to investigate the overall well-being of the

sampled population before and after they were involuntarily relocated from public housing units

in Atlanta, GA. The baseline and postsrelocation survey constructs were, in part, derived from

previously documented surveys and aimed to analyze how changes in location affect

neighborhood satisfaction (Oakley, Ruel, & Reid, 2013). Questions from the survey included

items related to how satisfied with their current circumstances residents were, perceptions of

quality of home, and a plethora of questions related to morbidity. The varied nature and scope of

the survey informed researchers on a variety of health issues.

PIs solicited volunteers from GSU. Once volunteers signed on, they were trained through

the Collaborative Institutional Training Initiative (CITI) to work with human subjects to ensure

ethical standards were met. Volunteers utilized a Questionnaire Development System (QDS) on

a laptop to conduct the interviews. This platform helps guide and track each interview. PIs and

volunteers conducted interviews in the apartments of the respondents. Respondents were offered

$10 to participate and were allowed to collect compensation upon finishing the hour-long

process.

Human subjects were used in the original study, thus IRB approval was necessary. Primary Investigators (PI), Drs. Erin Ruel and Deirdre Oakley, submitted the application for this study to IRBWise™ on December 8, 2009. It was approved on January 20, 2010. The Georgia State University Institutional Review Board (IRB) approved the study on April 10, 2008.

3.1b Primary Study, Data Collection Procedures

Wave 1, interviews conducted before the relocation, was conducted in the summer of 2008. A sample of 385 public housing residents were asked a series of questions related to their experiences of living in the unit. Questions focused on a variety of health conditions as well as measuring the tenant's experience of living in the housing unit. The survey item, "When I'm in my neighborhood I feel I'm in a place I'd miss if I had to leave" were used to measure feelings of community and safety. Items such as, "If yes, during the last 12 months did you visit the emergency room or urgent care center because of your sinus infection" and, "During the past 12 months, how much did you limit your usual activities due to wheezing or whistling in your chest" are examples of questions asked to determine health status. Health questions and the corresponding response options included the interview were used in the national Behavioral Risk Factor Surveillance Study questionnaire (BRFSS) (Centers for Disease Control and Prevention, 2008). The survey consisted of approximately 200 questions, all related to health status and living experiences in a public housing unit. The total number of questions answered by each individual was contingent upon each individual's answers.

Wave 2 interviews were conducted from November 2009 to August 2010. The same survey format was followed. Of the original people who participated in the first wave, 311 were tracked down and completed the second wave; giving a retention rate of 81%. Three people had lied to interviewers and were consequently dropped for the second wave. Another 71 people

from the Cosby-Spears complex did not relocate. Grant funds secured from the National Science Foundation (NSF) helped fund this part of the study.

3.1c Study Population

The population for this study consisted of tenants from public housing units located in Atlanta, GA before and after their impending relocation. The public housing units selected were located directly west of downtown Atlanta. There were four standard-aged public housing units selected: Bowen Homes, Hollywood Courts, Bankhead Court, and Herndon Homes. The other three housing units were designated specifically for seniors: Palmer House, Roosevelt Homes, and Cosby Spears. All six were scheduled to be demolished with the exception of Cosby Spears, which was used as a comparison group. Figure 2 shows the housing units chosen as well as their respective locations related to downtown Atlanta.

Figure 2. Map of Sample Public Housing Units
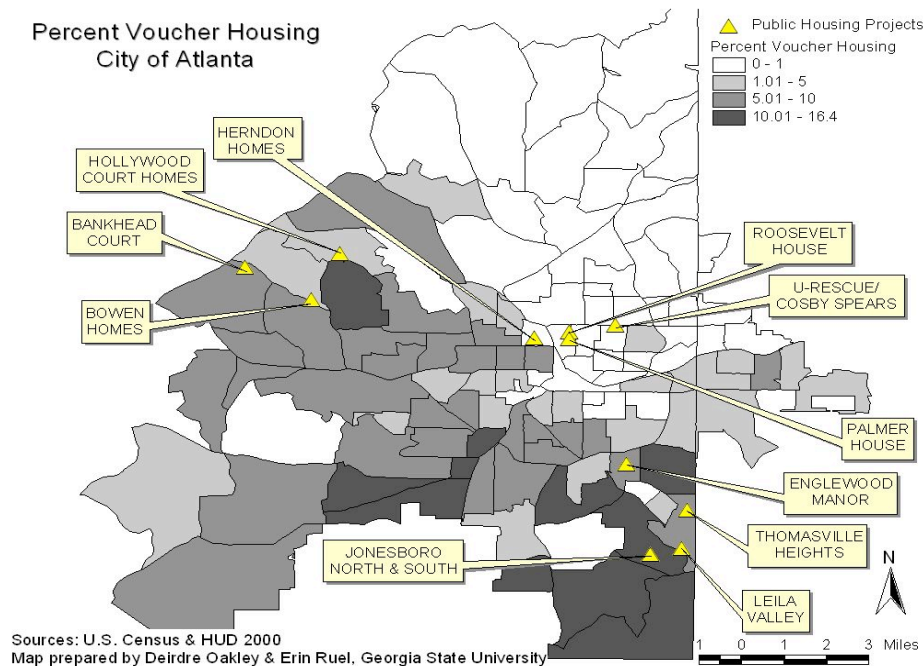
3.2 Study Measures

Responses from Wave 2 constitute the study questions, and their variables for the current study. The secondary data that comprises the measures in this study were all derived from the primary study described above. The question, "Have you been told by a doctor, nurse, or other health professional that you have asthma in the last 12 months" was used as the dependent variable? A total of 309 (81%) respondents answered this question. This question was used in the original study as it is commonly used to establish a condition of asthma and thus, was used in this study to establish continuity between the two (Ruel et al., 2010). Each question asked fits into one of the levels of the SEM: individual, interpersonal, organizational, and public policy. Community is included nominally in the categories, due to the nature of some of the questions. That is, some of the variables straddle levels of the SEM. Two to three questions from the survey were included within four of the five specific domains and represent the independent variables in this study. The placement within SEM levels is for reporting purposes and should not be seen as an attempt to establish any predictive values or relationships between the levels. Answers to all questions served as categorical variables; some were ordinal, dichotomous, as well as nominal. The variables are found under the subheading related to their SEM levels as they were in the previous chapter. Appendix A contains a list the questions in their original form along with their counterparts used in this study.

INDIVIDUAL (SES & Rx Usage)

Socioeconomic status (SES) is a construct used primarily to measure an individual's status within a particular economic setting. It is often measured as a combination of income, education, and employee status or occupation (American Psychological Association, 2013). SES is often used to measure an individual's relationship to the surrounding power and control

structures. Three questions specifically related to income were chosen to represent SES, based on the above definitions. WIC and food stamp usage are used as income level indicators due to their prerequisite "low-income" qualifications. These questions are listed below.

- Is your total monthly income (before taxes)...? (Including Earnings, SSI, Child Support, Public Assistance, and any other sources of money) (Choose one) Less than $250, between $250 and $499, between $500 and $749, between $750 and $999, between $1,000 and $1,249, between $1,250 and $1,499, between $1,500 and $1,999, between $2,000 and $2,499, between $2,500 and $2,999, More than $3,000

- {Are you/Is PERSON NAME} now authorized to receive Food Stamps?

- Did anyone in your family (in your household) participate in the women, infant, and children (WIC) nutrition program

Respondents were asked directly how much they spent on Rx drugs in a typical month and if there were months when they had to go without. These questions were used to assess Rx drug usage in this study. They are listed below:

- About how much do you spend in a typical month on prescription medicine? (after insurance)

- Prescription medication can be expensive. Has there ever been a month when you were not able to afford medicine needed

Responses to the first question were divided into eight categories of $0, $1-$20, $21-$40, $41-$60, $61-$80, $81-$100, $101-$150, and $151 or more. For the purposes of this study, categories were collapsed into five categories with the first four remaining the same and the last three being combined into >$60 or more. The rationale for this was the small number of valid

cases in the last three categories. Chi-square crosstabs require a minimum of 5 valid cases for each cell. The originally labeled missing responses left alone.

Interpersonal (Social Capital (SC))

Social Capital (SC) can be informally defined as the connections between social networks that can bridge separate communities or strengthen bonds between members of a singular community. A common method used to measure social capital is the presence of mutual trust (Kaljee & Chen, 2011). The questions below, based on the above definition, were chosen to represent SC in this study. The answers were 5-point Likert scales, beginning with Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree. Answers Don't know, Refuse to Answer, and Not Applicable were all labeled as "System-missing" in the analysis:

- People around here are willing to help their neighbors

- When I'm in my neighborhood, I feel I'm in a place where I belong

- There is too much crime and violence in this neighborhood

As stated, the original answers were 5-point Likert scales. Responses to these questions for this study, however, were collapsed into a 3-point categorical variable: Disagree, Agree, and Neutral. The rationale for collapsing the variables was the small number of cases in each of the original categories. It is important for this test that there be a sufficient number of cases (Garczynski, n.d.). Chi-square crosstabs require a minimum number of 5 valid cases in each cell in SPSS. The independent and dependent variables were originally ran as 5-point Likerts, but revealed a total of 3 cases (strongly disagree) in which the minimum 5 was not met. The variables were then reduced to the above-mentioned categories to accommodate for this.

Organizational (Housing Quality (HQ))

Indicators for HQ were chosen due to their presence in the original study. The housing questions from the original study were derived from conditions commonly associated with chronic conditions (Krieger & Higgins, 2002). These questions are listed below:

- Are there pests, such as cockroaches, in current home

- [Do you have . .] A leaky roof or ceiling

- Are there mice or rats in or around your apartment

Overall HQ was originally assessed with a 4-point categorical scale: Excellent, Good, Fair, and Poor. These four answers were collapsed into three answers, Good, Fair, and Poor due to respondents' distributions. The last two yes/no questions were left the same with, Don't know, Refuse to Answer, and Not Applicable left labeled as "system-missing."

Public Policy (ACCESS TO HEALTHCARE (HQ))

Access to healthcare can be defined in a few different ways. Lack of public transportation may serve as a physical – built environment – barrier, whereas lack of insurance is a financial barrier. Both of these play a part. A mother may be able to bring her child, but may not be able to afford prescription medicines. Both of these are measurements of access (Millman, 1993). The questions related to access are listed below:

- How long does it take you to get to the nearest bus or MARTA station

- How long does it take to get to your doctor or the place where you most often get health care

- Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs or government plans

The answers to the first two questions were collapsed from the original five categories into two. Respondents originally chose between <15, 16-30, 31-45, and 46-60 minutes as well as

>1 hour. These answers were collapsed into <15 and >15 minutes for the purposes of this study. These categories were chosen due to the fact that frequencies revealed most answers fell into the <15-minute category with an equal distribution across the remaining four. That is, variable were collapsed to give each cell the recommended 5 valid cases. As with the others, Don't know, Refuse to Answer, and Not Applicable were considered missing in the analysis.

3.3 Statistical Analysis

The demographic frequencies were based on the sample population of 311 who completed the second wave of interviews. PI's stated that, because items such as gender and race rarely change, these questions were not asked a second time. Consequently, these numbers are based on the percentages from the first wave in relation to the number of people participating in the second wave.

The Statistical Package for the Social Sciences (SPSS) was used to run Chi-square Crosstabs. The Chi-square test, or Pearson's Chi square test, is often used to test for associations between two categorical variables. The test is used to determine if associations between variables are significantly related or merely the result of chance. In order to run successful Chi-square tests, the data used must meet two requirements: 1) Both variables must be measured as ordinal or nominal: 2) Both variables should consist of two or more categorical, and independent groups. The data used in this study meets both of these assumptions. A probability level (p-value) of <.05 was used to determine significance of associations (The Chi-Square Statistic, n.d.).

The sampled population (n=311) is the total number of respondents participating in Wave 2. Of the 311, 309 answered the asthma diagnosis question. Varying numbers of participants that answered this question, also answered the questions serving as the independent variables. This led to different N's for each question. All questions had an N of >300, with the exception of "use

of food stamps", which only had 234. This was not considered problematic in that all sample

sizes were of sufficient size, and once the variables were collapsed, frequencies met the required

5 per cell.

CHAPTER IV
RESULTS

This section presents the study results in light of the research questions. A total of 310 agreed to participate in the 2nd wave of data collection. Their answers to the research questions presented above are delineated in this chapter.

4.1 Sample Demographics

The demographic characteristics of the respondents who returned are presented in Table 4.1. Ninety-four percent (n=291) of the sample in both waves of data self-identified as Black or African-American. Three percent (n=9) of the respondents self-identified as White. American Indian or Alaskan Native, Hispanic, and Multiracial all represented 1% (n=3) of the sample, respectively. Females were heavily represented in the sample, 73% (n=226), where as males represented only 27% (n=84) of the sampled population. Nearly half (46%) of the sample reported never being married, whereas 5% (n=16) reported currently being married. Eighty-three percent (n=257) of respondents report having at least one child under 18 living in the household, with 16% (n=50) having at least three. The sample is divided almost evenly, with 47% (n=146) reporting having neither a high-school diploma or GED and 52% (n=161) reporting having one or the other.

Table 4.1 Demographic Profile of Study Sample

Variable	N(311)	%
Race		
Black or African American	291	94%
White	9	3%
American Indian or Alaskan Native	3	1%
Hispanic	3	1%
Multiracial	3	1%
Gender		
Female	226	73%
Male	84	27%
Marital Status		
Never Married	143	46%
Divorced	53	17%
Widowed	47	15%
Separated	40	13%
Married	16	5%
Living with someone, but not married	12	4%
How many children under 18 live in household		
0	124	40%
3	50	16%
2	47	15%
1	37	12%
4	22	7%
6, 7, or 8	16	5%
5	12	4%
Have a high school Diploma or GED		
No, Neither	146	47%
High school Diploma	127	41%
GED	34	11%
Both	3	1%

The number of respondents reporting an asthma diagnosis was 13%. This is demonstrated in Table 4.2.

Variable	N(310)	%
Dependent Asthma Variable		
Have you been told by a doctor, nurse or other health professional that you have asthma in the last 12 months?	41	13%

Table 4.2 Percentage of Respondents Reporting Asthma Diagnosis

Results by Research Question

4.2 Asthma Diagnosis and Social Capital (SC)

The three independent variables associated with SC were: 1) Feelings of belonging in their neighborhood: 2) Feelings of being at home: 3) A belief in the presence of too much crime. Forty-one of those responding to these questions reported an asthma diagnosis. Of those 41, 61% (n=25) reported feelings of belonging, whereas only 20% (n=13) reported they did not feel they belonged in their community. That is, twice as many of those reporting an asthma diagnosis also reported feelings of belonging, although these differences were not found to be statistically significant ($\chi2$ (2) = 3.83, p=0.148). Those reporting asthma diagnosis were split at 49% (n=20) each for agreeing and disagreeing there was too much crime in the neighborhood, although these findings were not found to be statistically significant either ($\chi2$ (2) = 5.90, p=0.052). Table 3 displays the complete results. No statistically significant differences were found.

Table 4.3 Asthma Diagnosis & Social Capital (SC)

Variable	No Asthma N (%)	Asthma N (%)	p-value
Feelings of Belonging (N=307)			P=0.148
Agree	200 (75)	25 (61)	
Disagree	51 (19)	13 (20)	
Neutral	15 (6)	3 (7)	
Too much crime (N=307)			P=0.052
Agree	81 (31)	20 (49)	
Disagree	159 (61)	20 (49)	
Neutral	22 (8)	1 (2)	
Helpful neighbors (N=303)			P=0.262
Agree	176 (67)	24 (59)	
Disagree	48 (18)	12 29%	
Neutral	38 (15)	5 12%	

4.3 Asthma Diagnosis and Housing Quality (HQ)

Chi-square Crosstab analyses were ran to investigate associations between the dependent variable of an asthma diagnosis within the last 12 months and three independent variables associated with the HQ. The three independent variables were: 1) Presence of cockroaches: 2) Presence of Leaky Roof or Ceiling: 3) Presence of Mice or Rats in Home. Of those not reporting an asthma diagnosis, 96% (n=256) also reported no presence of mice or rats. These findings were significantly significant ($\chi2$ (2) = 7.50, p=0.006). Similarly, those reporting absence of leaky roofs or ceilings also demonstrated low asthma prevalence rates, with 96% (n=255) reporting no diagnosis. These findings were also statistically significant ($\chi2$ (1) = 6.64, p=0.010). Table 4 shows complete results for those reporting an asthma diagnosis. No other findings were found to be statistically significant.

Table 4.4 Asthma Diagnosis and Housing Quality (HQ)

Variable	No Asthma N (%)	Asthma N(%)	p-value
Presence of mice or rats (N=308)			P=0.006
Yes	11 (4)	6 (15)	
No	256 (96)	35 (85)	
Presence of Pests (N=309)			P=0.055
Yes	72 (27)	17 (42)	
No	196 (73)	24 (59)	
Leaks (N=308)			P=0.010
Yes	12 (5)	6 (15)	
No	255 (96)	35 (85)	

4.4 Asthma Diagnosis and Socioeconomic Status (SES)

Three separate indicators of SES were used as independent variables to determine associations with the dependent variable. Level of income per month, use of Women, Infants, and Children (WIC) nutrition program, as well as use of food stamps were all compared to asthma diagnosis using chi-square crosstabs. Of the 268 respondents who answered the question concerning income level, 15% (n=41) reported an asthma diagnosis. Most respondents chose a category of income, but 32 respondents chose Don't know, Refuse to Answer, or 99. Nearly half (47%) of those reporting an asthma diagnosis reported earning between $5-$749 a month. This is interesting considering the median income was $850/month for this population. These findings were not found to be statistically significant ($\chi2$ (1) = .525, p=0.630). Three times as many of those reporting an asthma diagnosis (n=31, n=9) reported also not using WIC, although these findings were not found to be statistically significant ($\chi2$ (1) = 2.23, p=0.135). Table 5 delineates these results. No other results were found to be statistically.

Table 4.5 Asthma Diagnosis and Socioeconomic Standing (SES)

Variable	No Asthma N (%)	Asthma N (%)	p-value
Participation in WIC (N=306)			P=0.135
Yes	36 (14)	9 (23)	
No	230 (87)	31 (78)	
Use of Food stamps (N=234)			P=0.681
Yes	54 (27)	10 (30)	
No	147 (73)	23 (70)	
Monthly Income Level (N=268)			P=0.630
<$250	14 (5)	5 (12)	
$250-$499	28 (10)	2 (5)	
$500-$749	96 (36)	19 (46)	
$750-$999	47 (18)	5 (12)	
$1000-$1249	21 (8)	5 (12)	
$1250-$1499	12 (5)	1 (2)	
$1500-$1999	6 (2)	0 (0)	
$2000-$2499	6 (2)	1 (<1)	
$2500-$2999	3 (1)	0 (0)	
>$3000	2 (<1)	0 (0)	

4.5 Asthma Diagnosis and Use of Prescription Drugs (Rx)

Chi-square crosstabs were ran to investigate associations between the dependent variable of asthma diagnosis within the last 12 months and two independent variables associated with the overall use of prescription drugs. The two independent variables were: 1) Amount spent on Rx drugs per month: 2) Going without Rx medications from month to month. A curious finding was that 67% (n=26) of those reporting an asthma diagnosis reported *not* going without medication. This is an interesting result and did prove to be statistically significant ($\chi^2 (1) = 5.59$, p=0.017). Close to half (48%) of those reporting an asthma diagnosis classified their monthly spending on Rx drugs as between $1-$20.00. It is important to note here that, while some of the categories for

this answer were collapsed into one variable, this one was not. This indicates that approximately

50% of those with asthma reported spending between $1-$20.00 on Rx drugs, even though this

result did not prove to be statistically significant ($\chi2$ (4) = 1.04, p=0.904). Table 6 includes the

full results.

Table 4.6 Asthma Diagnosis and Rx Usage (Rx)

Variable	No Asthma N (%)	Asthma N (%)	p-value
Went Without Medication (N=290)			P=.017
Yes	43 (17)	13 (33)	
No	208 (83)	26 (67)	
Monthly Rx Bill (after insurance) (N=300)			P=.904
$0	96 (37)	12 (30)	
$1-$20	112 (43)	19 (48)	
$21-$40	25 (10)	4 (10)	
$41-$60	13 (5)	3 (8)	
>$60	14 (5)	2 (5)	

4.6 Asthma Diagnosis and Access to Healthcare

Three questions were used to determine associations between asthma diagnosis and the

independent variables associated with access to healthcare. Respondents were asked to

categorize the length of time it took to travel to the nearest public transportation system

(MARTA) as well as their doctor or usual place of care. Additionally, respondents stated whether

they were currently covered under any type of health insurance (private insurance, prepaid plans

(such as HMO), etc.). The largest disparity existed between those reporting having insurance and

those not. That is, 83% (n=34) of those reporting an asthma diagnosis also reported having

insurance, whereas only 17% (n=7) reported having none. These findings, however, were not

found to be statistically significant ($\chi2$ (1) = .005, p=0.942). Twenty-eight of the 39 (72%)

reporting an asthma diagnosis reported living within less than 15 minutes of a public

transportation depot. Conversely, 85% (n=35) of those with asthma reported living over 15

minutes away from their usual place of care, although neither of these findings were found to be

statistically significant ($\chi2$ (2) = 2.20, p=0.138). Table 7 shows the complete results. No

statistically significant associations were found.

Table 4.7 Asthma Diagnosis and Access to Healthcare (ATH)

Variable	No Asthma N (%)	Asthma N (%)	p-value
Has Health Insurance (N=309)			P=0.942
Yes	221 (83)	34 (83)	
No	47 (18)	7 (17)	
Distance to Marta (N=293)			P=0.138)
<15 Minutes	208 (82)	28 (72)	
>15 Minutes	46 (18)	11 (28)	
Distance to Doctor (N=301)			P=0.623
<15 Minutes	31 (12)	6 (14)	
>15 Minutes	229 (88)	35 (85)	

CHAPTER V
DISCUSSION AND CONCLUSIONS

5.1 Discussion of Research Questions

There was a 13% asthma prevalence rate among those reporting in the second wave of interviews. This percentage is almost 60% higher than the national average of 8.2% (Akinbami, Moorman, & Liu, 2011). This is not surprising considering that previous research has shown those living in public housing units suffer higher rates of asthma prevalence as well has higher morbidity in general. Many studies have examined ways in which lifestyle, as well as policy changes, might mitigate the effect of asthma. Statewide smoking bans, for instance, have been shown to reduce the incidence rates of cardiac and pulmonary events ("State smoke-free laws for worksites, restaurants, and bars--United States, 2000-2010," 2011). Another study that focused on the behaviors of asthmatics demonstrated positive gains in inhaler use by simplifying the dosage requirements (Rau, 2005). Risk factors for asthma exist throughout the socioecological model. These factors begin with the individual's behavior (individual) and continue throughout the daily life of the asthmatic all the way to the factors related to local, state, and national laws (public policy).

The main objective of this study was to examine associations between those reporting an asthma diagnosis and those not reporting a diagnosis. The SEM was as a framework to hopefully make addressing the risk factors easier. The hope was that the associations shown might serve as indicators to future researchers as to which way to direct more specific statistical analysis.

Some variables did not show strong, statistically significant, associations. The questions related to social capital (SC), for instance, revealed no associations. It was interesting, however, that those disagreeing that there was too much crime and violence also reported less asthma diagnosis (n=159, n=20). The statistical analysis ran for this study does not permit an assessment

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of likelihood or odds ratios, but this number does reveal something for researchers aiming to develop an intervention around SC. That is, if stronger associations are shown between the individual component of feelings of safety may be more important than feelings of cohesion.

None of the questions within the Socioeconomic status domain yielded statistically significant associations. The variable *level of income* had 10 total possible answers. *Food stamp usage* showed the least significance, whereas *WIC usage* showed a stronger significance than income level. Even though the findings were not statistically significant, there were interesting trends in the prevalence rates of those not reporting an asthma diagnosis. That is, the majority of those reporting not using WIC (87%) or Food stamps (73%) also reported not having asthma. This is hopeful in that it shows possible ties between a level of self-sustainment and asthma control.

One finding that demonstrated statistically significant associations was *going without prescription medications* ($\chi 2$ (1) = 5.69, p=0.017). This makes sense in that most asthma is controlled through the proper use of an inhaler, which is only given with a prescription (Melani, 2007). If one were not using an inhaler properly, or at all, it is likely the condition would be exacerbated, and thus the individual may end up at the ER and be diagnosed all over again. This particular statistical test does not reveal the nature of the relationship, but according to the research, the more one uses her inhaler, the less likely she is to experience an attack. This is particularly important within this population in that if public housing does provide a protective effect – as the original study suggested – but asthma rates are still consistently high, then showing where the stronger associations exist is the first step towards mitigating the disease burden. The percentage of those reporting an asthma diagnosis and spending less than $20 on prescription drugs (78%, n=31) is also curious. This association could be indicative of the cost-

prohibitive nature of asthma control medications. That is, those who are unable to spend the money to buy maintenance drugs may be the ones using the ER and constantly being re-diagnosed. This is because, as research shows, increased costs of medication results in less Rx adherence and higher asthma hospitalization rates (Karaca-Mandic, Anupam, & Fong, 2012).

The *access to care* domain yielded some, if not statistically significant, interesting results. Eighty-three percent (n=34) of those reporting an asthma diagnosis, for instance, also reported having some type of health insurance or coverage. This is intuitive in that those who have the ability to go to the doctor, are more likely to go and consequently be correctly diagnosed. However, it is also curious in that the question asked is, have you been diagnosed within the last twelve months? It would seem those with proper insurance would have been diagnosed before the 12 month duration. It would take a more fine-tuned statistical analysis to tease this out. The questions related to distance from public transportation and usual place of care also revealed some interesting results. That is, the majority (82%, n=208) of those who reported living within less than 15 minutes of a Marta station also reported not having asthma. Conversely, the majority (88%, n=229) of those who reported living further than 15 minutes from their usual place of care, reported not having asthma. This is a curious finding but not as first may seem. That is, those living within a 15-minute radius may more likely to visit their doctor, no matter how far.

HQ yielded statistically significant results for two of the three variables. That is, significant relationships were shown between *presence of leaky ceilings or roofs* ($\chi2$ (1) = 6.64, p=0.010) and *presence of mice and rats* ($\chi2$ (2) = 7.50, p=0.006). These findings are important in that they support research showing the connections between living conditions and asthma. That is, the majority of those reporting an absence of the poor living condition also reported no

asthma diagnosis. These strong findings illuminate the need for safer living conditions for asthmatics as well as healthy and unhealthy people alike. Research has shown, however, that dampness is a contributing factor to respiratory health to such a degree that more work is being done to develop more accurate tools for measuring the effect of housing quality on health (Keall et al., 2012). Other studies have demonstrated associations between mice allergens and asthma prevalence (Olmedo et al., 2011). These studies indicate the potential for an etiological relationship between the variables studied and asthma prevalence in this sampled population.

Previous research shows that there are positive associations throughout the SEM and asthma. Although the hope was to find significant associations throughout the SEM and variables chosen for this study, their absence in no way contradicts this previous research. Rather, because this study is an analysis of a particular population shown to have a higher than average asthma prevalence (13%), it is important to begin parsing out the individual factors. Researchers often use scales, such as social cohesion and environmental effect, to collapse a number of variables in order to simplify matters as well as gain an understanding of the overall effect of the individual components. Questions such as these, and their results, however, may help the researcher develop more finely honed interventions.

5.2 Limitations of Study

The data used in this study was not weighted and should not be representative of the larger sample. This is a limitation. Another one of the limitations of this study was the use of chi-square statistical tests. The use of a logistical regression test may have illuminated not only the associations, but how, and to what degree, they were related. Another limitation was multiple options for a dependent variable. Other options included questions related to going to ER for an asthma attack and being admitted for one. Using these variables as the dependent variable may

have helped show more closely the immediate effects of certain risk factors. In addition, self-report bias is present when asking any individual about their health status. Individuals may remember being diagnosed with asthma, or be conscious of the disease and self-diagnose.

Another limitation was the questions related to housing quality. These questions were self-reported and thus give an idea of how the tenant views his/her living condition but not the actual objective assessment; such as mold tests and filter checks would. This would need to be addressed if one were conducting a true, comprehensive, level analysis related to living conditions.

Finally, this particular population had recently been displaced. Many of the analyses involving distances to places and neighborhood feelings may have consequently been affected. This is not as detrimental as it could be in that the ultimate aim of this study was to examine the particular associations between asthma and its risk factors within this population. The goal had nothing to do with the effect being displaced might have. Plus, presumably, the residents were not moved into circumstances far removed from the public housing units.

5.3 Recommendations

This study demonstrates a need for further investigation into risk factors throughout the socioecological model and how they may, or may not, interact and compound one another. A future study could examine the most salient risk factors from this study and then attempt to examine the correlations of each individual factor as well as their compounding effects. That is, if housing quality is shown to be associated with the prevalence of asthma diagnoses, to what degree, and how, is it related to other factors shown to be associated with asthma prevalence. There is a dearth in the literature regarding this topic, and this could be the first step to examining this issue.

Additionally, the knowledge gained from this study may provide directions for more qualitatively based research. In the age of funding reductions, it is often deemed most important to come up with quantitative results that show definable associations. Publication bias shows us that those producing positive results are the most heavily rewarded. Yet, such focus may skirt over the more nuanced factors that affect health behaviors and outcomes. This study supports previous research that has shown housing quality can have a pernicious effect on an asthmatic's condition. Future research and interventions could focus on reasons why people may not change their air filters, work at keeping a cleaner house, or ban together to force landlords to fix leaks. We know that these factors affect health outcomes, interventions needs to begin focusing on informing people.

5.4 Conclusion

This study is important because it demonstrates significant associations between risk factors throughout domains within the socioecological model and asthma. Asthmatics face a plethora of challenges to their health in all levels of their community. This demonstrates a need for not only behavioral interventions related to factors under his control, but those that affect factors outside his control; such as the quality of housing and crime and feelings of safety. Basic studies such as these can serve as initial community assessments when it comes to developing interventions.

In addition, the findings of this study have implications for the researcher hoping to glean further understanding of asthma and its associated risk factors. The five domains related to levels in the socioecological model were created in order to understand the ubiquitous nature of risk factors related to asthma. The presence of factors throughout the model demonstrate a need for

research to clarify the levels of interests so that readers using it, may develop a sense of steps needed to take to reduce burden.

The original study from which this study's data was derived addressed the issue of relocating public housing residents with the aim of improving their health. This study, and others similar to it, has shown that relocating citizens may not only reduce health outcomes, it may also reduce positive health outcomes. This is an important finding in that relocations are costly in both human resource and fiscal terms. If positive gains cannot be shown, it is important to find alternative methods for reducing the health burdens of certain populations.

This study could be a first step in developing theories addressing contradictions related to how populations in public housing settings can be both susceptible to some risk factors, while gaining protection from others. Access to care, for instance, is a good example. Several factors may be often compiled into one determinant labeled, "access to care." This method, however, may elide the effect of the individual determinants included within the one label. Separating them, and considering them independently, may aid in parsing out the individual effects of determinants.

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Appendices

Appendix A

Interview Questions Current Study Variables

Original Survey Question	Original Answer	Study Variable	Collapsed Answers
Dependent Variable			
Have you been told by a doctor, nurse, or other health professional that you have asthma within the last 12 months?	1) Yes 2) No	Asthma	1) Yes 2) No
Independent Variables			
SEM LEVEL: INDIVIDUAL			
Are you/Is [PERSON NAME] now authorized to receive Food Stamps?	1) Yes 2) No	Use of Food Stamps	1) Yes 2) No
Did anyone in your family (in your household) participate in the women, infant, and children (WIC) nutrition program?	1) Yes 2) No	Participation in WIC	1) Yes 2) No
Is your monthly earnings (meaning a paycheck and before taxes)...? (Choose one)	Less than $250, between $250 and $499, between $500 and $749, between $750 and $999, between $1,000 and $1,249, between $1,250 and $1,499, between $1,500 and $1,999, between $2,000 and $2,499, between $2,500 and $2,999, More than $3,000	Monthly Income Level	1) Yes 2) No
About how much per month do you spend on Prescription Drug Medications? (Choose one)	Less than $250, between $250 and $499, between $500 and $749, between $750 and $999, between $1,000 and $1,249, between $1,250 and $1,499, between $1,500 and $1,999, between $2,000 and $2,499, between $2,500 and $2,999, More than $3,000	Monthly Rx Bill (after insurance)	$0, $1-$20, $21-$40, $41-$60, >$60
Has there been a month when you've gone without Prescription Drugs?	1) Yes 2) No	Went Without Medication	1) Yes 2) No
SEM LEVEL: INTERPERSONAL			
When I'm in my neighborhood, I feel I'm in a place that is my home. (Choose one)	1) Strongly Disagree 2) Disagree 3) No Opinion 4) Agree 5) Strongly Agree	Feelings of Belonging	1) Disagree 2) Neutral 3) Agree
There is too much crime and violence in this neighborhood. (Choose one)	1) Strongly Disagree 2) Disagree 3) No Opinion 4) Agree 5) Strongly Agree	Too Much Crime	1) Disagree 2) Neutral 3) Agree
People around here are willing to help neighbors. (Choose one)	1) Strongly Disagree 2) Disagree 3) No Opinion 4) Agree 5) Strongly Agree	Helpful Neighbors	1) Disagree 2) Neutral 3) Agree
SEM LEVEL: ORGANIZATIONAL			
A leaky roof or ceiling?	1) Yes 2) No	Leaks	1) Yes 2) No
Are there mice or rats in or around your apartment or home?	1) Yes 2) No	Presence of Mice or Rats	1) Yes 2) No
Are there pests, such as cockroaches, in or around your apartment or home?	1) Yes 2) No	Presence of Pests	1) Yes 2) No
SEM LEVEL: PUBLIC POLICY			
How long does it take you to get to the nearest bus or MARTA station? (Choose one)	Less than 15 Minutes, 15-30 Minutes, 31-45 Minutes, 46 Minutes to an Hour, More than an Hour	Distance to Marta	1) <15 Minutes 2) > 15 Minutes
How long does it take to get to your doctor or the place where you most often get health care?	Less than 15 Minutes, 15-30 Minutes, 31-45 Minutes, 46 Minutes to an Hour, More than an Hour	Distance to Doctor	1) <15 Minutes 2) > 15 Minutes
Do you have any kind of insurance?	1) Yes 2) No	Has Health Insurance	1) Yes 2) No