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Risk and Preventive Factors of Asthma in Children in Texas

yvonne A. Deen
Walden University

Walden University

College of Health Sciences and Public Policy

This is to certify that the doctoral study by

Yvonne Ayodele Deen

has been found to be complete and satisfactory in all respects,
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Review Committee
Dr. Tolulope Osoba, Committee Chairperson, Public Health Faculty
Dr. Twanda Wadlington, Committee Member, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2024

Abstract

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by

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MPH, Walden University, 2010

BS, Njala University, 1993

Capstone Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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February 2024

Abstract

The purpose of this quantitative historical non-experimental correlational study was to investigate the intricate relationships between predictors of single parenting, low family income, and their impact on the prevalence of asthma among children in Texas. Additionally, the study explores whether common preventive measures for asthma, such as the use of air cleaners and adherence to action plans provided by healthcare providers, predict health-related quality of life (QOL) in affected children. The research is guided by the social ecological model. Secondary data from the Behavioral Risk Factor Surveillance System (BRFSS) dataset, encompassing Texas pediatric asthma data from 2006 to 2010 was used. Binary Logistic regression results indicated significant relationships between single parenting, low family income, and the prevalence of asthma among Texas children, even after controlling for other sociodemographic factors. Results of hierarchical linear regression revealed no significant relationship between the implementation of asthma prevention measures (specifically, the use of air cleaners and adherence to action plans from healthcare providers) and asthma-related QOL after controlling for sociodemographic factors. This finding suggests that the sociodemographic factors considered in the study may exert a more substantial impact on asthma-related QOL than previously acknowledged. Implications for positive social change include targeting early diagnosis and treatment interventions for pediatric asthma, improving both children's health outcome and decreasing the financial and QOL burden of the disease.

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Dedication

This research is dedicated to my deceased parents. My dad Jamaican born, Conrad Anton Inniss (1926- 1993), and mom Matilda Nwanke Inniss an Aku Christian Krio (1933 -2021) who imbedded the values of fear of God, promotion of social justice and fight for equality in me. They both inspired me to persevere and complete this doctoral degree.

This research is also dedicated to my family especially my sons Kwame Baldwin, Frank Bernard, grandson Amare Baldwin, adopted son Alton During, niece Yvonne Inniss-Taylor, daughter-in-law Roxie, my only surviving sibling: my baby sister Ethelda Williams, and Francis Baldwin 11 my husband, for their continuous unconditional love emotional support, motivation, and encouragement. The warmth of your encouragement has lasted for years.

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Section 1: Foundation of the Study and Literature Review

In the United States, almost 8.3 million children under the age of 18 have asthma (Centers for Disease Control and Prevention [CDC], 2017), a condition that is especially concentrated among children living in urban places. In Texas, approximately 479,712 children, or 7% of those in the state, suffer from asthma (Texas Department of State Health Services, 2021). Children from low-income minority populations and those living in inner cities experience disproportionately higher morbidity and mortality due to asthma than the general population. Per the CDC (2022), asthma deaths are uncommon in children, but not unheard of, accounting for about 200 deaths nationwide in the year 2020; however, this only counts direct deaths and not deaths from other conditions that asthma may contribute to in important ways. Key reasons for worsened urban asthma outcomes include increased air pollution from cars and industries, increased inner-city crowding, increased exposure to allergens, poor ventilation within the homes, noncompliance with prescribed medication, and late diagnosis (Seth et al., 2021).

When taking an ecological view of asthma, it is not wholly clear what specific socio-ecological factors predict a heightened risk of asthma in the context of Texas. Several sociodemographic factors could potentially contribute to the predictors of worsened asthma incidence and outcomes discussed above, such as single parenting (which may lead to complex stressors that can cause chronic and toxic stress in parents, that can ultimately affect the development of asthma) and low family income, which can harm mitigation efforts or asthma prevention measures (Salim et al., 2020; Thakur et al., 2014; Tzeng et al. 2018). If these issues could be more conclusively linked to asthma

risk, as opposed to only indirectly linked through other predictors, then it would be possible to use the socio-ecological approach to better target treatment and prevention efforts.

This study examined those links. In Section 1, the background of the study, followed by the development of the foundational study elements of the problem, purpose, and research questions, is discussed. Next, the theoretical framework and research methods are overviewed, before moving into the full literature review. The section concludes with a discussion of assumptions, limitations, delimitations, significance, and a summary.

Background

Asthma, a public health burden, is a significant chronic disease affecting the quality of life and contributes to morbidity and, to a lesser extent, mortality rates among Texas children (Chiquillo, 2018). Asthma is a respiratory disease that results in the sufferer having heightened sensitivity to lung irritants (Crossman-Barnes et al., 2019). When exposed to triggering irritants, those suffering from asthma experience airway constriction and inflammation of the muscles around the small airways of the lungs, which in turn causes asthma symptoms. The lungs of people with asthma react to irritants or triggers, leading to an asthma attack. Triggers, which include viral infection, dust, smoke, fumes, changes in weather, grass, pollen, strong soaps, and perfumes, vary from person to person (WHO, 2021). The most common and most easily identifiable symptoms of asthma are attacks of coughing and difficulty breathing (Bauer et al., 2019).

Both of these symptoms can be not only deeply uncomfortable but, if not treated promptly with an inhaler, dangerous or even potentially deadly (Coban & Ediger, 2018).

Every year in the U.S., about 3 million children under the age of 15 years make asthma-related visits to the doctor, and out of 2 million emergency room visits made, 570,000 were children less than 15 years (AANMA, 2019). There are high morbidity and high mortality rates among children living in inner cities like Dallas, Texas (Chiquillo, 2018). Worsened urban outcomes are troubling given the especially high concentrations of people in these areas, and the relationship between urban environs and asthma incidence and severity is one of the more pressing reasons why better asthma interventions are needed to ease the burden of disease in these areas. As inner cities are more likely to be inhabited by minority families (Coleman et al., 2019), this circumstance also adds a considerable racial dimension to the burden of asthma.

Child asthma is an urgent health problem in Dallas, Texas. In Texas, about 7% of children suffer from or have previously suffered from asthma (Texas Department of State Health Services, 2021). The disease is one of the top five reasons for emergency visits and hospitalization in Dallas County, Texas (Chiquillo, 2018). More boys than girls, and more African American children than White or Hispanic children suffer from asthma in Texas (Texas Department of State Health Services, 2021). Black children suffer from an especially high prevalence 10% relative to 9% in White children and 5% in Hispanic children (Texas Department of State Health Services, 2021). Moreover, Black children experience more serious asthma, with 26-28 asthma-related hospitalizations per 10,000

children, as compared to roughly 8-9 among White and Hispanic children (Texas Department of State Health Services, 2021).

In terms of who suffers from asthma, there are both genetic and environmental risk factors to consider (National Heart, Lung, and Blood Institute [NHLBI], 2020). In addition, cultural beliefs, social norms, and mores influence asthma home management. Most asthma-related deaths are among low and lower-middle income communities due to under-diagnosis and under-treatment (WHO, 2021). There is no cure for asthma, but people with proper management will have less frequent symptoms and live a healthy life (NHLBI, 2018). Proper management of asthma also decreases the associated healthcare and quality-of-life costs for both individuals and governmental actors (Gangemi et al., 2020). Health-related quality of life refers to, in general, the extent to which an illness impairs a person's ability to function in everyday life (Duriancik et al., 2019; George-Lucas & Brandon, 2021). Health-related quality of life is therefore a key indicator of how well asthma is being managed and essentially represents the degree to which asthma intrudes on everyday life (through frequency and severity of attacks).

Research has shown that comprehensive and community-based asthma management programs are expensive, and cost-effective interventions are needed (Serebrisky & Wiznia, 2019). Studies suggest that children with asthma utilize higher healthcare resources that are expensive than children without asthma (Perry et al., 2019). Certain factors may affect asthma incidence or severity. For example, single parenting may influence asthma through chronic familial stress (Barthouse & Jones, 2019). In addition, chronic maternal stress may lead to children being born with lung conditions

that heighten the risk of asthma (Jackson et al., 2019). As is self-evident by their nature, asthma prevention measures and the lack of them, such as air cleaners and specific action plans by health care providers when asthmatic crisis, may also potentially affect the incidence of the condition (Mayo Clinic, nd). Family income may also affect asthma in that low-income families are more likely to be exposed to worsened air quality (Baptist et al., 2019), and in general, have fewer resources for care and treatment (Eum et al., 2019). Further research is also needed to better understand the risk and protective factors surrounding pediatric asthma (Ferrante & La Grutta, 2018). These issues, taken together, suggest a research gap regarding pediatric asthma in Texas. In particular, accurate data are needed to target community- and context-specific interventions to reduce the harms of asthma.

Problem Statement

The problem was that it was not known what relationship, if any, existed between the predictors of single parenting, low family income, and the outcome of asthma prevalence among children in Texas, as well as whether common asthma preventive measures adopted by the families (use of air cleaner and an action plan given by health care providers), predicted health-related quality of life. Dallas County is the ninth-largest county in the United States, and the second-most populous county in Texas with over 2.3 million people residing within it (United States Census Bureau [USCB], 2018: Suburban Stats, 2019). In 2019, the significant metropolitan city population was 1,197,816, with 2,368,139 residents in the county (Suburban Stats, 2019). However, the county was also a poor county, with 21.8% of residents living below the poverty level and an

unemployment rate of 8.9% (USCB, 2018). The county was also the most ethnically diversified region in Texas with 47% minorities (Suburban Stats, 2019; USCB, 2018). In addition to 70,000 residents who speak Russian, this county's ethnicities were quite diverse (World Population Review, 2019). In 2018, the number of children (e.g., 14 or younger) in the county was 280,459 (USCB, 2018).

Asthma is the most chronic disorder among children in Dallas, Texas (Chiquillo, 2018; Zu et al., 2017). Further, research shows that both obesity and tobacco use in the county create public health concerns, contributing to the high asthma exacerbation rate in both adults and children (Newcomb & Cry, 2012; Liu et al., 2016). According to reports, over 14% of the population in Dallas County lives under the poverty line, with an unemployment rate of 8.9% (United States Census Bureau, 2010). Almost 30% of the residents are without health insurance, contributing to the leading causes of death in Dallas, which include cardiovascular disease, asthma, chronic obstructive disease, obesity, and diabetes (CDC, 2018). This study focused on childhood asthma to determine the association, if any, between demographic factors (i.e., education, income, location/place of residence, and age) and asthma prevalence in Texas.

Individuals of all ages are affected by asthma. It is one of the most prevalent and chronic diseases that affect children in urban areas (Liu et al., 2016). North Texas families have seen a high number of asthmatic children. The major reasons associated with the issue are poor air quality, rapid development, and the presence of natural aeroallergens (Liu et al., 2016). Some of the children miss school for emergency department visits, and this is largely due to poor asthma management at home (Clayton,

et al., 2012). Lower parent health literacy has been found to have an association with more health care utilization by asthmatic children (Clayton et al., 2012). Per a systematic review by Tzeng et al. (2018), poor parental health literacy regarding asthma is a widespread problem associated with significantly worsening asthma control in their children.

Due to the limited health literacy in parents of children with asthma (Salim et al., 2020), there is a need to examine the association between demographic factors, single parenting, low family income, and health-related quality of life in children with asthma. Various patient factors have been identified in the literature that affect asthma control. The main factor is poor knowledge of the patient regarding the health conditions (Mackey, et al., 2016), which can lead to the inadequate use of preventive measures, frequent emergency department visits, hospitalization, and poorer outcomes as the children grow into adulthood (Akinbami, et al., 2009). This is also attributed to poor self-management skills (Akinbami et al., 2009). The use of multiple sources of asthma education is a habit that has been reported by parents with high health literacy levels and has translated to healthier children (Fagnano, et al., 2012). Other factors include socio-demographic factors, behavior, attitudes, and beliefs of individuals, low socioeconomic status, and inadequate communication between the patients and care providers, which may influence adherence to medication (Thakur et al., 2014). Although significant advances in the identification, knowledge, and management of asthma have been made, barriers exist in the management and control of childhood asthma (Szefler et al., 2014).

Purpose of the Study

The purpose of this quantitative, historical, and non-experimental correlational study was to examine what relationship, if any, existed between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predicted health-related quality of life. The data included both the general BRFSS surveys for 2006-2010 and Asthma Call-Back Survey for 2006-2010. The results of the study may contribute to positive social change by identifying key sociodemographic contexts that contribute to an elevated risk of pediatric asthma, and how these contexts interlock.

Research Questions and Hypotheses

The research questions from this study were the following:

RQ1: What relationship, if any, exists between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas while controlling for other sociodemographic factors?

$H_0$1: There is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

H_a1: There is a statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

RQ2: Is there a significant association between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors?

$H_0$2: There is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

H_a2: There is a statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Theoretical Framework

The theoretical framework for this study was the social ecological model (SEM). The SEM is a derivative of Bronfenbrenner's (1994) ecological systems theory, a theory that helps to explain the influence of factors within a child's social ecology on his or her development. Although originally applied only in psychology, the theory of ecological systems has found utility in many disciplines, especially public health (Wold & Mittelmark, 2018). SEM is a version of ecological systems theory that is used to

understand how the many intersecting contexts within which individuals exist to produce public health outcomes (Davidson et al., 2018).

Under the SEM, people's behaviors are shaped by factors at the individual, relationship, community, and societal levels. These levels correspond to the microsystem, mesosystem, exosystem, and macrosystem levels in the original theory of ecological systems (Wold & Mittelmark, 2018). Understanding the interactional effects between different individual contexts within this framework offers a better way of grasping how and why outcomes for different members of the same group can widely differ—namely, because each member of the group is defined not solely by that single group context, but rather the way in which their membership in myriad groups interact (Davidson et al., 2018). The SEM is widely used in public health because it has been identified as an ideal tool for identifying and addressing disparities among vulnerable populations (Wold & Mittelmark, 2018). The SEM helps researchers to understand the ways in which different predictors can combine in either helpful or detrimental ways, thus better understanding the causes of complex behavior patterns at the population level (Davidson et al., 2018).

Within the context of the present study, the SEM was used to understand the intersectionality of different contexts, as well as their role in predicting the factors that point to the prevalence of asthma. In addition to offering a lens through which the study could understand these issues, adopting the SEM helped identify the predictors of childhood asthma risk in a way that made them easier for policymakers and public health workers to address. In addition, regarding the second research question, the SEM was valuable for suggesting and analyzing the way that several social ecological factors, such

as availability asthma preventive measures, could contribute directly or indirectly to health-related quality of life. By using the SEM to break down and understand the role of different intersectional risks, the present study could help to raise awareness among individuals, the community, and policymakers. Under the SEM, these different groups of stakeholders could, in turn, work at different levels of the social ecology to help create solutions.

Nature of the Study

The research methodology for the study was quantitative, which is an approach closely aligned with the population-level focus of public health research (Bruce et al., 2018). A quantitative research method allowed the present study to use secondary, population-level data regarding pediatric asthma collected by U.S. public health authorities. Within the quantitative research paradigm, the specific research design was a historical, non-experimental correlational design. Historical research allows the researcher to gain the benefit of already collected data, which aligns well with public health, where representative data were both imperative and difficult to collect directly. A correlational research design was appropriate because it addressed the relationships between variables (Peat et al., 2020).

The study population was derived from children in Texas with asthma, which was the target population of this doctoral study. The predictors or independent variables in this study were single parenting, low family income, and asthma prevention strategies (use of air-cleaner and a given action plan by health care). The outcome or dependent variables were asthma prevalence and asthma-related quality of life (measured by a

composite variable related to asthma symptoms and attacks). The control variables were sociodemographic factors, such as age and gender of the children, family income, race, educational level of parents, and place of residence. The data included both the general BRFSS surveys for 2006-2010 and Asthma Call-Back Survey for 2006-2010. The BRFSS was a nationally representative annual survey that focused on key public health outcomes and related risk factors and behaviors. The BRFSS typically addressed adults, but it also contained an optional module for children.

Texas last completed the optional child module for asthma in the 2006-2010 period based on the available BRFSS data. These data were retrieved from the Centers for Disease Control and Prevention (CDC) website where the BRFSS datasets were hosted. The data were analyzed using a logistic regression method to answer the research questions and test the associated hypotheses. Greater detail on the methodological approach is included in Section 2.

Literature Review

Introduction

The problem was that it was not known what relationship, if any, existed between the factors of single parenting, low family income, and sociodemographic and asthma prevalence in Texas. Dallas County was the ninth-largest county in the United States and the second-most populous county in Texas, with over 2.3 million people (United States Census Bureau [USCB], 2018: Suburban Stats, 2019). In 2019, the significant metropolitan city population was 1,197,816, with 2,368,139 residents in the county (Suburban Stats, 2019). However, the county was also a poor county, with 21.8% of

residents living below the poverty level and an unemployment rate of 8.9% (USCB, 2018). The county was also the most ethnically diversified region in Texas with 47% minorities (Suburban Stats, 2019; USCB, 2018). In addition to 70,000 residents who speak Russian, this county's ethnicities were quite diverse (World Population Review, 2019). In 2018, the number of children (e.g., 14 or younger) in the county was 280,459 (USCB, 2018).

Asthma is the most chronic disorder among children in Dallas, Texas (Chiquillo, 2018; Zu et al., 2017). Further, research shows that both obesity and tobacco use in the county create public health concerns, contributing to the high asthma exacerbation rate in adults and children (Newcomb & Cry, 2012; Liu et al., 2016). According to reports, over 14% of the population in Dallas County lives under the poverty line, with an unemployment rate of 8.9% (United States Census Bureau, 2010). Almost 30% of the residents are without health insurance, contributing to the leading causes of death in Dallas, which include cardiovascular disease, asthma, chronic obstructive disease, obesity, and diabetes (CDC, 2018). This present study focused on childhood asthma to determine what relationship, if any, existed between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as between asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life.

Individuals of all ages are affected by asthma. It is one of the most prevalent and chronic diseases that affect children in urban areas (Liu et al., 2016). North Texas families, where the Dallas-Fort Worth metropolitan area lies, have seen a high number of

asthmatic children. The major reasons associated with the issue are poor air quality, rapid development, and the presence of natural aeroallergens (Liu et al., 2016). Some of the children miss school for emergency department visits, and this is largely due to poor asthma management at home (Clayton, et al., 2012). Lower parent health literacy has been found to have an association with more health care utilization by asthmatic children (Clayton et al., 2012).

Due to the limited health literacy in parents of children with asthma there is a need to examine the association between demographic factors, single parenting, low family income, and health-related quality of life in children with asthma. Various patient factors have been identified in the literature that affect asthma control. The main factor is poor knowledge of the patient regarding the health conditions (Mackey, et al., 2016). This can lead to the inadequate use of preventive measures, frequent emergency department visits, hospitalization, and poorer outcomes as the children grow into adulthood (Akinbami, et al., 2009). This is also attributed to poor self-management skills (Akinbami et al., 2009). The use of multiple sources of asthma education is a habit that has been reported by parents with high health literacy levels and has translated to healthier children (Fagnano, et al., 2012). Other factors include socio-demographic factors, behavior, attitudes, and beliefs of individuals, low socioeconomic status, and inadequate communication between the patients and care providers which may influence adherence to medication (Thakur et al., 2014). Although significant advances in the identification, knowledge, and management of asthma have been made, barriers exist in the management and control of childhood asthma (Szefler et al., 2014).

The following topics are discussed in this chapter. First, the theoretical framework is explained. Second, the I discuss the relationship between asthma and sociodemographic factors. Third, the relationship between single-parent households and children with asthma is assessed. Fourth, the link between the single-parent households and quality of life is explored. Last, I focus on the case of childhood asthma in Texas before ending with a chapter summary and key conclusions.

Literature Search Strategy

The goal behind this literature review was to obtain the most relevant, peer-reviewed, and recent literature on the relationship between microsystems (family structure, family functioning, and financial situation), macrosystems (sociodemographic factors and geographical location), and asthma development and control. To achieve this, I focused my search on the major databases such as the PubMed, Web of Science, Scopus, Science Direct, Google Scholar, Directory of Open Access Journals, and Journal Storage (JSTOR). I concentrated my search on articles that were published between 2018-2022; however, older references for the theoretical framework and for articles that provided significant and relevant findings for the current study were included. I focused primarily on peer-reviewed literature, and occasionally included academic dissertations based on their contributions to the knowledge on the topic of influences on asthma development. I included both qualitative and quantitative studies. Several key words were used for this literature search: *asthma and single parenting, asthma and health literacy, single parenting, low family income and financial difficulties, single parenting and*

child's health, asthma and finance, asthma and healthcare in Texas, asthma and quality of living, single parenting and health literacy, socio-demographics factors, and *asthma.*

Theoretical Framework

The theoretical framework for this study was the SEM, which is a derivative of Bronfenbrenner's (1994) ecological systems theory, a theory that helps to explain the influence of factors within a child's social ecology on their development. Although originally applied only in psychology, the theory of ecological systems has found utility in many disciplines, especially public health (Wold & Mittelmark, 2018). SEM is a version of ecological systems theory that is used to understand how the many intersecting contexts within which individuals exist to produce public health outcomes (Davidson et al., 2018).

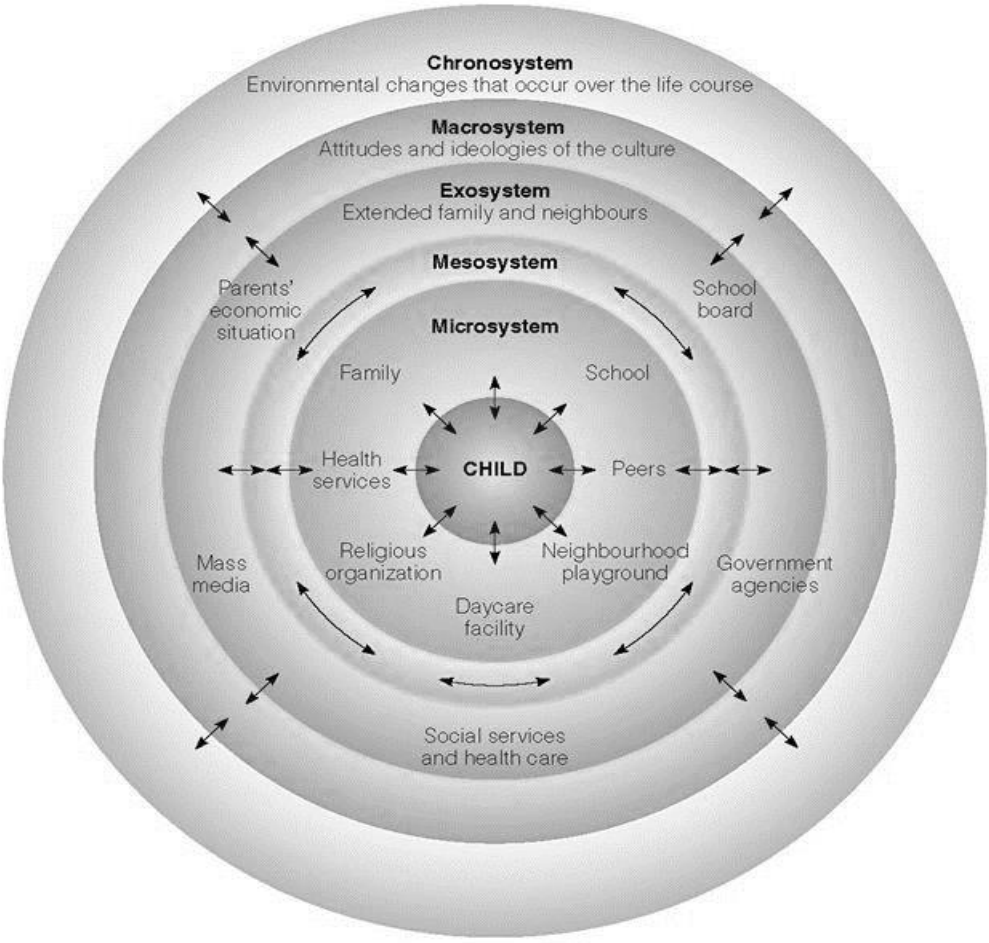
Under the SEM, people's behaviors are shaped by factors at the individual, relationship, community, and societal levels. These levels correspond to the microsystem, mesosystem, exosystem, and macrosystem levels in the original theory of ecological system (Wold & Mittelmark, 2018). Understanding the interactional effects between different individual contexts within this framework offers a better way of grasping how and why outcomes for different members of the same group can widely differ—namely, because each member of the group is defined not solely by that single group context, but rather the way in which their membership in myriad groups interact (Davidson et al., 2018). The SEM is widely used in public health because it has been identified as an ideal tool for identifying and addressing disparities among vulnerable populations (Wold & Mittelmark, 2018). The SEM contributes to the understanding of the ways in which

different predictors can be combined in either helpful or detrimental ways, thus better understanding the causes of complex behavior patterns at the population level (Davidson et al., 2018).

The SEM highlights five different systems that are critical to a child's development. Bronfenbrenner (1994) divided these systems into the microsystems, mesosystems, exosystems, macrosystems, and the chronosystems. The rationale behind having five separate systems was the fact that every environment is complex and made up of various structures that can have a different level of influence on the child's development. The microsystems are groups and institutions that have the strongest and direct influence on the development due to their proximity to the child, which is the family, school, neighborhood, and peers. The current study focused on this system by examining single parenting, low family income, and other sociodemographic factors and their influence on asthma development. The mesosystems are the interconnections between the microsystems, which can either be the relationships between the child's teachers and parents, or parents and peers. The exosystems are the indirect influences on the child. These are influences on the child's microsystems that, in turn, affect the child, such as their parents' job. The macrosystems are the cultural context, such as the geographical location, poverty, ethnicity, and socioeconomic status. The current study focused on the macrosystems when exploring the link between the sociodemographic and living in Texas, and asthma development. Last, the chronosystems included the life transitions, events, and environmental circumstances, which the present study did not focus on.

Figure 1

The Five Ecological Systems



Note. Derived from "Bronfenbrenner's ecological systems theory," by Guy-Evans, O. (2020), Simply Psychology.

There is some evidence of the influence of microsystems on asthma development. For instance, evidence suggests that parents who suffer from their own mental and physical health issues are worse at controlling their child's asthma (Weinstein et al., 2019). Similarly, the functioning in families living in poverty is much poorer, which in turn is linked to health outcomes on their children (Booysen et al., 2021). The reason for

that is microsystems are often interconnected; thus, if a family lives in a poor neighborhood, they are less likely to have access to good health services, have enough money to cover the costs of treatment and medication, and are less likely to be educated on the topic of asthma (Booysen et al., 2021). However, it is unclear how these factors interact, as well as what the final outcome is on the child's asthma development and treatment.

With respect to macrosystems, these systems can have a direct influence on the child's microsystems, as well as on the child. There is evidence that there are differences in health disparities between individuals from different socioeconomic groups as a result of chronic illnesses, family history, access to health services, and intersectionality with other health problems, such as poor mental health (Chen & Miller, 2013). Socioeconomic status is also highly correlated with health literacy, as individuals from lower socioeconomic backgrounds suffered from lower health literacy levels and lower education levels (Lastrucci et al., 2019). Therefore, the macrosystems directly affect the child's microsystems such as their parents, but it can also affect the child directly through their access to medical treatments and family health history.

Within the context of the present study, the SEM was used to understand the intersectionality of different contexts and their role in predicting the factors that point to the prevalence of asthma. In addition to offering a lens through which the present study could understand these issues, adopting the SEM helped identify the predictors of childhood asthma risk in a way that makes them easier for policymakers and public health workers to address. By using the SEM to break down and understand the role of

different, intersectional risks, the present study could help to raise awareness among individuals, the community, and policymakers. Under the SEM, these different groups of stakeholders could, in turn, work at different levels of the social ecology to help create solutions.

Literature Review Related to Key Variables and/or Concepts

The goal behind this literature review was to obtain the most relevant, peer-reviewed, and recent literature on the relationship between microsystems (family structure, family functioning, and financial situation), macrosystems (sociodemographic factors and geographical location), and asthma development and control. To achieve this, I first discuss the relationship between asthma and sociodemographic factors. Second, the relationship between single-parent households and children with asthma is assessed. Third, I explore the link between the single-parent households and quality of life. Last, I focus on the case of childhood asthma in Texas before ending with a chapter summary and key conclusions.

Asthma and Sociodemographic Factors

Income. One of the major sociodemographic factors predicting asthma prevalence is socioeconomic status. There is a significant link between household income and health insurance cover, and prevalence of childhood asthma (Eum et al., 2019). The factors of household income and health insurance cover are often interconnected, as individuals with poor income are unable to afford a health insurance cover. The reason why these factors affect asthma prevalence is the fact that families on low income are more likely to live in poorer neighborhoods exposed to poorer air quality, which could increase the

likelihood of asthma development (Baptist et al., 2019). Similarly, lack of access to health insurance means that the families will be less likely to afford a treatment for their asthmatic child in the event of an emergency (Eum et al., 2019). These factors are especially important in the case of single-parent households, where income is typically lower than in that of two-parent households.

Costs associated with asthma are significant and can pose a significant challenge for low-income, single-parent households. The costs of asthma treatment can be classified into direct, indirect, and intangible costs (Ferrante & La Grutta, 2018). This means that the families of an asthmatic child must make financial investments into the child's treatment, but also other expenses of minimizing the triggers of asthma, such as relocating to areas of less air pollution or lower humidity (Ferrante & La Grutta, 2018). Moreover, there is evidence that asthma-related mortality is higher among families from poor socioeconomic backgrounds (Gupta et al., 2018). The reason for the higher prevalence of asthma-related deaths in families from poorer backgrounds is linked to the fact that families are simply not able to afford the necessary medical care for the asthmatic child. These costs can be significant for single parents, who rely on a single salary to support the household, as well as to cover the medical needs of their asthmatic child. Thus, single-parent households are more vulnerable to challenges in childhood asthma management.

Another reason why income disparities can increase the risk of asthma in individuals is their living conditions. For instance, factors that are significantly predictive of prevalence of childhood asthma in New York City were income disparities, housing

characteristics, and built environment (Khan et al., 2021). These factors affected whether the individuals were able to afford to live in older building, high-rise building, or rental housing, which affected their living conditions and prevalence of asthma (Khan et al., 2021). For instance, rental properties were more likely to suffer from dampness and mold, which can have significantly detrimental effect on asthma development (Norback et al., 2018). Similarly, older buildings are also more likely to suffer from dampness and mold (Norback et al., 2018). Thus, factors such as income are closely interconnected with neighborhood and the living conditions. Each of these factors can increase the risk of asthma independently or interconnectedly.

Income can be indicative of the quality of life experienced by the families with asthmatic children. For instance, lower socioeconomic status was highly predictive of poorer asthma-related quality of life, which could increase the severity of the disease over time (Miller et al., 2018). The rationale for this argument was the fact that families from poorer socioeconomic backgrounds and with lower incomes were more likely to live in poorer neighborhoods, where living conditions were not optimal for asthma management. For instance, living conditions in poorer neighborhoods are associated with higher probability of mold, dampness, and exposure to harmful air pollutants, which can be significant asthma triggers (Miller et al., 2018). Similarly, Taminskiene et al. (2019) argued that lower socioeconomic status of the family indirectly lowered the quality of life lived by the family due to exposure to mold. However, Taminskiene et al. (2019) argued that family quality of life can also be worsened by other factors, such as the difficulty of managing asthma, increased anxiety, and reliance on medication. On the other hand, it

can be argued that each of these factors is indirectly linked to income difficulties, which can deteriorate the mental health of both parents and children and can make access to asthma treatment more challenging.

Income and socioeconomic status are also linked with higher asthma mortality. For instance, Sinharoy et al. (2018) discovered that asthma-related mortality and asthma prevalence were more common in lower socioeconomic neighborhoods. At the same time, Sinharoy et al. (2018) discovered the same relationship when comparing European, Asian, and African countries. Ultimately, they concluded that countries with lower socioeconomic conditions experienced a greater prevalence of asthma (Sinharoy et al., 2018). As previously stated, quality of life is significantly associated with the quality of life experienced by the family (Taminskiene et al., 2019). Thus, income and socioeconomic status significantly affect the quality of life lived by the family, which can determine whether their ability to manage asthma in their children successfully.

Comorbid Diseases. Asthma is one of the childhood diseases that has several underlying mechanisms, such as presence of comorbid diseases. Allergic diseases are common among asthmatic children, with approximately one third of patients having sensitization to allergens (Jantunen et al., 2019). Asthma in children often occurs as a result of multiple causes and other complex mechanisms, which can trigger the disease or increase its severity, such as allergies (Jantunen et al., 2019). Moreover, children with more difficult to manage asthma can suffer from allergic asthma, which occurs when the child's airways tighten when they inhale an allergen (Sbihi et al., 2019). Moreover, children with severe asthma had a presence of food allergy identified, which prevents

them from being able to consume certain foods that could trigger their asthma (Schoettler et al., 2019). Childhood asthma had previously been linked to significant wheezing morbidity and bronchial hyperresponsiveness as a result of allergic complications (Sbihi et al., 2019). Thus, presence of comorbid diseases such as allergies can make pediatric asthma more severe.

Obesity. Asthma and obesity are two major chronic diseases among children in the United States, and the two of them often coincide (Sansone et al., 2020). The risk of asthma is even higher among children who are overweight (Sansone et al., 2020). Obesity in children in the United States had been on a steady increase in the last four decades, which was linked to lifestyle factors and socioeconomic factors (Bantula et al., 2021). Children with difficult to manage asthma often experience bronchial hyperresponsiveness, which can be made more severe as a result of childhood obesity (Bantula et al., 2021). The reason for that is that in obesity, abdominal tissue deposition increases the pressure on the abdomen, which increases superficial ventilation and decreases the volume in the airways (Sansone et al., 2020). Thus, obesity can significantly increase the severity of asthma among children.

Vitamin D. Vitamin D exposure can have several benefits to the management of childhood asthma. Infant vitamin D exposure was linked to decreased atopic diseases outcomes, which includes asthma (Shen et al., 2018). Vitamin D was found to have a protective effect in acute respiratory tract infections, which can support the management and prevention of asthma in childhood (Hennessy et al., 2018). Moreover, there is evidence to suggest that maternal vitamin D status can contribute to greater reduction of

asthma and wheeze among children (Shen et al., 2018). On the other hand, vitamin D was not found to improve the lung functions of children or improve asthma symptoms (Shen et al., 2018). Thus, there is more evidence to suggest that vitamin D supplementation can help to prevent childhood asthma and wheezing, but there is limited evidence to suggest whether it supports the day-to-day management of asthma.

Family Structure. Another significant sociodemographic factor that was previously linked to asthma prevalence was the family structure. For instance, findings by Lietzen et al. (2021) indicated that asthma was prevalent among families who had suffered either a divorce or separation or experienced severe financial difficulties. These two factors are often interconnected, as due to the parental separation is often linked to a reduction in income and other costs (Gupta et al., 2018). Similarly, Lietzen et al. (2021) found that one of the factors predicting prevalence of asthma was occurrence of severe life events. This means that life-changing events such as parental separation or divorce can create significant stress in the child, which can increase their risk of asthma. Although the findings by Lietzen et al. (2021) indicated that these factors increased the risk of asthma in both parents and children, they are also relevant to be applied to children alone.

Family structure can subsequently affect the family functioning. For instance, events such as divorce or separation can significantly deteriorate the family functioning (Castillo et al., 2020). The reason for this is increased stress and presence of new financial difficulties, which is another sociodemographic factor that could increase the prevalence of asthma (Fitzpatrick et al., 2019). Similarly, poor family functioning is

predictive of factors such as anxiety and depression in parents (Castillo et al., 2020). Although mental health is not strictly a sociodemographic factor, it is closely linked to asthma and single parenthood. Single parents are more likely to suffer a greater level of pressure to care for their child, especially if the child is asthmatic. Moreover, parents who suffer from poor mental health are less likely to be able to adequately care for a child suffering from asthma.

Family structure can affect the levels of stress in the household. For instance, single-parent households are more likely to suffer from greater stress levels, which can contribute to asthma development (Barnthouse & Jones, 2019). The reason for this is that single parenthood is associated with complex stressors that can cause chronic and toxic stress in parents, that can ultimately affect the development of asthma. More, exposure to chronic psychosocial stress was a significant risk factor for asthma development (Barthouse & Jones, 2019). Similarly, chronic maternal stress was the main predictive factor of lung disease of prematurity in children born extremely preterm (Jackson et al., 2019). At the same time, children both with a lung disease of prematurity were at a greater risk of developing asthma in later life (Jackson et al., 2019). Thus, although these findings do not suggest a direct link between family structure and asthma, events such as separation or divorce can create significant levels of stress to the mother, which can indirectly increase the likelihood of asthma development.

Race. Racial disparities in asthma-related care are evident in the research. Black patients were less likely than White patients to utilize emergency services in the event of an asthmatic attack (Fitzpatrick et al., 2019). Similarly, Black patients were less likely to

seek care from a physician foe their asthma management due to the unfair treatment received when compared to the treatment received by the White patient (Fitzpatrick et al., 2019). Thus, the underlying issue for the racial disparities in asthma management and control is linked to discrimination and racism in healthcare services, which makes these patients less willing to seek treatment. Similarly, other factors such as neighborhood features, environment, and health literacy were significantly linked to racial and ethnic disparities in asthma treatment (Matsui et al., 2019). The reason for that is that ethnic minorities are more likely to live in poorer neighborhoods with worse living conditions, and potential exposure to air pollutants that could trigger asthma (Matsui et al., 2019). Although White asthmatic patients can also reside in poor neighborhoods and be exposed to harmful environmental triggers for asthma, these factors are more significant among the ethnic minority populations.

Geographic Location. As previously discussed, factors such as neighborhoods and location can affect one's exposure to asthma-related risks, access to resources for asthma management, and the living conditions. This section focuses on the geographical location, and its impact on prevalence of asthma. For instance, research on prevalence of childhood asthma in the city of Seoul, Korea, indicated there was a significant link between the air quality exposed to children and prevalence of asthma (Cho et al., 2018). Seoul is a highly congested city with high traffic volume and large population, which means that the quality of air is even more important for its residents, than it would be for smaller countries such as Lithuania (Taminskiene et al., 2019). Similarly, there was a strong link between asthma prevalence and socioeconomic status, which suggests

consistency across countries (Cho et al., 2108). The quality of air and living conditions decreases as socioeconomic status of the family decreases, and this finding is consistent across different countries (Taminskiene et al., 2019). Thus, these findings highlight that although there are similar factors across countries that increase the risk of asthma, some are more significant than others, such as high congestion.

With respect to the geographical location, extreme locations can increase the prevalence of asthma or act as potential triggers. For instance, research by Ochoa-Aviles et al. (2020) indicated that the highest prevalence of asthma, eczema, and rhinitis was evidence among populations living in high-altitude setting. The reason for this is that in high-altitude setting breathing is more challenging, and there is a greater presence of humidity in the air, which can contribute to wheezing problems over time (Miller et al., 2018; Ochoa-Aviles et al., 2020). On the other hand, Ochoa-Aviles et al. (2020) indicated other significant predictive factors of asthma, such as parental history of allergic diseases, socioeconomic levels, presence of pets, and living conditions. Although the researchers discovered a strong predictive relationship between high-altitude setting and asthma, this was not the only factor that contributed to asthma prevalence. Thus, it can be argued that geographical location rarely is the sole risk factor for asthma development, unless it is an extreme environment such as highly congested and polluted area. Otherwise, geographical location is typically linked to other predictive factors, which suggests that other factors are stronger in increasing the risk of asthma.

On the other hand, other findings suggest that the geographical location is less significant in asthma prevalence than other factors. For instance, researched conducted in

China by Cao et al. (2020) indicated that factors such as parental smoking behavior, parental asthma, and household living conditions were more significant in predicting childhood asthma. Moreover, factors such as ventilation in the house, parental education level, and education were highly predictive of asthma diagnosis in their children (Cao et al., 2020). Although the study was conducted in China, similar findings were previously obtained in other countries (Furuhata et al., 2020; Ogbu et al., 2021). Consistency in findings between countries highlights that it may be less about the geographical location and asthma prevalence, but more about the individual factors such as parental lifestyle and living conditions that increase the risk of asthma.

Single-Parent Households and Quality of Life

Family Structure. The structure of a family can significantly influence its functioning, which in turn affects the quality of life for both the child and the parents. There are different types of family, that is the nuclear family (consisting of two parents), single-parent families, and the step and adoptive families (Heintz-Martin & Langmeyer, 2020). The type of family a child grows up with can significantly affect the level of financial strains experienced by the parents. Level of financial instability can significantly impair the quality of life provided to the child, which over time can contribute to the deterioration of their health (Shaw et al., 2019). Similarly, there are different levels of economic strains that the single-parent families can experience. First, the single-parent families can experience an economic hardship, which is an income that is significantly lower than that of a family with two parents (Heintz-Martin & Langmeyer, 2020). Second, economic hardship can lead to an economic pressure, which

means that the family is unable to meet some of its basic material needs, or suffers significant financial cutbacks, some of which can refer to health (Heintz-Martin & Langmeyer, 2020). The economic pressures then lead to conflict, withdrawal, and lack of stability in the household, which affect the quality of life provided to the child (Heintz-Martin & Langmeyer, 2020). Although not all single-parent households are exposed to low incomes and economic strains, this type of family is at a greater risk than the nuclear families. Consequently, the child is exposed to unstable economic situation, which creates significant pressure on the parent and can ultimately deteriorate their relationship with them. Over time, this situation can lead to health deterioration of both the child and the parent.

There is an element of family complexity associated with the single-parent family structure. Heintz-Martin and Langmeyer (2020) referred to family complexity as the complicated situation or structure. In single-parent families, the children were often exposed to separation of parents, which can significantly deteriorate their economic status, and affect their physical and emotional development (Heintz-Martin & Langmeyer, 2020). Moreover, the number of children that the family has can also affect the economic wellbeing of the family after the separation (Shaw et al., 2019). Families that went from a nuclear family structure to a single-parent structure arguably expose the child to greater financial and emotional strains than families where the child grew up with one parent. As a result of this deterioration, the child may suffer extreme stress, which is a common trigger of asthma (Cancian & Meyer, 2018). Thus, not only may the child's asthma become triggered, but the child may suffer novel financial strains, which may

mean that their asthma treatment is unable to be sufficiently supported by the single parent.

Poverty. Poverty is common among single-parent households. Single mothers are more likely to be disadvantaged when it comes to finding full-time employment, more so than single fathers (Nieuwenhuis & Maldonado, 2017). At the same time, women on average have lower earning than men, which can be further widened by single parenthood (Nieuwenhuis & Maldonado, 2017). Although this issue is more likely to affect single mothers, single-parent households are more likely to consist of single mothers as opposed to single fathers (Rothwell et al., 2018). As a result of greater challenges in gaining employment and lower salaries, single-parent households are exposed to poverty more often than the nuclear families. As a result of the lack of a second parent in the household, the single parent becomes the main earner and caregiver to the child (Cancian & Meyer, 2018). As a result, the parent suffers from greater financial challenges, which can put a strain on them and the child.

Single-parent family structure means that the family experiences lower economic resources, which can affect the health of the child. Due to decreased economic resources, the single-parent families are exposed to greater residential mobility (that is, moving from a house to house), greater levels of stress, and poorer socialization (Cancian & Meyer, 2018). Consequently, the single-family households can create a greater level of disruption as opposed to stability for the child, which can affect their access to the necessary resources and level of security (Rothwell et al., 2018). Lack of stability, security, and resources can be damaging to the child's health. This is especially evident

when the child suffers from pre-existing health conditions, such as asthma. In the event of parental separation, the child may experience a great level of stress, which is a trigger for asthma (Cancian & Meyer, 2018). Similarly, as a result of the novel economic strain and poverty, the child may experience lower access to asthma treatments and medical care, which could affect the subsequent development of the illness.

There is scholarly evidence to suggest that single-parent households are exposed to poverty for a long period of time. For instance, longitudinal studies on single-parent households and employment indicates that parents often suffer severe deprivation and societal exclusion before the parent is able to gain employment (Nieuwenhuis & Maldonado, 2017). Although the single parent is able to increase the standard of living of a child upon securing employment, the child may continue to be excluded from their immediate environment as the parent may be unable to afford after-school activities or childcare (Nieuwenhuis & Maldonado, 2017). This means that as well as the physical health, the child's emotional health is likely to decrease as they adapt to the new circumstances. Similarly, due to lower economic opportunities, the single parent may be subject to longer working workers and greater instability, which means that they are less able to attend to their child's physical and emotional needs (Rothwell et al., 2018). In the event where the economic strain and instability persist for a longer period of time, the child's health-related needs may not be met to the appropriate standard, which can have negative impact on the long-term development of pre-existing illnesses such as asthma.

Illness. There is evidence to suggest how single-parent households can affect the health and disease prevalence among children. There is evidence to suggest that single-

parent households possess a higher number of healthcare needs that they struggle to meet, as opposed to households with two parents (Duriancik et al., 2019; George-Lucas & Brandon, 2021). Similarly, there is evidence to suggest that family structure and stability have an impact on the health of the child. For instance, longitudinal research revealed that children from single-parent households who recently suffered a sudden family structure change were more likely to suffer from obesity than children from nuclear families (Irwin et al., 2019). Although these findings were not strictly related to asthma development, they highlight the fact that family structure and stability plays a part in illness development. At the same time, children from single-parent households were more likely to have a lower intake of fruits and vegetables, and higher intake of unhealthy and processed foods than children from the nuclear families (McKenzie et al., 2018; O'Connor et al., 2021; Schnettler et al., 2018). It is likely that lower intake of fresh fruit and vegetables could be another outcome of financial difficulties, meaning that single parents may find it more challenging to afford healthy foods.

As well as the level of nutrition, single-parent households are likely to affect the healthy consumption patterns of the child, which over time could affect their health and disease immunity. There is evidence to suggest that the number of meals consumed by the family is linked to the level of financial challenges encountered (Stahlman et al., 2020). The reason behind is that single parents are likely to have less time to prepare healthy homemade meals regularly for their children, which over time can affect the level of health of the child (Stahlman et al., 2020). Similarly, lack of healthy meal patterns was linked to lower incomes and greater instability of single-parent households (Tester et al.,

2018). Similarly, a child who had recently undergone a change in the family structure (such as going from a nuclear family to a single-parent household), means that the child may have experienced a sudden change to their healthy eating habits as a result of increased stress and higher economic strains (Stahlman et al., 2020).

Overall, there is clear evidence to suggest that there are differences between children from single-parent households and nuclear households. These findings suggest that children from single-parent households are at a greater risk of developing some illnesses in the future, or their health deteriorating as a result of poorer food consumption. Thus, this suggests that there could be a potential link between asthma deterioration and single-parent households.

When it comes to severe and chronic illnesses that require long-term medical care and management, single parents face several challenges. As previously discussed, single parents often experience significant economic strains that affect the level of care they can provide to their children in the event of a health diagnosis (McKenzie et al., 2018). Similarly, single parents are at a greater risk of entering poverty after divorce, which means that they are likely to possess significantly fewer resources to look after their children (Tester et al., 2018). In relation to chronic illnesses, financial strains mean that the parent is unable to afford the expensive medical treatments for diseases such as asthma or obesity and regular healthcare visits (McKenzie et al., 2018). Although single-parent households experience challenges in relation to managing a healthy and balanced lifestyle for their children, it is evidence that long-term and chronic illnesses are likely to be more challenging to manage.

Psychosocial Health. Although the main focus of the current study is the physical health of children from single-parent households, it is important to explore how single-parent households affect the psychosocial health of children, which ultimately determines their quality of life. During the development stage, the child develops their social skills through socialization with others, which typically occurs through contact with the family (Babasa, 2014). At this stage, the child learns how to interact with their peers, neighbors, parents, and siblings (Babasa, 2014). However, a child that grew up in a single-parent household or experienced a parental separation is likely to experience a deterioration in their socialization development (Demir-Dagdas et al., 2017). A child who experienced a divorce of their parents are more likely to suffer from a decreased cognitive ability, adverse behavior, deterioration in their physical and mental health, poorer peer relations, lower social conduct, and a higher chance of substance use and criminal offending (Demir-Dagdas et al., 2017). During a divorce or separation, the child experiences a level of absence caused by the changes in their caregiving arrangements, ultimately causing a disruption to their quality of life (Babasa, 2014). Children who experienced a parental absence are more likely to long for care and attention, as their emotional needs may be less likely to be met.

There is evidence to suggest that single-parent household is likely to affect the mental health of the children. In the event where the parents divorced, the children may have been exposed to long-term transitions, such as the ongoing parental conflicts, and family disorganization (Demir-Dagdas et al., 2017). This means that children from such households have already been exposed to an intense psychological strain, which is likely

to become intensified as a result of a divorce (Demir-Dagdas et al., 2017). Similarly, as an outcome of these events, children from single-parent households often struggle with higher adjustment and socioemotional issues than children from nuclear households (Zhang, 2020). At the same time, there is evidence highlighting the higher likelihood of experiencing depressive symptoms as a result of distressing events at a young age, such as parental divorce (Zhang, 2020). There is a strong link between psychological and physical health, meaning that poor psychological health can significantly impair the physical health of a child (Demir-Dagdas et al., 2017). Although psychological deterioration as a result of single-parent households may not be strictly related to asthma development, it highlights the clear impact between a single-parent household and a quality of life.

Access to Healthcare. Demographic factors can affect the frequency of use of healthcare facilities by families with children suffering from chronic diseases (Lut et al., 2020). There is evidence highlighting that children from low-income and single-parent households were more likely to be frequent healthcare users than children from higher income and nuclear families (Hayes et al., 2019). This finding suggests that children from lower income and single-parent families are likely to suffer from greater health-related challenges, which increases their need to access healthcare services frequently. The problem arises as the cost of the healthcare services increases, and single parents may struggle to afford the frequent healthcare visits (Nieumenhuis & Maldonado, 2018). Thus, as the healthcare needs of children from single-parent households are likely to be

greater than that of children from nuclear families, cost and economic strain could be a major challenge.

Illness related QoL Measures. In the present study, the second dataset used as the source of data did not include direct measures of quality-of-life. Therefore, it was necessary to manufacture a composite proxy variable from what data exist. Such an approach is commonly used where direct measures are not available (Seltzer, 2021). In particular, the study used the factors of "symptoms free days" and "number of episodes/attacks." These correlated most closely to the "illness" aspect of quality-of-life as discussed above (Duriancik et al., 2019; George-Lucas & Brandon, 2021). In addition, asthma-related symptoms, such as discomfort due to coughing, were recently associated with quality of life (Kharaba et al, 2022). Although not a fully comprehensive way to measure QoL, focusing on illness was beneficial in terms of directly assessing the most prominent burdens of asthma in children.

Single-Parent Households and Children With Asthma

Socioeconomic Status. The previous section focused on how single-parent households differed from nuclear households with respect to quality of life. This section focuses on how single-parent households can affect children with asthma. There is a strong link between socioeconomic status and prevalence of childhood asthma (Assari & Moghani, 2018). Although the study did not distinguish between single-parent households and two-parent households, the previous section of this chapter highlighted the fact that single-parent households tend to be poorer, which means that childhood asthma may be more prevalent in these households. Similarly, there was evidence of

probability of an early-life wheeze occurring at the early age in poorer households (Zanobetti et al., 2020). At the same time, the researchers found that the probability of an early-life wheeze occurring at the early age was higher in single-parent households (Zanobetti et al., 2020).

As previously stated, single-parent households are not always poor. However, when the single-parent household is combined with poverty or low income, the likelihood of developing asthma in the early life is much higher. Single-parent households were also more likely to live in poorer and more deprived areas (Assari & Moghani, 2018), while the likelihood of a child developing asthma was higher for poorer neighborhoods (Zanobetti et al., 2020). Thus, although not all single-parent households are poor, they are more likely to be than the two-parent households. As a result of this probability, the likelihood of developing childhood asthma is higher in single-parent households.

Lifestyle. There are specific lifestyle factors that can contribute to development of childhood asthma, and many of these factors are associated with living in poverty. For instance, parental smoking behavior and low household income were linked to higher prevalence of asthma-related hospital visits (Furuhata et al., 2020). The reason for that is that living in poverty is associated with higher stress levels, which can increase the probability of a parental smoking behavior (Ogbu et al., 2021). Smoking can have detrimental effects on the child and can significantly contribute to the development of asthma (Furuhata et al., 2020). Similarly, living in poorer neighborhoods means that the child is often exposed to environmental smoke from other people living in the neighborhood (Ogbu et al., 2021). Moreover, other studies highlighted that single-parent

households were more likely to be exposed to secondary smoke exposure, primarily based on their living conditions (Wu et al., 2018). This means that even if the child's single parent is not actively smoking, because they live in the neighborhood where smoking is common, may increase the likelihood of the child being exposed to smoking. All of these factors have a negative impact on asthma control, and asthma development.

Living Conditions. Apart from parental behaviors, there are factors associated with living conditions that increase the likelihood of childhood asthma. For instance, factors such as exposure to mold, ticks, or air pollution are significantly associated with asthma development (Furuhata et al., 2020). Exposure to these factors is associated with poorer living conditions, as prevalence of mold and ticks is common among older and run-down buildings (Ogbu et al., 2021). Similarly, living with mold is associated with developing allergies, rhinovirus, and a respiratory syncytial virus in both parents and children (Furuhata et al., 2020). Ultimately, although the single mother may actively promote a healthy lifestyle with nutritious food and not smoking, the fact that the child is continuously exposed to mold can significantly increase their chance of developing asthma and breathing difficulties. Similarly, mothers living in these conditions are more likely to give birth pre-term, which further increases the likelihood of childhood asthma development (Furuhata et al., 2020).

As previously established, living conditions have a significant impact on asthma development. However, living conditions have an impact on asthma control. Previous studies highlighted the fact that better asthma control in children was associated with absence of negative environmental exposures, such as smoke and mold (Brooks et al.,

2019). Similarly, the way that asthma is controlled in children is a significant predictor of how the families manage the illness. There is evidence highlighting the fact that single mothers found it more challenging to manage asthma in their children and were more likely to develop depressive symptoms as a result (Brooks et al., 2019). Management of asthma is associated with behaviors such as regular healthcare visits, monitoring of daily symptoms, providing the medication, and avoiding the environmental triggers of asthma (Gjelsvik et al., 2019). Single mothers who are living in poor conditions and in poor neighborhoods may find it more challenging to avoid negative environmental triggers and manage regular healthcare visits, if healthcare clinics are not easily accessible. Similarly, single mothers who have developed depressive symptoms as a result of their living conditions and their child's asthma may find it more challenging to monitor the daily asthma symptoms of their child due to their own poor mental health.

There is further evidence that links the impact of neighborhood and asthma management. For instance, factors such as poverty, low housing prices, and low high school graduation rates were indicative of childhood asthma prevalence (Gjelsvik et al., 2019). The reason for this is that low housing prices and low high school graduation rates are indicative of a poor neighborhood. Children living in neighborhoods with these risk factors were at a higher risk of annual asthma-related hospitalizations (Gjelsvik et al., 2019). Similarly, other researchers claimed that the urbanization in cities meant that more people are now spending time indoors than ever before (Zhang et al., 2021). This means that children with asthma rely on the effective administration of medication and monitoring of their daily symptoms to manage their asthma. However, asthmatic children

who are spending a lot of their time indoors while living in a poor neighborhood may have a lower chance of effectively managing their asthma than children living in other neighborhoods.

Economic and Environmental Injustice. Although the factors discussed in this section closely relate to the living conditions, this section will focus more on the economic and environment injustices faced by single-parent households living in poor neighborhoods and poor living conditions. Researchers indicated that the structural determinants of health are linked to environmental, economic, and social factors, which allow the individuals to access, opportunities and resources in equal measure with others (Hunleth et al., 2020). Consequently, these factors reduce their risk of health deterioration (Hunleth et al., 2020). Factors contributing to access, opportunities, and resources are the economic constraints and segregation, which can contribute to the severity of asthma and its prevalence (Karunanayake et al., 2018). Factors that contribute to a greater segregation and economic constrains are the neighborhood contexts, housing, air pollution, and psychosocial stress (Hunleth et al., 2020). These findings reaffirmed the conclusions from the previous section, where a clear link was found between living conditions, housing, neighborhood, single-parent households, and asthma. In this case, this section highlights how these segregations can contribute to economic and environmental injustices for single-parent households, such as greater exposure to air pollution, smoke, and mold, which puts low-income single-parent household families at a greater disadvantage with respect to managing asthma. Similarly, economic injustices mean that single parents are often unable to afford a different house than that situated in a

low-income neighborhood, which can have negative long-term impacts on childhood asthma.

As a result of the economic and environmental injustices, single-parent households are exposed to certain psychological and socioeconomic burdens, which can affect the way that they are able to control and manage asthma in their children. Examples of psychological burdens experienced by parents from single-parent households living on low-income in poor neighborhoods included poor quality of sleep, chronic stress, decreased mental health, lower health (Foronda et al., 2020). On the other hand, socioeconomic burdens included financial constraints and poor access to healthcare (Foronda et al., 2020). Similarly, asthmatic children from lower-income households were less likely to have an individualized asthma action plan developed by a medical professional (Harrison et al., 2019). At the same time, children from single-parent households were more likely to experience asthma, dermatitis, eczema, or dental diseases as a result of the economic constrains of their parents (Nishioka et al., 2021). These factors are significant in effective asthma management in children, and as a result of the psychological and socioeconomic injustices imposed on single-parent households, it may be even more challenging for single parents to effectively manage their child's asthma.

Availability of Resources. As previously highlighted, single-parent households may experience poorer access to necessary resources, such as access to nutritious food. This section demonstrates the direct effect this situation can have on childhood asthma. For instance, researchers found that food insecurity was significantly associated with a higher risk of incident asthma (Clemens et al., 2021). Asthma was previously linked to

factors such as poor nutrition and obesity (Mangini et al., 2018). Food insecurity could be liked to poor nutrition, where single parents are more likely to choose cheaper and less nutritionally dense foods to feed their children, which can have a detrimental impact on asthma development and asthma management. Similarly, factors such as parental health and smoking were significantly linked with food insecurity (Clemens et al., 2021). The reason for that is that food insecurity is a phenomenon that is associated with complex pathways, such as maternal depression (Mangini et al., 2018). Thus, from these findings it becomes clear that food insecurity is not simply lack of adequate nutrition, but is associated with a variety of factors, such as poverty and parental depression. All of these factors have a contributing effect on asthma development and are more prevalent among single-parent households.

Lack of access to schools and after-school activities has also been linked to asthma. Parents from single-parent households were shown to experience barriers accessing good schools for their children, mainly due to financial constraints and living in low-income neighborhoods (Kornblit et al., 2017). Lack of access to good schools means that the parents from single-parent households are unable to enroll their asthmatic children to school physical activities (Kornblit et al., 2017). Physical activity was shown to have a positive impact on the management of asthma in children (Wu et al., 2018). Similarly, school physical activities are associated with additional costs, which create an additional burden for single parents who are already suffering from economic constrains due to relying on a single paycheck to support the entire household (Karunanayake et al., 2018). Overall, physical activity was shown to have a positive impact on managing

asthma. Single parents are often unable to provide their asthmatic children with an opportunity to access physical activities to support their asthma management.

Access to Care. Level of access to care that children with asthma receive can determine their level of treatment and mortality rates. The number of children being hospitalized for their asthma is increasing, and factors that relate to higher hospitalizations include poor disease management and poverty (Floyd et al., 2021). Poor disease management can be linked to poor access to medications and regular doctor visits, which can lead to progression of the disease (Floyd et al. 2021). One such example is in developing countries with poorly established medical system, which means that regular residents have limited access to care and essential medications (Perry et al., 2019). Poor medical system can also affect the level of care received by the asthmatic patients such as children, as they may be less able to receive a regular supply of medication and regular doctor visits (Perry et al., 2019). Although this situation can occur in developing countries, asthmatic children living in poorer areas of the United States can experience the same challenge.

Similarly, poverty can also limit access to care, as healthcare access in countries such as United States can be expensive (Assari et al., 2018). Healthcare in poorer areas of the country may be less efficient than healthcare available in more affluent areas of the country (Assari et al., 2018). Thus, the level of care that an asthmatic child receives in an affluent neighborhood is likely to be substantially better than the level of care that an asthmatic child from a poorer neighborhood receives. Access to care is often dictated by one's financial means and socioeconomic status, which ultimately limits the treatment

and disease management that the child receives (Federico et al. 2020). Moreover, the asthmatic child may be less likely to seek medical help in the event of an emergency if they do not have the necessary financial means to do so (Federico et al., 2020). Single-parent households are likely to be poorer than the traditional households, which can increase the risk of poorer access to care.

Health Literacy. Health literacy is an important in asthma management. Educational level of parents was linked to health literacy, meaning that the more educated the parent was, the higher the health literacy they possessed (Schyllert et al., 2021). Health literacy is defined as the degree to which the parents are able to understand and process information about adequate health management and make appropriate health decisions (Schyllert et al., 2021). Without health literacy, parents with asthmatic children will be unable to adequately monitor daily symptoms of asthma of their child. Parents from single-parent households living in poor neighborhoods are more likely to have lower levels of education (Weinstein et al., 2019). Similarly, lower levels of education and low income were associated with higher prevalence of depressive symptoms (Andrews et al., 2019). As previously mentioned, parents from single-parent households are more likely to suffer from depressive symptoms than parents from two-parent households. The above findings highlight the link between single-parent households, levels of education, depressive symptoms, and health literacy. All of these factors can affect the level of care than the single parent can provide to their asthmatic child.

Childhood Asthma in Texas

Air Pollution. Previous sections focused on highlighting the direct and indirect relationship between single-parent households and asthma. This section focuses on the case of childhood asthma in Texas with relation to previously discussed factors. In Texas there is a higher chance being exposed to air pollutants that can be detrimental to asthma management, particularly during the warmer months (Baek, 2020). Similarly, there is a significant link between exposure to harmful air pollutants and frequent asthma-related hospitalizations (Baek, 2020). The way that this finding links back to single-parent households is the fact that single-parent families are more likely to live in low-income neighborhoods with higher levels of pollution (Baek et al., 2020). Similarly, longer exposure to air pollutants was associated with longer hospital length of stay for asthmatic children living in Texas (Baek et al., 2020). Air pollutants are also associated with higher asthma-related morbidity (Burbank & Peden, 2019). Thus, although the above findings do not suggest that Texas is the most polluted state in the United States, it does suffer from areas that are more polluted than others. These areas can be riskier for children living with asthma, particularly if these children are from single-parent household due to various constraints and injustices discussed before.

Comparative studies have examined the cases of childhood asthma in metropolitan and rural areas of Texas. Pilat et al. (2012) discovered that asthma rates in the metropolitan areas in Texas were more prevalent than in rural areas. The rationale for that was the higher rates of tree vegetation in rural areas of Texas. As previously stated, Texas is a state that suffers from highly polluted areas, particularly in its less developed

parts (Baek, 2020). Single-parent households are more likely to reside in the less developed parts of Texas, thus become more exposed to air pollutants that are harmful for asthma. At the same time, children suffering from asthma were more likely to be exposed to chest infections and lung diseases as a result of air pollutants, which can be contribute to an asthmatic attack (Pilat et al., 2012). Tree vegetation was found to significantly decrease the risk of asthmatic attacks (Pilat et al., 2012). It can be concluded that areas with higher tree vegetation are more beneficial for children with asthma. However, as highlighted by previous sections, single-parent households are more likely to reside in the more polluted, low-income areas of Texas.

Environmental Tobacco Smoke Exposure. Undoubtedly, tobacco smoke exposure has negative effect on asthma in general, especially among children. Environmental tobacco smoke was previously linked to contributing to the development of lung diseases, which can be critical for children who are already suffering from asthma (Strzelak et al., 2018). Moreover, environmental tobacco smoke was previously linked to triggering allergic reactions in children, which can tighten the airways and make breathing more challenging for asthmatic children (Braun et al., 2020). Furthermore, environmental tobacco smoke contributes to inflammatory response in the body and introduce more harmful oxidants, which over time can lead to oxidative stress and increased mucosal inflammation (Braun et al., 2020). Any distress caused to asthmatic child's lungs can trigger an asthmatic, develop an allergic disease, or increase the severity of asthma (Strzelak et al., 2018). Thus, this is especially a high risk for asthmatic children living in Texas, who are already exposed to a major air pollution.

Environment. The relationship between household income and asthma prevalence was also observed in Texas. For instance, findings by Zarate et al. (2021) highlighted the fact that Texas suffers from high income and racial segregation. This means that in Texas, there are areas that are either extremely low-income, mid-income, or high-income, with very distinct disparities in access to schools, facilities, and other resources (Zarate et al., 2021). Similarly, studies indicated that those children living in the poorer areas of Texas were more likely to be exposed to dampness and environmental tobacco smoke as a result of their living conditions (Sun & Sundell, 2011). As previously highlighted, exposure to smoke, mold, and dampness can pose a significant risk to asthmatic children, creating breathing issues, increase the prevalence of wheezing, or increase the likelihood of an asthmatic attack. Single-parent families living in such areas in Texas are likely exposing their asthmatic children to higher risks.

Another reason Texas is important in relation to childhood asthma cases is due to its climate. Factors such as climate can create a general risk for individuals with respect to asthma and allergies, which over time creating wheezing or breathing problems (Sun & Sundell, 2013). Similarly, the climate in Texas can be humid. Sun and Sundell (2011) argued that dampness, hot, and humid climates can increase the severity of the asthmatic symptoms. Although these factors are not specific to single-parent households alone, these findings highlight the additional challenges that single-parent households with asthmatic children could face in Texas in relation to economic constraints.

Urbanization. Other researchers explored factors that contribute to higher asthma prevalence among adults and children in Texas. For instance, some researchers

highlighted the fact that Texas is vulnerable to high motor vehicle emissions and urban drilling, which can have negative impact on air pollutions and asthma management (Newcomb & Li, 2019). Similarly, motor vehicle emissions contribute to fine particles in the air, which decrease the quality of the air (Newcomb & Li, 2019). Similarly, other researchers identified that Texas is notorious for dense networks of roadways (Patel et al., 2020). In the urban architecture of Texas, houses are often built in close proximity to the roadways, which means that individuals are exposed to on-road air pollution even when in their own homes (Patel et al., 2020). As previously highlighted, modern urbanization means that many people spend majority of their time indoors. This means that even when they spend time indoors in Texas, they are still exposed to harmful air pollution from the roads, which can be significantly damaging for asthmatic individuals. Moreover, single-parent families may find it more difficult to move out from houses in close proximity to the road.

In relation to urban drilling, this is another challenge faced by the residents of Texas. Urban drilling in Texas consists of natural gas development and hydraulic fracturing, which increases the volume of traffic in already congested cities (Newcomb & Li, 2019). As previously mentioned, Texas is already highly congested and a lot of the housing is situated in close proximity to the roads, which can be detrimental to single-parent families with asthmatic children. Similarly, roads with Texas are often driven by major trucks, which contribute to air pollution and gas production, which contributes to the decreased quality of the air (Newcombe & Li, 2019). However, it should be noted that not all regions of Texas suffer from the same levels of traffic patterns and congestion. For

instance, urban Texas is more likely to suffer from significant air pollution than the greener, rural parts of Texas (Zora et al., 2013). However, these findings help to highlight the issues of residents living in urban Texas, which is where a lot of single-parent families live with their children due to the easier access to employment.

In relation to healthcare in Texas, there may be greater difficulties accessing urgent medical care in the event of an asthmatic attack. As previously highlighted, Texas suffers from high air pollution, which can be detrimental to individuals with asthma. Researchers highlighted that there is a strong relation between the volume of harmful ozone emissions and hospital admissions in Texas (Patel et al., 2020). Although the same relationship could be observed in other states, hospitals in Texas are often situated in areas of high traffic congestion (Patel et al., 2020). Similarly, exposure to traffic pollution and heavy border traffic pollution in Texas can be a burden to public medical services (Zora et al., 2013). As previously stated, single-parent families already suffer from a decreased access to resources such as medical services. Because public medical services may be overwhelmed with patients as a result of the chronic air pollution in Texas means that single-parent families will suffer from a greater challenge in an event of urgent medical emergency.

The prevalence of air pollution in Texas is highlighted in the fact that even the medical staff suffer from higher asthmatic symptoms. For instance, Patel et al. (2020) discovered that in hospitals in Texas, nurses experienced higher levels of asthma and bronchial hyperresponsiveness, which can increase the severity of asthmatic symptoms. The researchers highlighted the link between the air pollution in Texas as the main reason

for this phenomenon (Patel et al., 2020). Although it is common for nurses to be exposed to other harmful chemicals that could increase their vulnerability to asthmatic symptoms, these findings help to highlight the severity of the air pollution in Texas that affects even the nurses working in hospital. What is more significant is the fact that if nurses are affected by the air pollution, then the asthmatic patients can be even more vulnerable. Similarly, pre-existing conditions such as asthma can be worsened through work-related factors, or through spending time in harmful environments such as hospitals (Zu et al., 2017). Thus, the problem of asthma management and prevalence in Texas is a significant one.

As highlighted by previous findings, air pollution in Texas can act as a trigger for asthma in children and parents alike. However, there is further evidence to suggest that air pollution in Texas contributed to other harmful effects. For instance, Zu et al. (2017) highlighted the fact that long-term exposure to harmful particles in the air and pollution contribute to lung function deterioration, greater susceptibility to immunological triggers which can cause asthma, airway inflammation, oxidative damage, or bronchial hyperreactivity. Although these illnesses are different to asthma, these all cause some form of damage to the airways and ability to breathe, which can increase the likelihood of developing wheezing (Zu et al., 2017). Wheezing is a factor significantly associated with asthma, and if left managed can contribute to an asthmatic attack (Zora et al., 2013). Thus, air pollution can cause long-term harm to the airways, which over time can make some pre-asthmatic, or worsen their pre-existing asthmatic condition.

Socioeconomic Factors. The previous sections highlighted the fact Texas suffers from high traffic congestion and air pollution. Previous sections have also highlighted that single-parent families are more likely to live in close proximity to roads and subsequently become more vulnerable to harmful pollution exposure. However, socioeconomic factors can play a role in these circumstances. For instance, findings by Zora et al. (2013) highlighted the fact that socioeconomic factors affected the individuals' access to care in Texas. Similarly, children from poorer socioeconomic factors may be less likely to be medically insured in Texas (Zora et al., 2013). The reason that this finding is significant for Texas is the fact that prevalence of asthma is higher among individuals from lower socioeconomic backgrounds in Texas (Zu et al., 2017). As a result of being from poor socioeconomic background, many single-parent families are unable to move away from housing that is situated to a close proximity to roads, thus continuously exposing their children to harmful air pollution. Similarly, poor socioeconomic status means that the single-parent families are less likely to be medically insured or have access to adequate healthcare in Texas. Therefore, if these single-parent families have children suffering from asthma, not only would they be exposed to the environment that can trigger their asthma, but they will face greater challenges of seeking urgent medical help.

Regional Disparities. As previously highlighted, some areas of Texas can be more congested and harmful than others in relation to air pollutants. Urban areas of Texas and cities were found to suffer from a greater prevalence of asthma than more rural areas (John et al., 2020). Similarly, as a result of the regional disparity of asthma in Texas,

there is a greater knowledge disparity about the treatment and management of asthma across different regions (John et al., 2020). The reason for this is that many areas suffer from greater cases of asthma due to traffic congestion and air pollution, which increases the urgency for education and knowledge about asthma management. On the other hand, more isolated and greener areas of Texas may be less exposed to the harmful impacts of air pollution; thus, knowledge about asthma can be less prevalent (John et al., 2020). Other researchers discovered that many parents reported having lower levels of knowledge about asthma triggers and asthma management (Agusala et al., 2018; Stern et al., 2020). This lack of knowledge poses a significant risk for asthmatic children, as parents may be less informed on how to monitor daily symptoms of asthma. The significance of regional disparities in knowledge about asthma is that if there is limited access to knowledge on asthma management where the single-parent families live; this means that the parent will be less prepared to control asthma in their children.

Assumptions

Assumptions are foundational aspects of a study that cannot be tested and must be assumed to hold true (Bruce et al., 2018). There were several assumptions underlying this study. First, it was assumed that a quantitative, historical study would provide insight into the issues surrounding pediatric asthma. This assumption was justified by the body of prior research using similar methods to study asthma. Secondly, it was assumed that participants responded completely and accurately to the original BRFSS survey. This assumption was justified by the elaborate and methodical way in which it was carried out. Finally, it was assumed that there would be meaningful insights drawn from the potential

association between sociodemographic factors and pediatric asthma. This assumption was inherent in the use of the social ecological model as the study's theoretical foundation, as the theory postulated the importance of identifying individual and combined risk factors for public health issues to address them through multilevel solutions.

Scope and Delimitations

Delimitations are boundaries deliberately placed on the scope of a study to keep it feasible and relevant (Peat et al., 2020). There were several delimitations in this study. First, the present study was delimited to the study of pediatric asthma because it was unique vis-à-vis adult asthma in the sense that children had significantly less agency in avoiding, minimizing, or worsening the risk factors for asthma. Secondly, the study was delimited to the state of Texas in order to address pediatric asthma in an area where the problem was highly relevant and to localize the results enough to offer greater applicability. Finally, the study was delimited to sociodemographic factors because these factors represented contexts in which anti-asthma interventions could be addressed according to the social ecological model guiding the study.

Limitations

Limitations are weaknesses or drawbacks to a study (Bruce et al., 2018). There were also several important limitations to this study. The first was the availability of data. Although the BRFSS collected data annually, the pediatric asthma module was optional and had not been collected in Texas recently. As a result, only older data were available. However, no other dataset of significant size containing more recent data could be identified. Secondly, the study was limited by self-reported data on the part of the

participants. This limitation was unavoidable when addressing data such as these, as there was no fully objective way to measure any of the variables without access to private data such as healthcare records. Finally, the present study was limited in that it did not consider all possible sociodemographic predictors of pediatric asthma. However, the chosen predictors were synthesized from a combination of the existing literature and what data were available for use.

Significance

The present study has academic significance in the sense that it addresses multiple calls for further research. Firstly, Serebrisky and Wiznia (2019) called for further research into how asthma programming can be made more efficient and cost effective. The present study can contribute insights into how to target asthma programming more tightly in Texas. Secondly, Perry et al. (2019) emphasized the need to further understand the patterns behind pediatric asthma in order to better prepare and allocate healthcare resources for those suffering from asthma, a goal that the present study advances. Finally, and most directly, Ferrante and La Grutta (2018) called for more research that addresses and seeks to better understand the risk and protective factors for pediatric asthma, which the present study did by addressing risk factors in the context of Texas.

A significant number of deaths and other harms from pediatric asthma could be prevented through better identification and diagnosis of the disease (WHO, 2021). Hence, there is great value in understanding which communities and contexts these efforts should focus on. Addressing pediatric asthma at the community and context level is likely of increasing importance going forward, especially given that the ongoing COVID-19

pandemic and future endemicity of the respiratory disease make asthma an even more significant health risk (Papadopoulos et al., 2020). New communications methods offer valuable ways of disseminating information regarding pediatric asthma (Ramsey et al., 2020), but effective use of these novel methods requires better knowledge of where they should be targeted. Overall, the results of the present study may contribute to positive social change by helping target early diagnosis and treatment interventions for pediatric asthma, improving both children's health outcome and decreasing the financial and quality-of-life burden of the disease.

Summary and Conclusions

In summary, the purpose of this quantitative historical non-experimental correlational study was to examine what relationship, if any, existed between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predicted health-related quality of life. This research purpose was in turn addressed by answering three quantitative research questions, namely (a) RQ1: What relationship, if any, exists between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas while controlling for other sociodemographic factors? and (b) Is there a significant association between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for

sociodemographic factors? The study was guided by the social ecological model of public health, a theoretical framework that helped break down the different contextual risks and offered a way of understanding the interaction of different ecological contexts. The present study has both practical and academic significance.

This section offered an overview of the study. In addition, it contained the literature review that addressed the research problem and theoretical context in detail. Having laid out these key aspects of the study, the next section, Section 2, addresses the methodological dimensions of the present study.

Section 2: Research Design and Data Collection

To reiterate, the purpose of this quantitative, historical, and non-experimental correlational study was to examine what relationship, if any, existed between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predicted health-related quality of life. This section addresses how that research purpose is achieved, beginning with a discussion of the research method and design as well as why these are chosen. Next, the section addresses key methodological issues, including the population, sampling, instrumentation, operationalization of variables, and data analysis plan. Second 2 concludes with a discussion of the threats to validity, research ethics, and a summary of key points.

Research Design and Rationale

To recall, the research questions guiding the present study were the following:

RQ1: What relationship, if any, exists between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas while controlling for other sociodemographic factors?

H01: There is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

Ha1: There is a statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

RQ2: Is there a significant association between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors?

H02: There is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Ha2: There is a statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Within these research questions were three independent variables, one dependent variable, and a set of control variables. The independent variables were single parenting, low family income, and asthma prevalence. The dependent variables were asthma prevalence in children and health-related quality of life. The control variables comprised

other sociodemographic factors. These variables were addressed using a quantitative, historical, and non-experimental correlational research design. The use of a quantitative methodology was necessitated by the field of public health, which addresses issues at scale (Bruce et al., 2018). Because scale and population-level issues were key, large scale, closed-ended quantitative data were necessary as opposed to more in-depth, individually focused qualitative data.

A quantitative methodology also allowed for the use of existing datasets of secondary data, which was valuable given that representative population-level data were difficult to directly collect. A quantitative research methodology uses numerical data that allows for statistical analyses, helps reduce biases, and is based on an objectivity paradigm (Bowers, 2017). Quantitative research measures include statistical, mathematical, or numerical analyses of data collected through questionnaires and surveys, or by the manipulation of pre-existing statistical data using computational techniques.

Within the larger quantitative paradigm of research, the study was non-experimental and historical. As noted, public health data are typically large scale and must be representative (Bruce et al., 2018). This makes secondary data ideal as government agencies and other public health bodies collect data on the necessary scales. However, research using secondary data can only be non-experimental in nature because experimental research requires that the researcher manipulate variables during the data collection (Peat et al., 2020).

To address the specific research questions guiding this study, a non-experimental quantitative method with a correlational design was the correct design for the current study because the objective was to identify and evaluate the relationship between the dependent variables, and the independent variables. Correlational research is used to assess the relationships between variables in a non-experimental context (Bruce et al., 2018). Although such research cannot show causation, it can demonstrate strong and practically relevant correlational or association links between variables using real-world data (Peat et al., 2020) This made the correlational research design appropriate to this study, as both research questions pertained to the relationships between variables.

Methodology

Population

The overall population of this study was children in the United States who had asthma. According to the Center for Disease Control and Prevention (CDC, 2017), about 8.3 million children in the United States of America have asthma. In 2018, the percent of children under age 18 years who had asthma was 7.5%. (CDC, 2018). Within this population, the specific target population was children in Texas with asthma. Per the CDC (2018), the rate of asthma for children matches or exceeds the national average for every individual age group from 0-17.

Sampling

The present study used data from the Behavioral Risk Factor Surveillance System (BRFSS) dataset from the most recent period with Texas pediatric asthma data, 2006-2010. The BRFSS (2020) is an annual survey of health and risk factors using a nationally

representative random sample. The sample was stratified by state, with each state involving individual random sampling. The BRFSS may oversample some populations of particular interest for health outcomes, but this oversampling is adjusted for in creating overall values and can similarly be adjusted for by weighting in any analysis using the dataset (BFRSS, 2020). For the 2006-2010 period, the pediatric asthma dimension of the BRFSS comprised a sample of 760 children with lifetime asthma in Texas. Per a G*Power analysis, this met and exceeded the minimum sample size of 77 needed to achieve an 80% statistical power, 0.05 significance level, and medium effect size (f^2 = 0.15). The G*Power analysis was conducted using a multiple linear regression model as a substitute for the multiple logistic regression due to the unavailability of key parameters to use G*Power for the multiple logistic regression directly. Another rule of thumb suggested approximately 100 plus 50 for each independent variable (Bujang et al., 2018). By that rule, the study would have required 300 participants, which was still well below the available datapoints.

Instrumentation

The instrumentation for the study was the BRFSS surveys, including both general BRFSS surveys for 2006-2010 and Asthma Call-Back Survey for 2006-2010. These surveys addressed key issues related to health behaviors and risk factors at the national and state levels (BRFSS, 2021). Although the BRFSS primarily addressed adults, the survey contained an optional state-level module for children that included key issues such as pediatric asthma. A particular asthma-focused dimension of the BRFSS included the Asthma Call-Back Survey (ACBS), which was used to obtain further data from

respondents indicating their child has asthma. Texas participated in the ACBS in the 2006-2010 period, but not in the more recent periods. Hence, the 2006-2010 data were the most recent available for Texas. The BRFSS contained items that measured key constructs directly (BRFSS, 2021). A sample question was, "Has a doctor, nurse, or other health professional ever said that the child has asthma?" Because of their nature in innately measuring the variables, the items were presumed to have perfect reliability and validity barring clerical error. The BRFSS was also an annual, national survey that had been repeatedly iterated upon.

Operationalization

The present study contained four key variables:

***Single Parenting* – 2009 – 54; 2010 - 54**

Single parenting was measured in terms of the parent's marital status, as reported in the BRFSS demographic factors section. This variable was dichotomous, reflecting whether the parent's marital status is married and living together. Hence, single parenting was defined as a dichotomous variable using data from the overall BRFSS dataset for 2006-2010.

***Financial Difficulties-Low Family Income* – 2009 – 418; 2010 - 404**

The variable of financial difficulties was measured using the BRFSS's income variable. Income was measured as a continuous variable based on the data, but the specific cutoff points for financial difficulties such as poverty level were considered when interpreting the results as they relate to the numerical value of this variable. In particular, the federal-level Health and Human Services guidelines from 2010 were used

to determine poverty based on income and number of people in the household, with a poverty level of $10,830 for one person, $14,570 for two, $18,310 for three, $22,050 for four, and so on, increasing by $3,740 per additional household member. These data were retrieved from the standard BRFSS dataset for 2006-2010.

Asthma Quality-of-Life

Data on health-related QoL, a key outcome in RQ2, were not available directly in the BRFSS. Instead, health-related QoL was proxied by two asthma-related factors that the BRFSS did include, namely "symptoms free days" and "number of episodes/attacks." These two factors were treated as dimensions of health-related QoL. The actual QoL variable was created as an index of the normalized scores on these two dimensions to have an overall score as well:

- symptom free days – 2009 – 477; 2010 - 447
- number of episodes/attacks – 2009 – 479; 2010 - 449

Other Sociodemographic Factors

Three key sociodemographic were included as dimensions of this variable, namely parental education level, parental race, and parental ethnicity. Parental education level was a categorical variable reflecting the highest education level obtained by any parent currently living with the child. Ethnicity was a dichotomous variable measured as Hispanic or non-Hispanic. Race was a categorical variable using the racial categories used by the U.S. Census Bureau, as included in the demographic variables collected for the BRFSS.

- parental education level – 2009 – 56; 2010 - 56

- parental race – 2009 – 401; 2010 - 387
- parental ethnicity – 2009 – 403 (compute); 2010 – 389 (compute)

***Asthma* – 2009 – 296; 2010 - 267**

Pediatric asthma was assessed directly using the BRFSS data, as the answer to the item "Has a doctor, nurse, or other health professional ever said that the child has asthma?" The variable was dichotomous and drawn from the overall BRFSS dataset for 2006-2010. Using only the ACBS responses would result in an incidence rate of 100%.

Preventative Measures

Preventative measures for asthma included two factors, namely use of air-cleaner and a given action plan by health care providers. These two factors were both dichotomous variables. As they were specific pediatric asthma prevention strategies, these preventative items were taken from the ACBS responses for 2006-2010 rather than the overall BRFSS dataset.

- air cleaner – 2009 – 500; 2010 - 470
- given action plan – 2009 – 498; 2010 - 468

Data Analysis Plan

The data analysis for the present study comprised descriptive statistics and sought to answer the two research questions through a multiple logistic regression analysis. Once the data were retrieved from the original dataset, they were loaded into SPSS Version 28 statistical analysis software for analysis. As a first step, the data were cleaned by removing any datapoints with missing data; if a value was missing, the entire case was

removed from the analysis (listwise deletion). In listwise deletion, a case was dropped from analysis because it had a missing value in at least one of the specified variables.

Once the data were cleaned, they were run through a descriptive analysis. Descriptive statistics of the data for the predictor and dependent variables were reported. Frequency and percentages summary were obtained for categorical variables, while the measures of central tendencies of means, and standard deviations and minimum and maximum values were conducted for continuous variables. These results were presented in the forms of tables and charts.

Then, because the dependent variable was a binary categorical one (asthma yes/no), the data were analyzed using binary logistic regression to answer RQ1 (Shipe et al., 2019). The assumptions of logistic regression, namely the independence of observations and a lack of outliers, were tested. Regression models' goodness of fit and explained variation of the dependent variable were evaluated by interpreting Hosmer-Lemeshow test and Cox & Snell *R* Square, as well as Nagelkerke *R* Square values, respectively. Odds ratios and *p* values were reported for each predictor included in the regression models. The level of statistical significance was set at 0.05 (5%). To control for the base sociodemographic factors, a hierarchical model was employed, whereby the three sociodemographic controls were used to develop an initial model. Then, the independent variables were added and the Hosmer-Lemeshow test and Cox & Snell *R* Square, as well as Nagelkerke *R* Square values were used to determine if the combined model contains any additional information.

Then, in the second RQ, the independent variables were both dichotomous (use of air-cleaner and a given action plan by health care providers), whereas the outcome was continuous (composite variable measuring asthma-related QoL). This meant that RQ2 was answered using a hierarchical multiple linear regression model, as multiple linear regression allowed for categorical predictors, and binary predictors were a sub-category of categorical predictors. This model was developed parallel to the analysis model for RQ1, except with a hierarchical multiple linear regression instead of a multiple logistic regression, with the multiple *R*-squared value being used to assess goodness of fit, and the coefficient of regression being used to assess individual predictors. As in RQ1, coefficients of regression and *p* values were reported for each predictor included in the regression models. The level of statistical significance was set at 0.05 (5%).

Threats to Validity

Validity consists of two types: external and internal validity. Validity is a key concern in all research. In quantitative research, two types of validity are considered, internal validity and external validity (Bruce et al., 2018). Internal validity refers to the validity of the findings within the research study (Peat et al., 2020). Internal validity issues relate to ensuring the results accurately reflect what was set out to be studied. To avoid threats to internal validity, the present study was carefully aligned. The research problem gave rise to the research purpose, and the research questions operationalize the research purpose. In turn, the BRFSS was chosen as the source of secondary data precisely because it contained data suited to answering the research questions. For this study, the specific factors of interest were all measured through direct measurements,

meaning that there was no significant concern that the variables were measured by an instrument that did not adequately reflect the underlying concept. One potential issue was the necessity of using a proxy to measure illness quality of life. Though the specific variables captured a notion of illness or health-related quality of life more than an overall measure, this was an aspect of quality of life that was most directly relevant aspect of quality of life. Still, it is important to note the use of this proxy, and its use is highlighted in the results and limitations.

External validity refers to the degree to which the results of the study can be generalized to the population (Bruce et al., 2018). The present study confirmed external validity based on two reasons. Firstly, the present study's sample size met and exceeded the minimum necessary sample size indicated by a G*Power analysis, as discussed in the sampling section. Secondly, the BRFSS dataset used for the study was nationally representative and stratified at the state level. Consequently, the sample used in the present study was representative of the state of Texas and is generalizable as a result.

Ethical Procedures

Because an existing dataset was used, this study did not require informed consent procedures, and Walden IRB approval was needed. Data were retrieved from the publicly available BRFSS dataset. These data were collected annually from a nationally representative sample stratified at the state level. Moreover, the data were collected anonymously as a part of the BRFSS and posted publicly in the aggregate with no identifiers attached. In addition, as a part of the original data collection, the BRFSS data involved informed consent where appropriate. Overall, the anonymity, secondary nature,

and public nature of the data were such that the present study posed no ethical risk to the participants. In addition, the public and quantitative nature of the data should help ensure the study was accurate and free of bias, as any interested party could have chosen to download the data and repeat the analysis themselves.

Summary

In summary, the purpose of this quantitative, historical, and non-experimental correlational study was to examine what relationship, if any, existed between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predicted health-related quality of life. This section addressed how that purpose was carried out. For this study, the independent variables were single parenting, low family income, and asthma preventative measures. The dependent variables were asthma prevalence in children and asthma-related quality of life. The control variables comprised other sociodemographic factors. These variables were examined through a quantitative methodology and a historical non-experimental correlational research design. The overall population of this study was children in the United States who have asthma. The target population was children in Texas with asthma. The sample included the participants of the 2006-2010 BRFSS in Texas, comprising 760 children. Data were analyzed using multiple logistic regression. The research addressed issues of validity and was conducted in an ethically sound fashion.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative, historical, and non-experimental correlational study was to examine what relationship, if any, existed between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predicted health-related quality of life. Two research questions and associated hypotheses guided the study:

RQ1: What relationship, if any, exists between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas while controlling for other sociodemographic factors?

H01: There is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

Ha1: There is a statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

RQ2: Is there a significant association between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors?

H02: There is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Ha2: There is a statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Section 3 begins with a discussion of the secondary data used in the study, the general BRFSS survey for 2006-2010 and the Asthma Call-Back Survey for 2006-2010. Details related to accession of the data are provided, along with the results of descriptive statistical analyses used to summarize the data set. Next is the main results section, which will contain additional descriptive statistics for the sample and the findings that emerged from analyses to test the study's hypotheses. Section 3 will conclude with a summary.

Accessing the Data Set for Secondary Analysis

This study included data from the Behavioral Risk Factor Surveillance System (BRFSS) dataset from the most recent period with Texas pediatric asthma data, 2006-2010. The BRFSS (2020) is an annual survey of health and risk factors based on a nationally representative random sample. The sample is stratified by state, with each state involving individual random sampling. The BRFSS may oversample some populations of

particular interest for health outcomes, but this oversampling is adjusted for in creating overall values and can similarly be adjusted for by weighting in any analysis using the dataset (BFRSS, 2020). After obtaining the dataset, key variables for the study were selected. The study included four key variables namely single parenting, financial difficulties, asthma quality of life, and sociodemographic variables such as parental education level and parental race/ethnicity. Data were also collected on pediatric asthma and preventive measures of participants. The variables were cleaned for missing values and were coded numerically to prepare for data analyses.

Results

For research question 1, BFRSS data including patients not diagnosed with asthma were included. A total of 4478 data were included. All 4,478 patient data were from the state of Texas. Frequencies and percentages of demographic characteristics are presented in Table 1. For education level, 36.1% of participants are college graduates (n = 1,615), 23.4% of participants have some college or technical school (n = 1,047), and 23% of participants are high school graduates (n = 1,029). For the income level, 1,460 participants have incomes of $75,000 or more (32.6%), 582 participants have incomes from $50,000 to $75,000 (13%), and 504 participants have incomes from $25,000 to $50,000 (11.3%). The majority of the participants were not diagnosed with pediatric asthma (n = 3,880, 86.6%), and only 598 participants were diagnosed with pediatric asthma (13.4%). In terms of race, most participants were Hispanics (n = 2,026, 45.2%) and White only, non-Hispanic (n = 1,944, 43.4%). For the poverty status, 3209 participants were not classified as low family income (71.7%). Moreover, for the single

parenting variable, 3,347 participants were not in a single-parenting family setup (74.7%).

Table 1

Frequencies and Percentages of Demographic Characteristics

		Frequency	Percent
Education Level	Never attended school or only kindergarten	5	.1
	Grades 1 through 8 (Elementary)	363	8.1
	Grades 9 through 11 (Some high school)	419	9.4
	Grade 12 or GED (High school graduate)	1029	23.0
	College 1 year to 3 years (Some college or technical school)	1047	23.4
	College 4 years or more (College graduate)	1615	36.1
	Total	4478	100.0
Income Level	Less than $10,000	365	8.2
	Less than $15,000	315	7.0
	Less than $20,000	412	9.2
	Less than $25,000	436	9.7
	Less than $35,000	404	9.0
	Less than $50,000	504	11.3
	Less than $75,000	582	13.0
	$75,000 or more	1460	32.6
	Total	4478	100.0
Pediatric Asthma Diagnosis	Yes	598	13.4
	No	3880	86.6
	Total	4478	100.0
Race/Ethnicity	White only, non-Hispanic	1944	43.4
	Black only, non-Hispanic	326	7.3
	Asian only, non-Hispanic	115	2.6
	Native Hawaiian or other Pacific Islander only, Non-Hispanic	8	.2
	American Indian or Alaskan Native only, Non-Hispanic	18	.4
	Other race only, non-Hispanic	3	.1
	Multiracial, non-Hispanic	38	.8
	Hispanic	2026	45.2
	Total	4478	100.0
Poverty status	Yes	1269	28.3
	No	3209	71.7
	Total	4478	100.0
Single Parenting	No	3347	74.7
	Yes	1131	25.3
	Total	4478	100.0

RQ1: What relationship, if any, exists between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas while controlling for other sociodemographic factors?

H01: There is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

Ha1: There is a statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

To address the first research question, a binary logistic regression considering the pediatric asthma diagnosis variable as the dependent variable and single parenting and poverty status as predictors. The variables education and race are considered as control variables in the analysis. Prior to conducting the analysis, it is essential to ensure that the assumptions of a binary logistic regression are met. First, the dependent variable is binary. For this study, the dependent variable is coded as 1 for asthma diagnosis, and 2 for no asthma diagnosis. Second, there is no multicollinearity in the predictor variables. The variance inflation factors ranged from 1.046 to 1.522, which is below the value of 10 indicating that there is no multicollinearity in predictors. Third, the observations are independent. The Durbin-Watson statistic was computed as 1.206, which is within the range of 1.5 to 2.5 indicating that the observations are independent. Fourth, there are no extreme outliers; however, since the data are categorical in nature, there are no outliers in the dataset. Thus, all assumptions of binary logistic regression are met.

Table 2

Variance Inflation Factors

Model		Collinearity Statistics	
		Tolerance	VIF
	Poverty Status	.683	1.464
	Single Parenting	.956	1.046
	Education Level	.657	1.522
	Race/Ethnicity	.772	1.295

The result of the binary logistic regression is presented in Table 3. As observed, single parenting variable is a significant predictor of pediatric asthma diagnosis (B = .398, $p < .001$). The result determined that a change in category from non-single parenting to single parenting increases the pediatric asthma diagnosis by .398. Categories of race/ethnicity such as Whites only, non-Hispanic ($p = .023$), Blacks only, non-Hispanic ($p = .044$), and Asian only, non-Hispanic ($p < .001$) are significant covariates of the dependent variable. The Hosmer and Lemeshow test determined that the model is insignificant in predicting the pediatric asthma diagnosis of patients. Moreover, the model explains only 2.1% of the variance in the pediatric asthma diagnosis based on the Nagelkerke R-square value. The result determined that there is sufficient evidence to reject the null hypothesis that stated that there is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

Table 3

Binary Logistic Regression Results

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Poverty(1)	.047	.119	.154	1	.695	1.05
	SingleParenting(1)	.398	.101	15.536	1	.000	1.49
	Education			4.568	5	.471	
	Education(1)	19.259	17937.171	.000	1	.999	231222936.00
	Education(2)	.186	.218	.733	1	.392	1.20
	Education(3)	-.041	.183	.050	1	.823	0.96
	Education(4)	.049	.129	.146	1	.703	1.05
	Education(5)	-.165	.117	1.995	1	.158	0.85
	Race			16.292	7	.023	
	Race(1)	-.218	.108	4.069	1	.044	0.80
	Race(2)	-.574	.158	13.144	1	.000	0.56
	Race(3)	.280	.345	.660	1	.416	1.32
	Race(4)	19.224	14164.832	.000	1	.999	223398787.78
	Race(5)	-.367	.640	.329	1	.566	0.69
	Race(6)	19.499	23185.234	.000	1	.999	294091648.56
	Race(7)	.219	.537	.167	1	.683	1.25
	Constant	1.731	.139	154.487	1	.000	5.64

a. Variable(s) entered on step 1: Education, Race.

For the second research question, data were isolated to cases with pediatric asthma diagnosis. Variables of using air cleaner, given asthma action plan, and asthma quality of life were also included in the analyses. Among the 598 pediatric asthma cases, 221 did not have data on variables included for the second research question. Thus, a total of 377 patient data were included from the BFRSS dataset. All 377 patient data were from the state of Texas and had pediatric asthma diagnoses. Frequencies and percentages are presented in Table 4. As observed, 169 patient data were from year 2009 (44.8%), and 208 patient data were from year 2010 (55.2%). Among the participants, about 25%

were in a single-parenting household (n = 96). In terms of education level, about 46.7% are college graduates (n = 176), while 24.7% have some college or technical school (n = 93). For the race/ethnicity, 200 participants were White only and non-Hispanic (53.1%), while 124 participants were Hispanics (32.9%). In terms of income level, 195 participants have incomes above $50,000 (51.7%).

Table 4

*Frequencies and Percentages of Demographic Characteristics (*N = *377)*

		Frequency	Percent
ACBS	2009	169	44.8
Year	2010	208	55.2
	Total	377	100.0
Single	Non-Single Parent	281	74.5
Parenting	Single Parent	96	25.5
	Total	377	100.0
Education	Never attended school or only kindergarten	1	.3
Level	Grades 1 through 8 (Elementary)	21	5.6
	Grades 9 through 11 (Some high school)	16	4.2
	Grade 12 or GED (High school graduate)	68	18.0
	College 1 year to 3 years (Some college or technical school)	93	24.7
	College 4 years or more (College graduate)	176	46.7
	Missing	2	.5
	Total	377	100.0
Race/Ethni	White only, non-Hispanic	200	53.1
city	Black only, non-Hispanic	31	8.2
	Asian only, non-Hispanic	7	1.9
	American Indian or Alaskan Native only, Non-Hispanic	3	.8
	Multiracial, non-Hispanic	5	1.3
	Hispanic	124	32.9
	Missing	7	1.9
	Total	377	100.0
Income	Less than $15,000	36	9.5
	$15,000 to less than $25,000	49	13.0
	$25,000 to less than $35,000	29	7.7
	$35,000 to less than $50,000	37	9.8
	$50,000 or more	195	51.7
	Missing	31	8.2
	Total	377	100.0

Preventative measures for asthma include two factors, namely use of air-cleaner and a given action plan by health care providers. These two factors were both dichotomous variables. Frequencies and percentages of participants' responses are presented in Table 5. About 44.3% of participants have an asthma action plan (n = 167), while 54.1% have no asthma action plan (n = 204). Only 28.4% of participants are using an air cleaner (n = 107), while 71.4% of the participants are not using an air cleaner (n = 269).

Table 5

Frequencies and Percentages of Preventive Measures Variables

		Frequency	Percent
Asthma Action Plan	Yes	167	44.3
	No	204	54.1
	Total	371	98.4
Missing	System	6	1.6
Total		377	100.0
Air Cleaner Used	Yes	107	28.4
	No	269	71.4
	Total	376	99.7
Missing	System	1	.3
Total		377	100.0

Asthma-related quality of life was measured using two variables namely symptom-free days and number of episodes/attacks. The descriptive statistics of the variables are presented in Table 6. Symptom-free days has a mean score of 12.17 (SD = 3.759) with a range of score from 0 to 14. The number of episodes or attacks has a mean of .85 (SD = 3.295) with a range of 0 to 45. An overall score was calculated from the two variables to measure quality of life for the study. The overall QOL score was calculated as the sum of the normalized values of symptom-free days and number of

episodes/attacks. Overall QOL has a mean of 13.003 (SD = 2.722) with a range of 3.84 to 21.00.

Table 6

Descriptive Statistics of the Asthma-Related Quality of Life Variables

	N	Min	Max	*M*	*SD*
Symptom-free Days	374	0	14	12.17	3.759
Number of Episodes/Attacks	375	0	45	.85	3.295
QOL	371	3.84	21.00	13.003	2.722

RQ2: Is there a significant association between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors?

H02: There is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

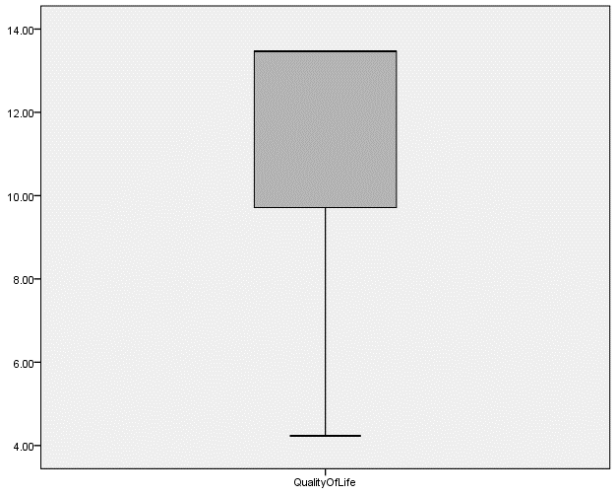
Ha2: There is a statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

To address the second research question, a hierarchical linear regression analysis was conducted to consider overall asthma QOL as the dependent variable. The predictors are the use of air-cleaner and given an action plan variables. Sociodemographic variables are also considered as control variables in the analysis. Prior to conducting the analysis, assumptions of a hierarchical linear regression analysis were tested.

The assumptions of the hierarchical linear regression analysis include the assumptions on outliers, normality of residuals, independence, and multicollinearity. To check the assumption on outliers, a boxplot was generated to determine whether there are significant outliers with the QOL variable. The result is presented in Figure 2. As observed, there is no significant outlier in the dataset. Thus, the assumption on outlier is met.

Figure 2

Boxplot of QOL Variable

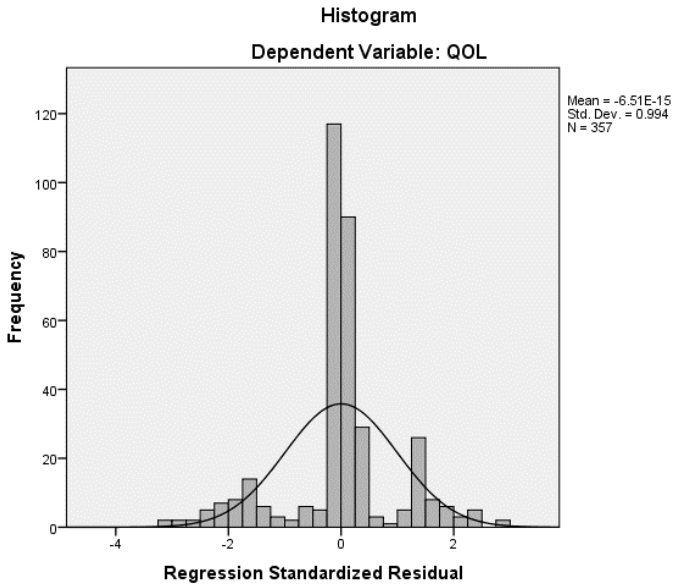


The assumption on normality of residuals is checked using the histogram of residuals. Figure 3 presents the histogram for normality of residuals. As observed, the

residuals are normally distributed. Therefore, the assumption on normality of residuals is met.

Figure 3

Histogram of Residuals



To check the assumption on multicollinearity, the variance inflation factor was used to determine whether there is multicollinearity in the predictor variables. The variance inflation factors are presented in Table 7. As observed, the VIF values are below the value of 10 indicating that the assumption on multicollinearity is met. Moreover, the Durbin-Watson statistic was used to determine whether the assumption on independence was met. The Durbin-Watson statistic was computed as 1.854, which is within the range of 1.5 to 2.5. Thus, the assumption on independence is also met.

Table 7

Variance Inflation Factors

	Collinearity Statistics	
	Tolerance	VIF
Given an Asthma Action Plan	.932	1.073
Air Cleaner Used	.938	1.066
Parental Education Level	.864	1.157
Parental Race/Ethnicity	.861	1.162

After checking for the assumptions, the hierarchical linear regression analysis was conducted. The first model included the predictors air cleaner used and given asthma action plan. The second model included the control variables of parental education level and parental race/ethnicity. The ANOVA results are presented in Table 8. As observed, the model is insignificant in predicting the dependent variable of overall QOL. Therefore, the predictors are insignificant in predicting the dependent variable.

Table 8

ANOVA Result of the Hierarchical Linear Regression Analysis

Model		Sum of Squares	df	Mean Square	F	*p*
1	Regression	.545	2	.273	.037	.964[b]
	Residual	2631.148	354	7.433		
	Total	2631.693	356			
2	Regression	69.413	4	17.353	2.384	.051[c]
	Residual	2562.279	352	7.279		
	Total	2631.693	356			

a. Dependent Variable: QOL
b. Predictors: (Constant), Air Cleaner Used, Given an Asthma Action Plan
c. Predictors: (Constant), Air Cleaner Used, Given an Asthma Action Plan, Parental Education Level, Parental Race/Ethnicity

Table 9 presents the regression coefficients of the predictors and the control variables in the hierarchical linear regression analysis. The results of the analysis determined that the predictors given an asthma action plan (B = .085, p = .776) and air

cleaner used (B = -.013, p = .969) are not significant predictors of QOL. The control variable parental education level (B = .264, p = .045) is significant in predicting the QOL of participants. Therefore, there is insufficient evidence to reject the null hypothesis, which stated that there is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Table 9

Result of the Hierarchical Linear Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
		B	Std. Error	Beta		
1	(Constant)	13.173	.664		19.831	.000
	Given an Asthma Action Plan	-.022	.297	-.004	-.073	.942
	Air Cleaner Used	-.079	.329	-.013	-.239	.811
2	(Constant)	11.823	1.033		11.449	.000
	Given an Asthma Action Plan	.085	.297	.016	.285	.776
	Air Cleaner Used	-.013	.328	-.002	-.039	.969
	Parental Education Level	.264	.131	.114	2.013	.045
	Parental Race/Ethnicity	-.071	.047	-.084	-1.489	.137

Summary

The purpose of this quantitative, historical, and non-experimental correlational study was to examine what relationship, if any, exists between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predict health-related quality of life. The

data included both the general BRFSS surveys for 2006-2010 and Asthma Call-Back Survey for 2006-2010. For the first research question, the result of the binary logistic regression determined that single parenting is a significant predictor of pediatric asthma diagnosis. Thus, there is sufficient evidence to reject the null hypothesis, which stated that there is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

For the second research question, the result of the hierarchical linear regression analysis determined that both given action plan and use of air cleaner are insignificant predictors of the QOL of participants. Therefore, there is insufficient evidence to reject the null hypothesis which stated that there is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative, historical, and non-experimental correlational study was to examine what relationship, if any, exists between the predictors of single parenting, and low family income and the outcome of asthma prevalence among children in Texas, as well as whether asthma common preventive measures (use of air cleaner and an action plan given by health care providers) predict health-related quality of life. Data were collected using Behavioral Risk Factor Surveillance System (BRFSS) surveys from 2006-2010 and Asthma Call-Back Surveys from 2006-2010. For research question one, the result determined there was sufficient evidence to reject the null hypothesis, which stated there is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas, while controlling for other sociodemographic factors. For research question two, there was insufficient evidence to reject the null hypothesis, which stated there is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas, while controlling for sociodemographic factors. This chapter provides interpretations of the findings, a discussion of the limitations of the study, recommendations, implications for professional practice and social change, and a conclusion to the study.

Interpretation of the Findings

The following subsections present the findings for research questions one and two. In addition, the results are interpreted within the context of existing literature and the theoretical framework. As a reminder, the research questions and hypotheses that guided this study were as follows:

RQ1: What relationship, if any, exists between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas while controlling for other sociodemographic factors?

H01: There is no statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

Ha1: There is a statistically significant relationship between the predictors of single parenting and low family income and the outcome of asthma prevalence among children in Texas controlling for other sociodemographic factors.

RQ2: Is there a significant association between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors?

H02: There is no statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite

variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Ha2: There is a statistically significant relationship between the predictors of asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and the outcome of asthma-related quality of life (measured by a composite variable related to asthma symptoms and attacks) among children in Texas controlling for sociodemographic factors.

Research Question 1

The results of hypothesis testing for research question 1 revealed that relationships exist between single parenting and low family income and the prevalence of asthma among children in Texas after controlling for other sociodemographic factors. In a general sense, these findings align with existing evidence that poverty is linked to poor health outcomes among children (Booysen et al., 2021), as well as the theoretical framework for this study (SEM). The findings align with SEM because microsystems are often interconnected, meaning that if a family lives in a poor neighborhood, they are less likely to have access to good health services, money to cover the costs of treatment and medication, and education on the topic of asthma (Booysen et al., 2021). There is evidence that there are differences in health disparities between individuals from different socioeconomic groups because of chronic illnesses, family history, access to health services, and intersectionality with other health problems, such as poor mental health (Chen & Miller, 2013).

The results also align with literature that specifically explored the relationship between income and childhood asthma. For instance, Eum et al. (2019) found a significant relationship between household income and the prevalence of childhood asthma. Similarly, Assari and Moghani (2018) and Gupta et al. (2018) found a strong relationship between socioeconomic status and prevalence of childhood asthma. More specifically, Zanobetti et al.'s (2020) study showed evidence for the probability of early-life wheezing occurring in poorer households (Zanobetti et al., 2020). A potential reason why income impacts the prevalence of childhood asthma is that low-income families are more likely to live in poorer neighborhoods and exposed to poorer air quality, which could increase the likelihood of asthma development (Baptist et al., 2019).

The relationship between single parenthood and childhood asthma that was identified in this study also aligns with the literature. For instance, Zanobetti et al. (2020) found that the likelihood of a child developing asthma or early life wheezing was higher for single-parent households. Similarly, Lietzen et al. (2021) found that asthma was prevalent among families who had suffered either a divorce or separation or experienced severe financial difficulties. These two factors are often interconnected because parental separation is often linked to a reduction in income and other resources (Gupta et al., 2018). Additionally, single-parent households are also more likely to live in poorer and more deprived areas (Assari & Moghani, 2018).

Research Question 2

The hypothesis testing for research question 2 revealed that no relationship existed between asthma prevention measures (use of air-cleaner and a given action plan

by health care providers) and asthma-related quality of life (QOL; measured by a composite variable related to asthma symptoms and attacks) among children in Texas after controlling for sociodemographic factors. This insignificant result was surprising, as it does not align with the literature on air quality prevention measures for asthma. For instance, there is plenty of evidence in the literature that air pollutants are associated with higher asthma-related morbidity (Braun et al., 2020; Burbank & Peden, 2019). Moreover, environmental tobacco smoke was previously linked to triggering allergic reactions in children, which can tighten the airways and make breathing more challenging for asthmatic children (Braun et al., 2020). Based on these findings, it would be expected that air purifying measures would decrease issues related to asthma and increase asthma-related QOL.

The finding that treatment related prevention measures (i.e., action plan by health care providers) do not impact asthma-related QOL also does not align with what is indicated in the literature. For instance, the number of children being hospitalized for their asthma is increasing, and factors that relate to higher hospitalizations include poor disease management and poverty (Floyd et al., 2021). Also, poor disease management can be linked to poor access to medications and regular doctor visits, which can lead to progression of the disease (Floyd et al. 2021). Similarly, Harrison et al. (2019) found that asthmatic children who were less likely to have an individualized asthma action plan developed by a medical professional had poorer outcomes (Harrison et al., 2019).

A potential reason for the non-significant result is that the sociodemographic factors that were controlled for in the study have more impact on asthma-related quality

of life than previously thought. This was indicated by the results, where the control variable parental education level was significant in predicting the asthma-related QOL of participants. According to the literature, the educational level of parents is linked to health literacy, meaning that the more educated the parent is, the higher the health literacy they possessed (Schyllert et al., 2021). Health literacy is defined as the degree to which the parents can understand and process information about adequate health management and make appropriate health decisions (Schyllert et al., 2021). Without health literacy, parents with asthmatic children are less equipped to adequately monitor daily symptoms of asthma in their child (Weinstein et al., 2019).

Other sociodemographic factors may also have a greater influence on asthma-related QOL than asthma prevention measures. For instance, lower socioeconomic status was found to be highly predictive of poorer asthma-related quality of life, which increased the severity of the disease over time (Miller et al., 2018). Taminskiene et al. (2019) also argued that lower socioeconomic status among families indirectly lowered asthma-related quality of life because of increased exposure to mold. However, Taminskiene et al. (2019) argued that family quality of life can also be worsened by other factors, such as the difficulty of managing asthma, increased anxiety, and reliance on medication.

Limitations of the Study

There were several limitations that arose from the execution of this study. The results for Research Question 2 did not align with the literature, which was unexpected. A potential reason was that asthma-related quality of life was measured using two variables,

the number of symptom-free days and the number of episodes/attacks. The limitation associated with these two variables is that the operational definition of asthma-related quality of life may be different than other operational definitions used in the literature. Additionally, the preventative measure 'asthma action plan' may be operationally defined differently in the ABCS than what is found in the literature and other large datasets.

Another limitation was that the study did not consider all possible sociodemographic predictors of pediatric asthma, or extraneous and confounding variables that could influence the prevalence of asthma or QOL. However, the chosen predictors and control variables were synthesized from a combination of the existing literature and what data were available for use.

A possible limitation would have been listwise deletion. Data were cleaned by removing any datapoints with missing data; if a value was missing, the entire case was removed from the analysis (listwise deletion). In listwise deletion, a case was dropped from analysis because it had a missing value in at least one of the specified variables. In this study, listwise deletion entailed dropping data without pediatric asthma diagnoses. Variables of using air cleaner, given asthma action plan, and asthma quality of life were also included in the analyses.

Among the 598 pediatric asthma cases, 221 did not have data on variables included for the second research question. Although 221 pediatric cases were dropped from the study because those data did not align with the variables in the study, a total of 377 patient data were still included from the BFRSS dataset. All 377 patient data were from the state of Texas and had pediatric asthma diagnoses. Therefore, listwise deletion

was accounted for despite being a possible limitation, as the same size was still far larger than required by G*Power for the multiple logistic regression directly and another rule of thumb suggesting approximately 100 plus 50 for each independent variable (Bujang et al., 2018). By that rule, the study would have required 300 participants, which was still well below the available datapoints.

Because the study used data from participants specifically located in Texas, the results have limited generalizability to other geographic locations. In Texas, there is a higher chance of being exposed to air pollutants that can be detrimental to asthma management, particularly during the warmer months, than in other U.S. states (Baek, 2020). As a result, the level of asthma-related QOL among children with asthma in other states may be different.

Moreover, some potential limitations were presented by the BRFSS (2020), which potentially reflect on the field of public health and may be accounted for with further research or survey development. First, the BRFSS may oversample some populations of particular interest for health outcomes. However, this oversampling is adjusted for by creating overall values and can similarly be adjusted for by weighting in any analysis using the dataset (BFRSS, 2020). The BRFSS was also the only data set that could be found of significant size containing more recent data, as discussed further below.

Second, another limitation was the availability of data. Although data for the BRFSS are collected annually, the pediatric asthma module is optional and has not been collected in Texas recently. As a result, only older data were available for use. Despite this issue, BRFSS data were used in this study because no other dataset of significant size

containing more recent data could be identified, and the data aligned well with public health. However, having outdated data limits the generalizability of the results to the present day, reflecting a need for further research or development of data sets for the field of public health. Representative data are imperative to public health research but difficult to collect directly.

Third, the study was limited by using self-reported data on the part of the participants. This limitation was unavoidable when addressing data such as these, as there is no fully objective way to measure any of the variables without access to private data such as healthcare records. Moreover, the data were secondary data, so I had no influence on the collection methods used.

Recommendations

Several recommendations for future research that are grounded in the strengths and limitations of the current study, as well as the literature reviewed, can be made. First, it was indicated in the literature (see Taminskiene et al., 2019) that childhood asthma-related QOL may be affected by parents' difficulty managing their children's asthma. Future research could focus on identifying the central barriers to effective childhood asthma management. A study such as this could be conducted using either a qualitative or quantitative methodology.

Another recommendation for future research was drawn from the limitations of this study. Specifically, future research should build on this by exploring the predictors of asthma prevalence and asthma-related quality of life among children in other states in the

U.S. Expanding the study to other geographic locations would enable comparisons across populations and enhance the generalizability of results.

Another recommendation for future research is to explore whether sociodemographic variables, beyond parents' level of education, predict asthma-related outcomes and QOL. This recommendation stems from the results of hypothesis testing for research question two, which showed that parents' education was the only significant predictor of asthma-related QOL in the model. Furthermore, future research could focus on specific types of asthma treatments received, and their efficacy among children in urban areas compared to those living in suburban and rural areas. This recommendation stems from the literature, which indicates that air quality has a large impact on asthma morbidity, and air quality differs in urban, suburban, and rural areas. Finally, future researchers should consider exploring the same phenomena as this study, but using archival medical records as opposed to BRFSS data, which would address the limitation associated with using outdated data.

Implications for Professional Practice and Social Change

Several implications for practice were drawn from the study's results, which are discussed below. The implications include theoretical and practical implications, as well as recommendations for professional practice. The following subsections also provide a description of the potential impacts for positive social change.

Professional Practice

The results have implications for professional practice, as well as for healthcare policy. Because the results showed that single parenthood and low-income predict asthma

diagnosis in children, Texas healthcare policymakers could design pediatric asthma awareness and prevention initiatives that target individuals in low-income neighborhoods and/or who identify as single parents. New communications methods offer valuable ways of disseminating information regarding pediatric asthma (Ramsey et al., 2020), but effective use of these novel methods requires better knowledge of where they should be targeted.

The results of the study also contribute insights into how practitioners can target asthma programming more tightly in Texas. Specifically, the results of the study confirmed two predictors of pediatric asthma, and with this information, they can better prepare and allocate healthcare resources for those suffering from asthma. Additionally, because parents' level of education influences asthma-related QOL among their children, parents should be provided with educational resources on asthma and associated treatments. Doing so would better equip parents to manage their child's asthma.

The results of the study also have theoretical implications. Microsystems are often interconnected, meaning that if a family lives in a poor neighborhood, they are less likely to have access to good health services, money to cover the costs of treatment and medication, and education on the topic of asthma (Booysen et al., 2021). Therefore, childhood asthma treatment should take a holistic approach, where the many interconnected factors that influence the morbidity of asthma are addressed as a whole.

Positive Social Change

Overall, the results of this study contribute to positive social change by providing information that will help target early diagnosis and treatment interventions for pediatric

asthma, improving both children's health outcome and decreasing the financial and QOL burden of the disease. A significant number of deaths and other harms from pediatric asthma can be prevented through better identification and diagnosis of the disease (WHO, 2021). Hence, there was great value in understanding which communities and contexts these efforts should be focused on. Ultimately, the results of this study contribute to advanced knowledge that can improve pediatric asthma-related outcomes among children who come from single parent, low-income, and low education backgrounds.

Conclusion

The results of hypothesis testing for research question 1 revealed that relationships exist between single parenting and low family income and the prevalence of asthma among children in Texas, after controlling for other sociodemographic factors. These results aligned with current literature on the topic. The hypothesis testing for research question 2 revealed that no relationship existed between asthma prevention measures (use of air-cleaner and a given action plan by health care providers) and asthma-related QOL (measured by a composite variable related to asthma symptoms and attacks) among children in Texas after controlling for sociodemographic factors. These findings did not align with the literature, which was unexpected. A potential reason for the non-significant result is that the sociodemographic factors that were controlled for in the study have more impact on asthma-related quality of life than previously thought. This was indicated by the results, where the control variable parental education level was significant in predicting the asthma-related QOL of participants.

There were several limitations in from the study, which were discussed in this chapter. Despite the limitations, multiple implications for professional practice, theory, and positive social change were identified and discussed. Ultimately, the results of this study contribute to advanced knowledge that can improve pediatric asthma-related outcomes among children who come from single parent, low-income, and low education backgrounds. More importantly, the results of this study contribute to positive social change by providing information that will help target early diagnosis and treatment interventions for pediatric asthma, improving both children's health outcome and decreasing the financial and QOL burden of the disease.

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