2022

California's Urban and Rural Asthma Healthcare Access and Asthma Management During COVID-19 Pandemic

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Walden University
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Abstract

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MA/MS, University of Maryland, 2017

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

A lack of adequate healthcare access can negatively affect asthma management. The purpose of this study was to understand whether there was an association between source of care and asthma management. This study provides important insights concerning the changing landscape of how individuals receive asthma treatment and manage their asthma during a pandemic. Asthma management and asthma care have been studied; however, results have been inconclusive in relation to the barriers to health that are experienced among various adult age groups. Identifying additional subgroup characteristics could provide insight into where health practitioners, practice management, and policymakers direct healthcare resources. The 2020 California Health Interview Survey is a public use database with 22,160 surveyed participants. Bronfenbrenner's social ecological model was used in this study to explain how healthcare access, delays of needed care, and usual source of care likely influenced asthma management for adults between the ages of 35 and 65. The information was used to understand the relationship between asthma status, healthcare access, usual source of health care, asthma management, and need to delay care using descriptive statistics, chi-square test of association, and logistics regression. This study focused on the healthcare influence during COVID-19 and asthma prevalence among individuals between the ages of 35 and 65. Thus, it led to the identification of another subset of the population that is likely to be at increased risk for developing chronic obstructive pulmonary disorder.

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Dedication

Earning a doctorate has been one of the most formidable goals that I have set out to accomplish. This process has increased my recognition personally and professionally and has given me a sense of accomplishment to know that I completed a lifelong educational goal. As I start my journey to military retirement, I am looking to build credibility and loyalty from my peers, counterparts, and experts/researchers of the health care field. I began because of my desires, but as I progressed, I realized I am not only doing it for myself; I am doing it for my family. Earning my doctorate has shown my family that if I can do it, they can also do it as well. I dedicate this complete dissertation to my daughter Aubrey, who showered me with support, love, and encouragement throughout my studies.

Also, to my brothers and sister, Jason, Shane, and Danielle, as well as my loving parents, Joanne and Richard, thank you for the lessons you taught me and the memories that we shared. Because of your support throughout my military career, I was able to achieve all my life goals. Thank you for the loving support you have given me my entire life. For that, I dedicate this accomplishment to you.

Acknowledgments

Throughout the writing of this dissertation, I received a great deal of support and assistance. I am grateful for the people in my life whose encouragement, guidance, and wisdom enabled me to reach this level of success in my life and complete this dissertation. I first would like to give honor and thanks to my Lord and Savior, Jesus Christ. Without him ordering my steps and being a guiding light in my life, I would not have been able to reach the heights I obtained. Secondly, I would like to thank my family, the strongest and most inspiring people I know. Your strength assisted me to no end. I can never thank you enough for being great examples. I would like to thank my committee members, Dr. Bill Sumner and Dr. Julia Leischner. Thank you for the time, dedication, and expertise you have given me. You made a difference through your dedication and continued support for me throughout this dissertation process. Your input, knowledge, and support were invaluable to me in developing and completing a quality research project. To my friends and fellow doctoral candidates, through this journey, I have made lasting friendships. We encouraged one another to stay the course even when it got hard as well as provided each other with noteworthy advice to help with our research. To my friends, Jessica Brewington, Estolita Bowling, Dr. Tyler Bennet, Dr. Myra Johnston, and Dr. David Feola, who have supported me from the beginning, you have been there for my highs and lows. When it seemed like a lot, you always encouraged me to keep going, never failing to remind me that when it is all over, every step of this journey has had meaning and has been worth the long hours.

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Section 1: Foundation of the Study and Literature Review

Introduction

This research study was centered on examining aspects of asthma management to understand the influences during the SARS-CoV-2 (COVID-19) pandemic on California's rural and urban health outcomes. Health studies have often highlighted disparities in access, health status, and resource availability affecting certain subsets such as race and ethnicity. Some researchers have also claimed that healthcare resources are likely different between subset groups in California and across the United States (Vohra et al., 2020). A lack of access likely explains differences in sources of care, which could lead to differences in health outcomes (Egen et al., 2017; Hodge et al., 2020; Vohra et al., 2020). Additionally, there are inequalities among groups based on socioeconomic status that are likely the lead indicators of possible distrust in health systems, which make it challenging to improve access and decrease delays in care. Thus, the living environment, inadequate resources, as well as distrust toward the system have been good indicators of why the United States has faced significant health disparities involving asthma.

In California, it was unclear whether asthma symptoms were effectively managed during the pandemic, as well as whether individuals were able to attain healthcare to treat their symptoms. Systematic review had not detected or clearly identified how individuals of varying socioeconomic levels gain access to healthcare to manage their asthma condition. As indicated by the American Community Survey (2019), California was one of the top 10 states with significant income gaps, which affected healthcare management for individuals suffering from asthma. Significant income gaps likely caused issues in

access and utilization of needed healthcare services to treat asthma symptoms. This research study was built on associating the elements of equitable healthcare access to better understand asthma status and whether income influenced asthma management. I sought to understand the relationship with the social determinants of health and asthma to comprehend what the conditions were to satisfy health care needs for certain geographic areas. This study was important and added to the body of literature on the state of affairs in a community, organization, or program to provide actionable suggestions that would strengthen asthma health services and resource availability in certain geographic settings. Finally, the study elevated the essential task of equitable distribution with health resources.

The focus on rural and urban communities in California as the targeted population for this study was important to understanding whether the health disparities became more transparent during the COVID-19 pandemic (Cromartie et al., 2020; Martino et al., 2020). The causes of health disparities during pandemic events were relatively understudied. Furthermore, a study by Cromartie et al. (2020) concerning rural and urban populations had significant variations in terms of income, education, and access to health resources. Because of the likelihood that rural Americans have low SES, they often experience significant barriers to access to health services or forgo treatment because of distance, available time, and lack of understanding of the complexity of care needed for their health condition (Douthit et al., 2015). Individual communities, geographically isolated areas, and certain groups likely have a higher disease burden.

In my research, I reviewed and conducted analysis on asthma, which was annotated in the California Health Information Survey (CHIS). The CHIS provided relevant information on the individual's perspective on their asthma health as well as the individual's ability to control symptoms and thus prevent emergency room (ER) visits. Lastly, all research questions were related to ethnic and income variability to facilitate understanding of the different levels of impact on individual health behavior.

This study will likely have a positive impact toward social change and help public health leaders to understand risks related to healthcare access within California. In previous studies, researchers gained a keen understanding of the effect of access in relation to quality of life (QOL; Cancel-Tirado et al., 2018; Crosssman et al., 2018). Furthermore, understanding variables from an individual's response and perception will likely help to improve rural health care outcomes and identify whether there is an associated difference in access to needed coordinated care. The research sheds additional light on what happens to individuals with asthma from a source of care lens in healthcare systems. Conclusions drawn from asthma research may be instrumental to building knowledge on the social, economic, and political factors associated with California rural and urban care. The study expands on research by analyzing healthcare source variability in relation to California's Medicare expansion, the Affordable Care Act, and the SARS-CoV-2 pandemic. Thus, it may inform health policy on healthcare expenditures to the effect of improving access in California.

My aim in conducting the literature review was to identify research gaps and to understand the variables analyzed to expand on California's asthma status and how

healthcare works to reduce health disparities. In this section, I develop the problem statement, purpose of study, research question, and hypothesis. To further align the study, I present the theoretical framework to align known health behaviors to each level of the socioecological model (SEM). The nature of the study and the literature review further guide an extensive review on key variables and concepts in relation to this study. The study presents key definitions, study assumptions, scope and delimitations, and limitations. In the last section of this chapter, I explain the significance of the study, followed by a summary and conclusion.

Problem Statement

Healthcare access and asthma care inequality constitutes a public health problem (Healthy People, 2020; Hodge et al., 2020; Jenkins et al., 2016). Journal articles have indicated growing transparency with asthma care health disparities in the United States during the COVID-19 pandemic (Janio et al., 2020; Liu et al., 2021; Westeroff et al., 2018). Disparities likely are indicators of inequality. Thus, disparities likely interfere with social functioning, increase healthcare mistrust, and perpetuate Americans' poor health status (Mood et al., 2016; Nurmagambetov et al., 2018). As indicated by the Rural Health Information Hub (RHIhub, 2019), inequality likely was more transparent in California, with an estimated rural population of 837,284, as COVID-19 appeared in these secluded areas.

Research conducted by Martino et al. (2020) indicated that areas in which health disparities prevailed were in source of care and availability to sustain their health. Disparities in health were also relevant to population health status and likely affected

certain chronic health conditions more. According to the University of California Los Angles (UCLA) and the Centers for Disease Control and Prevention (CDC, 2020), asthma was the fastest growing disease linked to developing chronic obstructive pulmonary disease (COPD) later in life. Thus, asthma, which involves systematic inflammation of the pulmonary system, likely caused high rates of COPD in California (CDC, 2020). According to the California Health Department (CHD, 2020), every year about 40,000 Californians are hospitalized because of asthma. The CHD (2018), using asthma racial equality data, provided an important analysis that compared White Californians to other ethnicities. Significant findings from the CHD (2018) indicated that compared to White, African Americans had 5 times higher ER visits and Hispanics and Native Americans had a 1.3 times higher rate of hospital admissions and 3 times higher asthma deaths than compared their Caucasian counterparts. According to the U.S. Census (2020), the racial/ethnic composition of the population in California is 71.9% White, 6.5% African American, 1.6% Native American, and 15.5% Asian, with 39.4% of the population indicating Hispanic ethnicity. In a study by James et al. (2017), racial inequalities were most likely a critical indicator of racism, classism, and discrimination in policies that likely disadvantaged certain groups of people.

As indicated by the California Department of Public Health (CDPH, 2017), asthma prevalence had not changed significantly since 2001. At the national level, the American Lung Association's (ALA, 2020) analysis on asthma data from the 2018 Behavioral Risk Factor Surveillance System (BFRSS) showed that African Americans and Native Americans were at greater risk for hospitalization and death compared to

other racial groups. The CDC's (2019) BRFSS reported that the national rate for adult asthma was 7.9. The CDPH (2017) reported that in California, 8.1% of adults had asthma. This was 1 point higher than the national rate. The higher burden of asthma was likely caused by individuals' inability to obtain healthcare access and manage their health condition through a comprehensive health plan. Furthermore, ill-managed disease conditions mostly likely led to a greater risk of morbidity and mortality among certain groups. Multiple studies involving evidence-based research have identified healthcare characteristics differentiated by regional setting and certain subgroups (Greenberg et al., 2018); (Whitacre et al., 2017). Thus, health disparities have continued to prevail in California because of health behaviors and availability of individuals' sources of care.

Rural and urban regional aspects were also reviewed in this study. It was important to my study to underscore recent trends in Medicaid expansion, which included telemedicine reimbursement, and the surging coronavirus (COVID-19) pandemic. Changes in healthcare sources likely provided significant barriers to essential medical resources. Previous evidence-based research initiatives from Caldwell et al. (2016) emphasized that certain geographical regions most likely were disadvantaged for optimal health outcomes and were likely independent of poverty and health care supply. Relative to this assertation, Caldwell et al. (2017) and Kirby et al. (2020) discovered that access to source of care was likely associated with improved health outcomes; however, gaps existed between certain ethnicities in geographic areas.

Despite the effort to drive down the asthma burden in California, variations of health care status among ethnicity gaps have existed (Kirby et al., 2020). A recent

analysis from the CHD (2020), data analysis from the National Health Information Survey (NHIS), and the BRFSS showcased the ethnicity differentiator of access to healthcare, utilization of healthcare, and healthcare coverage. In another study by Baffour et al. (2017), challenges for ethnic and minority groups were likely longstanding due to geographic isolation. Baffour et al. stated that systems-level change likely necessitates increased social capital for ethnic minorities and fund infrastructure improvements for enhanced health access.

Social disparities were a prevailing theme in California with the growing rate of COVID-19 infection among communities of lower socioeconomic status. The income likely affected the individual's ability to keep, attain, and treat low socioeconomic population. This likely established the perfect conditions for increased health disparities and showcases how disparities affect health outcomes (Agency for Healthcare Research and Quality, 2020). The U.S. Census (2018) provided a gap analysis from a 5-year ACS study that captured the range and income distribution for the California residents. Thus, worsening healthcare in relation to chronic disease prevalence was likely linked to inadequate health management. Problems arose due to healthcare availability, medication management, and prevention screening (CDC, 2020). Focusing research on identifying the critical source of care in association to disease status within California's geographic setting may provide insights into health's fundamental social determinants.

Purpose of the Study

The aim of this quantitative research study was to investigate the impact to asthma within the setting of the COVID-19 pandemic. The ability to access care is the

main determinant of an individual's health despite geographic location. I focused on understanding differences in healthcare access, coordinated care, source of care, and asthma management. The social determinant of health identified whether ethnicity or income implications played an important part during the COVID-19 pandemic. SPSS Version 27 was used to analyze the data using descriptive statistics, crosstabulation (phi, Cramer's V, and Pearson chi-square), and binomial logistic regression. The dependent variables were having a source of care (yes or no), had someone at doctor's office/clinic who helped to coordinate care (yes or no), and health professional prescribed asthma management plan. The predictor variables were source of care by type, asthma episodes over the past 12 months, controlling asthma with daily medication, and general health condition. I used the social cognitive model, which addresses how people actively shape and are shaped by their environment. This helped when explaining the behaviors of rural and urban Americans and the socioecological impacts within California. Thus, identified factors to improve QOL to understand the health system needs.

The study was a secondary analysis of archived data obtained from the UCLA Center for Health Policy Research (CHPR) called the CHIS. The dataset was divided into three modules called adults, adolescents, and children. In 2019, CHIS developed a mixed-mode survey (web and telephone) and used a random sample of California addresses with responses from over 22,160 participants (Wells et al., 2019). The CHIS is a population-based survey of California's residential, noninstitutionalized population conducted every other year. CHIS is the nation's largest state-level health survey and one of the largest health surveys in the nation. The selected database, CHIS, reflects the results of an annual

cross-sectional survey to best answer questions about the rural and urban healthcare systems in relation to chronic disease management.

I chose the dataset because it includes health indicators that track changes in the healthcare system to better respond to current events and the impact of the changing economic and social climate. To ensure reliability, the CHIS employed several strategies that produced high-quality data that accurately represent California's diverse population, which included language inclusivity, an advance letter, incentives, a toll-free line, a respondent website, maximum call attempts, well-trained interviewers, and a certificate of confidentiality (Wells et al., 2018). CHIS used 44 primary geographic strata as well as eight Los Angeles-specific and six San Diego-specific substrata.

The validity of the research was evaluated through a pilot study (Wells et al., 2018), which involved three counties (Los Angeles, Santa Clara, and Tulare), which contributed to the efficiency of the design. The initial positive results led to a statewide pilot test by Wells et al. (2019), which reaffirmed the validity of information collected during the 2020 CHIS survey. The end result provided an increased response rate and reduction in overhead expenses, showing no sign of poor validity or high rates of false negatives/positives (Olson et al., 2020). The validity of the research data was evaluated through a pilot study, which centered on interviewing adults using telephones. The interviews were conducted a few months before the actual research was undertaken, as indicated by Reynold et al. (2020), who similarly used CHIS data to evaluate the role of Medicaid expansion in utilization of prevention services by men between the ages of 18 and 64 in California. Varying professionals have used the data to review health threats,

COVID-19 impact, research, training, and inform policy (Elwood et al., 2020). Recently, health officials used the data in tracking health trends. Thus, the CHIS data are reputable and can inform asthma care and asthma management. The data are considered reliable and credible.

Research Questions and Hypotheses

The quantitative research questions (RQs) and their corresponding null hypotheses (H0) and alternative hypotheses (HA) for this study are stated below.

RQ1. Was there a statistically significant association between healthcare access (yes or no) and general health condition (*excellent*, *very good*, *good*, *fair*, and *poor*) among adults with asthma between 35 and 65 years of age living in urban/rural areas?

$H0_1$: There was no statistically significant association between healthcare access and general health condition among adults with asthma between 35 and 65 years of age living in urban/rural areas.

HA_1: There was a statistically significant association between healthcare access and general health condition among adults with asthma between 35 and 65 years of age living in urban/rural areas.

RQ2. Was there a statistical association between having someone at a doctor's office/clinic who helps to coordinate care (yes or no) and asthma episodes/attacks within the past 12 months (yes or no) among adults with asthma aged 35-65 residing in urban/rural areas?

$H0_1$: There was no statistical association between having someone at a doctor's office/clinic who helps to coordinate care (yes or no) and asthma episodes/attacks within the past 12 months among adults with asthma aged 35-65 residing in urban/rural areas.

HA_1: There was a statistical association with having someone at a doctor's office/clinic who helps to coordinate care and asthma episodes/attacks within the past 12 months among adults with asthma aged 35-65 residing in urban/rural areas.

RQ3. Was there a statistically significant association between type of place for usual source of care (*doctor's office, government clinic, ER, no other place,* and *no usual source of care*) and having a health-professional-prescribed asthma management plan (yes or no) among adults between the ages of 35 and 65 residing in rural/urban areas?

$H0_1$: There was not a statistically significant association between kind of place for usual source of care and having a health-professional-prescribed asthma management plan among adults with asthma between the ages of 35 and 65 residing in rural/urban areas.

HA_1: There was a statistically significant association between kind of place for usual source of care and having a health-professional-prescribed asthma management plan among adults with asthma between the ages of 35 and 65 residing in rural/urban areas.

RQ4. Does ethnicity moderate the relationship between controlling asthma with medication (yes or no), controlling asthma with daily medication (yes or no), having a health-professional-prescribed asthma care plan (yes or no), and asthma episodes/attacks within the last 12 months (yes or no) between the ages of 35 and 65 when looking at California's rural/urban areas?

$H0_1$: Ethnicity does not moderate the relationship between health-professional-prescribed asthma management plan, controlling asthma with daily medication, and asthma episodes within the past 12 months among adults.

$H0_A$: Ethnicity does moderate the relationship between health-professional-prescribed asthma management plan, controlling asthma with daily medication, and asthma episodes within the past 12 months.

RQ5. Does annual income level (five levels) moderate the relationship between health-professional-prescribed asthma management plan (yes or no) and asthma episodes with the past 12 months (yes or no)?

$H0_1$: Annual income level does not correlate the relationship between health-professional-prescribed asthma management plan and asthma episodes.

$H0_A$: Annual income level does correlate the relationship between health-professional-prescribed asthma management plan and asthma episodes within the past 12 months.

Theoretical Framework

The study was a cross-sectional quantitative study of healthcare characteristics and chronic disease status within California's rural and urban areas. The social-ecological model (SEM) by Bronfenbrenner's (1977) and McLeroy et al. (1998), was used because it addresses multiple levels of influence on the social determinants of health. The theory was appropriate for this study because there were internal and external factors affecting asthma prevalence (Bronfenbrenner, 1977; McLeroy et al. 1998). The theory has also been used to look into health behavioral, understand healthcare phenomena such as health disparities, and address social determinants of health to form a multilevel intervention.

The four-level SEM was used to better understand chronic disease status and the effect of health source characteristics to create a potential prevention strategy for rural and urban Americans residing in California. The SEM emphasizes the system linkage among individual, relationship, community, and societal factors to understand the socioeconomic factors that likely influence a particular high-risk population. Understanding the health system's influence on a chronic condition (asthma) provides insight into possible vulnerabilities of populations that have experienced losses of health system access and care. The COVID-19 pandemic likely intensified the problem by exacerbating resource limitations.

The rationale for employing the SEM was those relationships cannot be statistically tested for directionality, and the visual SEM model effectively displayed the social determinants of health from the human to the environmental level. I was interested in the strengths of the relationships between the variables asthma management and

healthcare source differences. Thus, the key findings in the research were readily displayed and interpreted in a complex statistical platform. The SEM involves a combination of factor analysis and multiple regression; thus, the multivariate procedure allowed me to examine the independent and dependent variables for my research design for path analysis. The SEM application has shown success in helping other researchers address complicated social issues concerning health outcomes (Lewis et al., 2017; Morsa et al., 2018). The SEM convergence strategy in the health source analysis and application was the main reason for applying it in this study.

As stated previously, use of the SEM is a quantitative research technique that can also incorporate qualitative methods, the perception of health, knowledge, and outcomes reported in the CHIS. The SEM also emphasizes that interventions at different levels mutually reinforce each other by changing patterns of interaction among two or more intervention audiences; this strategy is one approach for combining interventions at different levels to produce synergistic effects (Lewis et al., 2017). The SEM nested five interlinking behavior levels designated as individual, interpersonal, organization, community, and policy ranking. The interlinking of the five levels is established within all healthcare systems.

The model enables statewide engagement to identify comprehensive factors that contribute to poor health outcomes in adults and develop a broad approach that involves action at all SEM levels, an effort that ensures equity in healthcare practices and access. The research questions were the product of the individual, community, and

environmental factors that were the determinants of health. I sought to understand individuals' behaviors to the policy level, which aligned with the SEM.

The central circle in the SEM is the individual's behavior. Each research question associated the individual's ability to retain a source of healthcare that ensured the prevention and intervention of asthma. The individual factors that affect asthma management were source of care availability, medication treatment, and the ability to modify the care plan. Individuals with asthma must retain healthcare. At the individual level, some health officials have faced challenges with encouraging a certain group to seek asthma care by balancing knowledge, care availability, and lifestyle behaviors. The decision to obtain and retain healthcare was at the individual level and likely contributed to asthma's morbidity and mortality rates among certain subgroups.

The next level under consideration for the study was the interpersonal level. At the interpersonal level, I looked at the availability of healthcare. This provided the information to determine the available health services to prevent or manage the asthma health condition. The research questions provided a foundation for understanding healthcare access and clinic-based health management. The ability to access and coordinate with a healthcare provider is likely central to asthma care. Healthcare providers likely contribute to increased knowledge of adequate health status management in California, which likely affect the incidence rate.

Availability of healthcare centers is critical at the community level of the SEM. Healthcare centers and hospitals are likely affected by economic conditions, health providers' availability, and individuals having the right coverage to sustain funds needed

to keep the facilities open. The research questions were associated with specific healthcare characteristics in both the rural and urban population of California. Limitations to health services are known to exist in certain populations and are a factor of public policy. The state's ability to influence healthcare policy likely leads to unfavorable healthcare outcomes in certain populations. Locking out certain populations likely causes variations in asthma care outcomes within California. Influencing equality in rural and urban health systems likely decreases the morbidity and mortality rate for the asthma condition.

I also sought to understand how socioeconomic factors within the environment influence asthma. The environmental factors likely vary in rural and urban designated populations. In rural areas, distance, cost, and timing are important factors affecting individuals' ability to manage their asthma, continue medication, and reduce severe asthma episodes. The utilization of virtual medicine practices likely expands healthcare and certainly provides essential communication between a primary care provider and the individual. This aligns with the SEM. The independent variables and confounding variables were aligned with the four levels of the SEM.

Nature of the Study

The quantitative research design allowed for exploration and analysis to determine whether any association among variables relates to healthcare source characteristics and asthma management within the rural and urban areas. The cross-sectional research design addressed the study's research aim. Using the cross-sectional research approach allowed for the study of asthma, and the healthcare characteristics

(access, source, and barriers to asthma care) were investigated over a short duration. The research variables in the study were quantitative in nature; therefore, I selected a quantitative technique for the statistical analysis. The cross-sectional survey research design determined whether asthma healthcare and asthma management in California rural and urban areas were different among race/ethnicity and socioeconomic levels. My primary ethical concern with the collection of the data was that the interviews were both web based and phone based. To bridge this ethical concern, the CHIS required that the participants sign an agreement regarding health data collection. Additionally, the information was gathered by highly trained UCLA staff.

The aim of the first research question was to understand the relationship between general health condition and having a usual source of health care among adults with asthma. The targeted age group consisted of adults 35-65 years of age who resided in California's rural and urban settings. The independent/predicting variable was access. The dependent variable was general health condition. The grouping variable was rural/urban status. The descriptive statistics were deductive to summarize the information about the population. This included the frequency table as well as allowing me to make conclusions about the CHIS 2020 data. The analysis helped in understanding the association between general health condition and having a usual source of healthcare for the targeted population. Additionally, the analysis highlighted the differences between rural status and urban status. The analysis that I used was crosstabulation applying Pearson chi-square, Cramer's V, and phi. The results from the phi and the Cramer's V were used to demonstrate the strength of the association between the access and asthma.

The results from the Pearson chi-square indicated whether there was a statistically significant relationship between the usual source of health care and general health condition. The covariate or grouping with rural/urban status defined any statistical differences. The crosstabulation function allowed me to look over the differences for both rural and urban settings. Previous research had identified that conditions at the individual levels lead to certain health behaviors, which had relevant application in the theoretical SEM.

The aim of the second research question was to determine whether there was an association between someone at a doctor's office/clinic who helped to coordinate care and having asthma episodes/attacks over the last 12 months. The targeted population was adults with asthma between the ages of 35-65 years residing in California. The dependent variable was someone at a doctor's office/clinic who helped to coordinate care. The predicting/independent variable was asthma episode/attacks in the past 12 months. The grouping variable for the analysis was rural/urban status. The descriptive statistics were deductive to summarize the information about the population. This included the frequency table as well as allowed me to make conclusions about the CHIS. The analysis for the association used was crosstabulations with analysis application of Pearson chi-square, Cramer's V, and phi. The results were used to demonstrate the strength of the association between someone at a doctor's office/clinic who helped to coordinate care and asthma episodes/attacks over the past 12 months. The analysis with Cramer's V and phi determined the strength of the relationship between someone at a doctor's office/clinic who helps to coordinate care. The chi-square provided me the statistical

significance between both variables. The crosstabulation function allowed me to look over the differences for both rural and urban settings. Previous research had identified conditions at the environmental level and led to certain individual and community health behaviors that had relevant application in the theoretical SEM.

The aim of the third research question was to understand the usual source of healthcare (by type) and having a health-professional-prescribed asthma care plan. The targeted population was adults with asthma between the ages of 35 and 65 residing in the rural and urban areas of California. The independent/predicting variable was health-professional-prescribed asthma care plan. The dependent variable was usual source of care. The covariate or grouping variable was rural and urban. The descriptive statistics were deductive to summarize the information about the population. This included the frequency table as well as allowed me to make conclusions about the CHIS. The analysis for the association between source of healthcare (by type) and health-professional-prescribed health plan was statistically analyzed using a crosstabulation with Pearson chi-square, Cramer's V, and phi. The results from the phi and the Cramer's V were used to demonstrate the strength of the association between the usual source of care and asthma management plan. The Pearson chi-square was used to understand if the research question is statistically significant. The crosstabulation function allowed me to look over the differences for both rural and urban settings. Previous research had identified conditions at the community level that led to certain health behaviors at the individual, environment, and societal levels, which had relevant application in the theoretical SEM.

The aim of the fourth research question was to understand whether ethnicity moderated the relationship with having asthma management (health-professional-prescribed asthma action plan; taking medication to control asthma) and having asthma episodes/attacks within the past 12 months. The variables were asthma episodes/attacks in the past 12 months, health-professional-prescribed asthma action plan, rural/urban, and controlling asthma with medication. The moderating variable was ethnicity. The descriptive statistics were deductive to summarize the information about the population. This included the frequency table as well as allowed me to make conclusions about the CHIS. The analysis for the association between asthma management, controlling asthma with daily medication, and asthma episodes in rural/urban while understanding the moderating effect of ethnicity was statistically analyzed using a binomial logistics regression. The results were used to demonstrate the strength of the association between the moderating variable ethnicity. Thus, moderating variables to this statistical model helped in gaining a deeper understanding of the relationship between variables or rethinking the direction of an association. I chose the binomial logistics regression to look at the different levels within ethnicity, in the hope of understanding whether there were differences between certain groups. The binomial logistics regression allowed me to perform model fitting and likelihood testing. Model fitting allowed me to determine whether ethnicity predicts any of the variables with the chi-square function. The likelihood ratio looked at the significance of ethnicity within a chi-square function. Previous research had identified conditions at the individual levels that lead to certain

health behaviors at the individual, community, environment, and societal levels, which had relevant application in the theoretical SEM.

The aim of the fifth research question was to understand annual household income in the rural and urban areas of California and asthma management and asthma episodes over the last 12 months. The variables were health-professional-prescribed asthma care plan and asthma, controlling asthma with daily medication, and asthma episodes/attacks in the past 12 months. The moderating variable was annual household income. The descriptive statistics were deductive to summarize the information about the population. This included the frequency table as well as allowed me to make conclusions about the CHIS. I chose binomial logistics regression to address the relationship between the variables. Thus, moderating variables to this statistical model can help in gaining a deeper understanding of the relationship between variables or rethinking the direction of an association. Previous research had identified conditions at the individual level that lead to certain health behaviors at the individual, community, environment, and societal levels, which had relevant application in the theoretical SEM.

Secondary Data Types and Sources of Information

For the research study, I used the CHIS sponsored by UCLA. The survey is conducted in person and via telephone in odd-numbered years. The CHIS had a sample size of about 22,160 participants in California for the year 2019-2020. The CHIS provides information on the California population for assessment of changes over time.

My analyses used this dataset to explore the relationship between asthma and the social determinants of health among participants aged between 35 and 65 in California's

rural and urban areas. Additionally, I analyzed ethnicity and SES implications in relation to asthma. There were 3,589 adult participants. The respondents reported on access to care, usual source of care, and reason for delaying care. Respondents reporting with asthma status were also asked whether they had received healthcare management for their disease from a provider.

Significance

This study's results provide needed insight into utilization, prevention, and health coverage within the rural and urban areas of California to better understand asthma management and related health concerns to individual's suffering from asthma. The results add to existing literature that links healthcare characteristics to chronic disease management in rural and urban areas. The study's findings show an association among socioeconomic status, asthma prevalence, and healthcare source. The study provides information to public health officials, healthcare providers, and policymakers about obtaining optimal chronic disease management through various avenues, such as defining hotspot trends, improving awareness, and formulating a comprehensive medical coverage plan within California. Thus, the study provided insights to consistent and culturally sensitive healthcare regardless of socioeconomic status. By controlling their healthcare source, population health providers likely increase Californians' QOL and decrease emergency departments' (EDs') utilization for asthma management.

Furthermore, this study may contribute to positive social change by bringing to the forefront predictors of asthma care in California's rural and urban areas. The results may positively impact low-income families and inform the development of approaches to

equity in health services by providing additional coverage and expanding virtual health programs to increase the span of control. This may empower Californian policymakers to push funding toward prevention programs within urbanized and rural areas.

Positive Social Impact

In this research study, I examined whether any differences exist in rural and urban healthcare systems regarding social determinants of asthma management and health management within California. The information was further stratified by ethnic groups. My study provides essential insights into the specific challenges faced with health resource limitations and in vital capacity to manage resources statewide. Thus, studying a vulnerable population's health concerns provided meaningful information for developing comprehensive healthcare and prevention services. The findings from my study may open up research opportunities that build community infrastructure and forecast funding sources that target areas where the most significant disparities exist (Egen et al., 2017; Hodge et al., 2020; Nurmagambetov et al., 2018; Vohra et al., 2020).

A specific focus on healthcare characteristics, rural and urban influence, and health management has the potential to build on or add to existing literature. Practical health system application was imperative to addressing the health disparities with asthma management as well as improving asthma care among California's rural and urban areas. Further, this study offers insights for developing targeted health metrics based on each community's specific cultural and health needs (Nurmagambetov et al., 2018). Studies from Kwan et al. (2018) and Ramírez et al. (2017) reported the importance of reducing information inequality within rural settings to map the health information landscape. The

authors evaluated the association between chronic disease prevalence and healthcare access. Key findings indicate that public health campaigns were a venue to educate people about healthcare options and needed rural/urban community-focused infrastructure improvements. Additionally, this study may help to inform discussions related to Medicaid expansion policies, addendums to asthma management programs, and expansions of health care access and increased home visit prevention services in rural and urban designated areas.

Literature Search Strategy

For this review, I selected articles related to asthma care and rural/urban areas in the United States, asthma care in the United States or California, asthma management in the United States and California, health system influence in California, rural population/communities/area in the United States or California, asthma care expenditures for California, COVID-19 influence on asthma status, poor asthma health for rural areas or rural communities in the United States, social determinants of health in the United States and California, asthma demographics, and Medicare and Medicaid impact on healthcare reimbursement and utilization.

First, I conducted several searches to clarify the differences in meaning between social determinants of asthma health, rural and urban asthma care, asthma management, access to asthma care, source of asthma care, and asthma preventative care. During this phase, I reviewed various literature sources related to the differences in definitions, which I retrieved from scholarly authors, social scientists, encyclopedias, public health dictionaries, multiple peer-reviewed articles, and U.S. federal government websites. I

used the following search engines: Academic Search Premier, CINAHL Plus with full text, Google Scholar, PUBMED/MEDLINE, Google Scholar, Lancet, SAGE Journals, Walden Thoreau multidatabase search, Science Direct, and Sage Knowledge. In addition, the following keywords were explored in Google Scholar, SAGE Journals, and a Walden Thoreau multidatabase search: *chronic disease management*, *asthma demographics for the United States and California*, *California asthma health expenditures*, *asthma prevalence in California*, *health disparities in relation to asthma prevalence in California*, *healthcare access and asthma problems*, *rural and urban status*, *socioeconomic theory*, *asthma and rural health in the United States*, *quality of life on asthma disease management*, and *socioecological theory*. Articles were chosen if they were peer reviewed and published after 2015.

Throughout the literature search process, I gathered scholarly articles that addressed key research goals in order to explore the significance of the social determinants of health in the rural and urban areas of California and identify gaps within the literature. Based on the keywords, this literature review researched existing literature as well as made assumptions on the gaps to asthma management in the prevention, pharmaceuticals, and routine care in the rural and urban designated areas. Any document relevant to this study was carefully reviewed by electronic download and catalogued using the school-provided literature matrix. Additionally, I used Endnote and the bibliographic management software Zotero, which facilitated proper American Psychological Association (APA) citations and reference formatting. To obtain a thorough understanding about the topic for my study, I reviewed articles that had been

cited repeatedly by current articles for application and logged them. Using this exhaustive approach offered a wealth of knowledge gained through scholarly materials, including studies that included mixed methodologies, literature analysis, and survey interviews. The reviewed articles revealed that socioeconomic status most likely effected asthma condition and status and further provided significance on health disparities within the rural and urban areas. However, most of the articles specific to asthma care, asthma treatment, and asthma care plans had not addressed the social determinants of health when further exacerbated by a pandemic.

Significant Literature to Research

Asthma Action Care Plan

Asthma is a condition in which the airways narrow and swell and tend to produce extra mucus. This makes breathing difficult and triggers coughing, a whistling sound (wheezing) when the individual breathes out, and shortness of breath. For some people, asthma is a minor nuisance. For others, it can be a major problem that interferes with daily activities and may lead to a life-threatening asthma attack. Triggers include irritants that enflame the bronchial system, which are categorized as environmental, occupational, or exercise induced. According to the CDC (2020), National Institutes of Health (2020), and Global Initiative for Asthma (GINA, 2021), all adults with asthma need to have their own asthma action plan (AAP). The plan is a goal that prevents and controls an individual's asthma episodes. The AAP guide suggests things that individuals can do to avoid asthma triggers. The health care practitioner plays a vital role in building an AAP

by reviewing the patient's triggers, medication adherence, and approaches that can prevent a severe attack.

California Adult Asthma Death

Macy et al. (2019) conducted a cross-sectional analysis on asthma deaths occurring in active Kaiser Permanente Southern California health plan members between 2007 and 2015. In their research, Macy et al. highlighted that health care and asthma medication use are imperative to prevent death. Pertinent results from the study were that individuals with confirmed asthma deaths used preventative inhalers at very low rates (0.20 per 100,000 patient-years asthma-confirmed deaths; CDC, 2020).

Health Disparities and Asthma

According to Vohra et al. (2020) and Hodge et al. (2020), disparities exist in health, livelihood, and mortality among vulnerable populations. One research article by Mantel (2018) conveyed how reimbursement payment reform likely had led to providers rejecting patients who did not adhere to medical advice. Ziller et al. (2020) examined an article from a century ago and determined its connections to contemporary health disparities. The meta literature analysis revealed commonalities in challenges. The most influential research was by Egen et al. (2017), who articulated and geographically demonstrated the impact of poverty on various health outcomes and social conditions by comparing the poorest to the wealthiest counties. The authors used a 5-year average for median household income, which formed 3,141 U.S. counties. Findings corroborated previous literature by indicating statistically significant differences in life expectancy, smoking rates, obesity rates, and health and well-being (Egen et al., 2017). Another

study, a correlation survey by Beccera et al. (2021), used CHIS and indicated that 15-18% of individuals with asthma suffered from food insecurity. The study indicated that food insecurity likely caused delays in prescription medication for adults in lower socioeconomic groups (Beccera et al., 2021). Thus, key areas of focus included targeted asthma measures at the point of care (source of healthcare), which could provide optimal health outcomes (CDC, 2020; Egen et al., Ziller et al., 2020). The research gives truth to the recognized socioeconomic differences in the United States.

Literature Review

Asthma care availability and affordability likely contribute to the consistency of management in the rural and urban areas of California (CHD, 2020). Unanticipated costs have included poor asthma health outcomes, increased annual healthcare expenses, reduction in workforce human capital, and a rise in mortality (ALA, 2020; CHD, 2020; National Heart, Lung, and Blood Institute [NHLBI], 2020). The social determinants of asthma health were transparent when understanding the importance of a comprehensive asthma care contribution to QOL (AHRQ, 2020; Bullinger et al., 2015; Macy et al., 2019). Asthma management remains a complex public health concern, therefore research efforts must continue with a multifaceted approaches to understand on how to close the gap with the remaining health disparities among different groups among Californians (George Mason University Mercatus Center, 2020; GINA, 2018).

Asthma Management

The AHRQ National Healthcare Quality and Disparity 2018 report deemed chronic care “weak” in California. Chronic care management (CCM) activities

incorporate oversight and education by health care professionals to help patients understand chronic conditions and overcome associated difficulties, thereby leading to higher QOL. During these activities, a primary care manager (PCM) develops a connection with the patient and develops an individualized health plan that can ensure excellent health outcomes. The CMS (2020) chronic care guidelines can provide structural support to personalized care plans that are important for people with complex asthma care issues. These activities can be vital in promoting a unique understanding of the patient's condition and providing tailored health support (GINA, 2018). In multiple studies, CCM has been accomplished through telemedicine practices to manage health in geographically isolated areas (Jenkins et al., 2016; Jones et al., 2018). CCM support can motivate patients to stay in necessary therapies and interventions and help them attain optimal QOL (Jones et al., 2018). The design can support quick and efficient assessments and enable individuals to manage multiple health conditions (Jenkins et al., 2016. As indicated by the CDC (2020), the diverse landscape and demographics throughout California are linked to differences in asthma status. Rural risk factors for asthma prevalence are a significant health concern in California and a national problem for rural areas across the United States.

Asthma Knowledge

National guidelines from the GINA (2018) recommend that healthcare providers give individuals with asthma a written self-management plan that includes daily management and ability to handle worsening symptoms. Per the CDPH (2021), data obtained from the CHIS indicate that the asthma prevalence is at a rate of 15.9, and the

rate increased by 1.0 over the past few years. Controlling asthma and decreasing social health disparities are primary targets of California Environmental Health Services Breath Program initiative. By controlling asthma, it is possible to reduce the impact of the condition on everyday life. According to the CDC (2010), unmanaged asthma is costly due to increased risk of an ED visit, hospitalization, and absenteeism. In parallel to uncontrolled asthma among certain ethnic groups are social disparities (Aarab et al. 2019). In California, social disparities are a prevailing theme for worsening asthma conditions and disease prevalence, which may be linked to inadequate housing (CDPH, 2017). In certain geographic locations in California, problems arise among lower income families due to health care availability and barriers to achieving healthy outcomes (CDC, 2016). Identifying the key source of care and barriers to asthma management in association with asthma prevalence for those in the age group 35-65 residing in California has remained a high-priority public health issue (CDPH, 2017; CDC, 2020). Consequently, Zein (2021) from the Cleveland Clinic indicated that changes in immunity, environmental factors, and medication adherence are precursors to worsening asthma. Another research study Mychaskiw et al. (2021) indicated that more research is needed the proportion of controlled asthma in the noncommercially insured population. The study also highlighted that asthma management is often underestimated by patients and health care providers, due to other limitations.

Asthma guidelines play an important role in guiding health care providers and patients by providing evidence-based recommendations for asthma management (GINA, 2018). The NHLBI (2020) has supported the development of clinical practice guidelines

based on the best available science that specialists and health care providers use to improve the care that patients receive. According to Cloutier (2020), asthma care plans are designed to improve patient care and support informed decision making about asthma management in the clinical setting. The AHRQ (2020) conducted systematic reviews of these six topics based on literature searches up to March-April 2017. According to Dixon et al. (2020), reviews were updated through October 2018 and used by an expert panel (n = 19) that included asthma content experts, primary care clinicians, dissemination and implementation experts, and health policy experts to develop 19 new recommendations using the GRADE method. The 17 recommendations for individuals aged 12 years or older were reported in this special communication (Dixon et al., 2020). Thus, having an asthma plan was vital for individuals to improve the status of health in both rural and urban areas of California.

The GINA (2021) conducted a research study on adherence to asthma plan protocols during the COVID-19 pandemic. A key finding from the research was that in 2020, a reduction in asthma exacerbations was likely due to handwashing, masks, and physical distancing (GINA, 2021). In another meta-analysis study, Biswas et al. (2020) noted that individuals with asthma and did not have an asthma plan were at an increased risk for not having a rescue inhaler during a severe asthma episode. That study's key finding was that patients with managed asthma had fewer episodes than those of the nonasthmatic group (Biswas et al., 2020). Corticosteroids likely provided more protection against the severity of COVID-19. Therefore, it is imperative to continue good asthma management even when faced with a pandemic. All patients should be provided with a

written asthma plan (ALA, 2020). Factors that increased the risk of asthma-related deaths are individuals who needed but did not currently use inhaled corticosteroids (Bloom et al., 2021).

Demographics of Asthma in the United States

The CDC (2020) collection of ICD-10 from 2018 indicated that in the United States, 41.9 million people had been diagnosed with asthma by a health professional. According to the ALA (2020), adult asthma attack prevalence was at a rate of 11.9; however, only 48.2% percent of those diagnosed with asthma were seen routinely by a provider. Thus, over half of the adult asthma population still had moderate to severe asthma attacks. Secondary data analysis conducted for the NHIS by the ALA (2020) indicated that from 2010 to 2018, no change to asthma prevalence. Thus, demographics for asthma rates have remained consistent, and additional research is needed to understand how the health care environment effects the individual health behavior among adults.

The variations among subgroups and their unique health behaviors make asthma prevention and treatment multifaceted and targeted.

Differences Between Sexes

Both the ALA (2020) and CDC (2020) have validated that current asthma rates are not the same across demographic groups and subgroups. The ALA estimated that adult females were 4.3 times more likely than males to have asthma. The CDC (2020) corroborated the ALA information and estimated that the asthma rate is 4.4 times higher among adult females 18 years of age and older.

Differences Among Age Groups

Also indicated by the ALA (2020) was that adults aged 18-55 years had the highest lifetime prevalence rates compared to other age groups at a rate of 14.7.

Ethnicity and Asthma

Certain subgroups are likely to have higher asthma prevalence than other groups. In 2018, the CDC (2020) indicated that, at the national level, African Americans were more likely than any other ethnicities to be diagnosed with asthma over a lifetime. A cross-sectional research study by Anarella et al. (2017) indicated that African Americans with asthma experienced higher rates of ED visits and inpatient hospitalizations. Key findings indicate that African Americans have lower rates of long-term medication use compared to other racial/ethnic groups (Anarella et al., 2017). Another study by Keet et al. (2017) linked a trend with African Americans residing in poor areas. The study observed an increased risk of asthma-related ED visits and hospitalizations for African Americans relative to any other racial group (Keet et al., 2017). The U.S. Census Bureau (2020) indicated that California had a small percentage of African Americans in the population. However, CHD (2020) asthma statistics still indicated that even though African Americans represented a small percentage of the population, they had the highest rate of admissions to the ED compared to any other ethnic group in California.

Adult Adherence to Asthma Management

Despite advantages to treatment adherence, individuals with asthma often failed to take medication as prescribed. The chronic inflammatory was potentially a driver to having COPD in your later years. As indicated by the GINA (2020), most adults between

35-65 were having the highest prevalence rating from any other group. In 2016, the CDC (2020), *AsthmaStats*, highlighted that California had an overall rate of 57.8% of nonadherence, with the highest age group between those ages of 35-54 at a rate of 61.9%. Thus, adherence to asthma guidelines was poor among adults in the primary care setting, which leaves opportunities for improvement (CHD, 2020). Yawn et al. (2016), ascertained in the research those older patients were negatively associated with asthma guideline adherence in the primary care setting, documenting a 3.1% rate of electronic medical records documenting an Asthma Action Plan (AAP). Additionally, the adherence to nonmedication elements were higher in cities of more than 250,000 people that utilized electronic medical records (EMR) (Yawn et al., 2020). Another study conducted by Westerhof et al. (2018) introduced the MAR-Scale to understand the reasons for non-adherence to asthma medication. It was likely the ability to access healthcare and medication on hand likely had some unforeseen risks among the working population (age 18+) (Westerhof et al., 2018; Yawn et al., 2020; CHD, 2020).

Existing intervention strategies likely proved effective, however, measuring and addressing adherence to asthma plans remained complex among certain groups with uncontrolled asthma (Lewis et al., 2017; Narmagambetov et al., 2018). Nonadherence to asthma plan was also indicated as more prevalent among individuals with low socioeconomic status (Jenkins 2016; Jones et al., 2018; Liu et al, 2021). According to Biswal et al. (2017), key findings were that despite improved access to care and reduced medication pricing individuals with lower SES still fail to adhere. The recommendation was focuses on the patient-centered communication strategies to overcome the barriers

(Biswal et al., 2017). During the pandemic the provider patient communication likely had highlighted some vulnerabilities in the early 2020's (Lui et al., 2021). The asthma medication and plan adherence likely had negatively been affected by the lack of communication platforms that positively effect health outcomes (Jones et al., 2018). The study conducted by Young et al. (2017) identified the direct communications strengthen the trust and motivation for individuals with asthma. The key finding also with MacDonell et al. (2021) that African Americans indicated the importance of focusing on clinical integration to automate asthma adherence through text messaging.

COVID-19 Influence on Rural Asthma Health

Long-standing systemic health and social inequities had put rural residents in the United States and California at an increased risk for worsening asthma symptoms (King 2020; Kirby et al., 2020; Kwan et al., 2018). The CDC (2020), *Social Vulnerability Index (SVI)*, consolidated and analyzed information collected by the Census Bureau database, the National Vital Statistics, and National Health Surveys. The risk factors conveyed in the SVI include housing, transportation, socioeconomic status, race, and ethnicity (CDC, 2020). The 2020 SVI report conveyed that rural communities had a higher vulnerability than their urban counterparts (CDC, 2020). Comparing COVID-19 case rates was sometimes problematic due to the virus's ability to affect a wide array of health outcomes (GINA, 2020; Lui et al., 2020). According to Cromartie et al. (2020) economic study on the United States rural communities and COVID-19 impact, rural areas had about 27% of total confirmed COVID-19 cases and 23% of all deaths in October. COVID-19 had changed the healthcare landscape with the deteriorating financial status, inability to

expand healthcare access in rural communities, and balanced demand for resources (Cromartie et al., 2020; Ziller et al., 2020;). Once COVID-19 started to show up in the rural population, the social inequities and the vulnerability became apparent, highlighting the difficulty in deploying medical resources (Cromartie et al., 2020; Hodge et al., 2020). The outbreak was noticed because the health infrastructure was imperative to reducing the morbidity and mortality rates within these unique geographic regions requiring state-level alignment (Cromartie et al., 2020).

The inability for state-level alignment of health system resources and the reduced operational revenue caused some hospitals to become overwhelmed (Adam et al., 2020; OSHPD, 2020). The patient load shifted, and it appeared that hospitals were taking in more than they could discharge. The Office of Statewide Health Planning and Develop (2020), 2018-2019 FY Hospital Annual showcased significant declines in inpatient and outpatient visit volume. Thus, the hospitals had decreased net revenue substantially as well as reducing the outpatient volume (Adam et al., 2020). The authors estimated an immediate 50% reduction in hospital net revenue, followed by gradual improvements as shelter-in-place orders begin to loosen (OSHPD, 2020). Adams et al. (2020) indicated that improved technology and interfaces had increased communication lines within the healthcare network behind the scenes. Hospitals and health centers utilized the technology interfaces (telehealth) to provide coordinated care for outpatient services (Lagakos, 2020). However, in rural areas, the network infrastructure was likely

diminished or reduced, which likely had left individuals that could afford healthcare without support (Adams et al.,2020; Lagakos, 2020).

A few economic studies from the United States Department of Agriculture indicated that the rural population appears to be more vulnerable to severe infections and poor health outcomes for several reasons (Cromatie et al., 2020). In late October, a precise snapshot on the social determinants of health was observed as the COVID-19 cases surged in rural areas. The author highlights the significant infection rate per 100,000 adults and a rise in death rates, approximately 40% higher than in urban communities (Cromatie et al., 2020). The CDC (2020) identified two characteristics of people highly vulnerable to the coronavirus: elderly over 75 and underlying health problems such as uncontrolled chronic conditions. Multiple cross-sectional research findings had indicated that rural communities likely also were more vulnerable and had difficulty accessing healthcare (Adams et al., 2020; Cromartie et al., 2020; Lee et al., 2019)

Social Determinants of Health and Asthma

The relationship between poverty and ill-health (such as asthma) was not a simple one. It was multi-faceted and bi-directional (Mood et al., 2016). Bidirectionally, ill-health was likely the catalyst for poverty conditions, and in turn, poverty likely created and perpetuated poor health status (Mood et al., 2016). The Social determinants of Health (SDOH) were conditions in the living environment aspects that affect asthma health and QOL (Tran et al., 2017; Whiteacre et al., 2017). The social conditions likely drove up asthma prevalence for individual subgroups within a given population (ALA, 2020,

Biwas et al., 2020). The primary domains of concern in this research within SDOH were healthcare access, source, and quality. The fundamental connection between the individual's access and source of services to better health outcomes and quality of life (Egan et al., 2017). Understanding this SDOH likely provided context to why specific individuals were likely to seek, utilize, and abide by the guidelines provided in their asthma care management plan when implemented by a healthcare provider (Delinger et al., 2017; GINA, 2018;).

A study conveyed that consistent communication and follow-up were critical to addressing the health needs of the chronically ill and adjusting a plan based on clinical-based findings (Bauerly et al., 2019). The primary areas of interest in this research study were the asthma sources of care and defining asthma management among the California residents with asthma. The author indicated that only slight differences in rural and urban populations despite limited resources (Bauerly et al., 2019). Other outside forces played to the asthma care inefficiencies during 2019-2020 when considering the availability of resources and the social environment. In this research, I hoped to understand the healthcare sources effect asthma management. During the COVID-19 pandemic, systematic social inequalities contributed to higher incident rates in asthma and other chronic conditions (CDC, 2020). According to Sravani et al. (2020), the literature analysis indicated that the during the pandemic, healthcare resources were limited outside of work hours making visits difficult and not feasible. In addition, low-cost primary

health clinic care and services to underprivileged populations were the primary source for maintaining their well-being (Sravani et al., 2020).

Health Vulnerabilities and Asthma

The COVID-19 pandemic influenced the availability of resources and further identified the United States and California's health vulnerabilities. In the beginning months of the pandemic, California had high rates of infection and transmission. This trend underscored the need for policymakers, health care leadership, and community invested stakeholders to act, define, and address vulnerabilities in overall health and health inequities. Multiple news reports, research publications, and healthcare policy developments identified this trend as the "race pandemic and viral pandemic." The observed trends underlined systematic and institutionalized bias that had likely impacted certain groups and probably fueled disinvestment in the communities (Kirby et al., 2020; Kwan et al. 2018; Lewis et al.017).

This study identified asthma health vulnerability in California by analyzing the health metrics on access, asthma management, and source of care utilized throughout 2019 and 2020. What can be understood from the U.S. Census Bureau (2020), ACS analysis on current rates of access was that the rates had reduced over the past decade; however, variations had still prevailed in both urban and rural populations. Multiple studies also highlight that the certain subgroups and geographic locations had a higher asthma prevalence due to provider shortages, proximity to care, and mitigating platforms had likely perpetuated health inequity (Egen et al, 2018; Hodge et al, 2020). This was

likely why the population growth rates were low in rural areas for the past decade. Thus, the perception of health economics likely influenced health beliefs and behaviors.

Health Care Access Vulnerabilities

The failure to achieve health equity had likely impacted healthcare access. Health access embodies three interlinked objectives that affect asthma status: equity, quality, and protection. Emphasis on access was critical to responding to rural residents' unique geographical challenges residing in California (Kirby et al., 2020). The trends observed showcased a higher vulnerability level and dependency on public health programs. Also observed trends are 1) a higher presence of older and chronically ill with the population, increased poverty, 2) increased nursing and physician shortages, and 3) reduced local access to quality healthcare.

Definitions

Summarized below are operational definitions and terms relevant in the context of this research study:

Socioeconomic status: An economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others.

Socioecological model: The SEM relied on individual and environmental factors to understand people’s behaviors. These behaviors could explain different health and social issues. The theory-based framework had five nested and hierarchical levels: individual, interpersonal, community, organization, and policy. These levels of

understanding people's behaviors were instrumental in comprehending human and organizational leverage points for health promotion within a society (UNICEF, 2016).

Ethnic group: The shared characteristics of a community or population who share a distinctive cultural background, homeland, history, ancestry, religion, and language. Individuals in an ethnic group view themselves as sharing similar social experiences and traditions that differentiate them (Britannica, 2020)

Health disparities: Differences in health and health outcomes closely related to socioeconomic and/or environmental disadvantages. Health disparities unfavorably affect groups of people with similar interests or aims, who had systematically endured greater obstacles to health. (Healthy People 2020).

Health care access: This refers to the timely use of services to improve an individual's health outcomes (Agency for Health Care Research and Quality, 2016).

Assumptions

A fundamental assumption underlying this study was that the collection of the CHIS data used rigorous sampling techniques as reviewed in the UCLA methodology. Second, I assumed that respondents likely felt that their information would be immediately encrypted to protect privacy, which increased. Even though the answers were self-reported that the respondents provided accurate information to the best of their knowledge. The validity and reliability of the information were further driven by the respondent's method and the influence of the pilot studies to ensure the information generalizable with California demographics and trends. I further assumed that since the CHIS staff collecting the information was highly trained, the information was coded

correctly at the state level and interpreted, coded, entered, analyzed, and weighted correctly. I also assumed that the information collected was free from errors and the findings were representative of the urban and rural population in California. Finally, based on a review of the CHIS codebook and the AHS adult dataset, I assumed that there would be enough cases to analyze to determine if associations existed between healthcare characteristics (source of care, management of asthma care, reason for delayed care, asthma status) to be able to generalize the findings on the rural and urban population.

Scope Limitations, Challenges, and/or Barriers

The study's limitations were confined to the parameters of a cross-sectional research design that utilizes casualty to define a relationship between the health care variables and asthma management variables during a given space and time (Wells et al., 2018). Many studies utilized CHIS data noted that the study's critical limitations were lack of generalizability and recall bias (Memon et al., 2020; Wells et al., 2018). Based on the definition of asthma care assessment, I added sufficient variables to define management in the healthcare setting.

Generalization

The lack of generalizability was noted by the population density for rural residents in California, in comparison to the high-density rural population in the Midwest, Northern Plains, and Southwest (Maxwell, 2020). Therefore, the proportion of the urban population was higher in California, limiting the generalization of the key findings. Also, the CHIS data findings cannot be utilized to ascertain the cause of asthma status in California using the findings from this research.

This cross-sectional study attained information at a specific point in time from 2019-2020. The study findings could not be assumed valid for the previous periods or any periods after. Additionally, other external influences could have affected asthma management within the urban and rural health system. Thus, findings likely did not holistically representatives of the California urban and rural population. Therefore, findings from the 2020 CHIS database were restricted to the collection period and the dynamics that prevailed at that time.

Insufficient Assessment of Asthma Management

Asthma management identified the asthma condition, formulating a plan, and periodic review of the plan and medication use (GINA, 2018). The questionnaire provided a preliminary assessment of the compliance to an asthma management plan by the participants. I utilized the variables available to make a casual assumption related to asthma management. The asthma variable was not confirmed by documented medical provider reports by firmly based on the participant's self-reported asthma status. Thus, the accuracy of the dependent variables was a limitation to this study.

Information and Recall Bias

I suspected that asking respondents to recall their experiences over the past 12 months would likely be subject to recall bias, meaning survey respondents not accurately recall entirely on specific events such as doctor visits and how often they visited throughout 12 months.

Summary

Asthma management within the rural and urban designated areas remained a significant public health issue and costly on several levels. Building on previous research efforts had identified that certain groups had a higher risk of poor asthma status (Aaron et al. 2017; Hsu et al., 2018). The COVID-19 pandemic further exacerbated the social determinants within both the urban and rural populations (Bloom et al., 2021; Liu et al., 2021). Examining the role of healthcare source, asthma management, access to care and asthma status in California could increase awareness of the socioeconomics that effect rural health (Macy et al., 2019). The certain subgroups, especially poor and low-income households, were at risk for not having a consistent source of healthcare throughout their lifetimes if health services were not available (Cromartie et al., 2020; Douthit et al., 2015). The study offered the potential to proactively focus on prevention efforts, policy changes, expand health care services, and alleviate the effects on quality of life within the social determinant of health.

Poor asthma health remained a significant public health issue and costly on several levels (ALA, 2020; Brown et al., 2015; CDC, 2020). Built on previous research efforts, public health research has identified numerous potential risk factors for poor health outcomes among certain subgroups and examined the healthcare role in the health disparities. The information provided a targeted focus that could increases the awareness of the social determinants of health associated with poor health outcomes in different geographic areas (Caldwell et al, 2016; Cancel-Tirado et al., 2018). The study offered the

potential to proactively focus on prevention efforts, policy changes, and health care services that have reduced the social determinants of health among different groups.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study was to analyze asthma care and asthma management among California's rural and urban settings. The healthcare had gone significant changes during the pandemic. The overarching question is "How was asthma managed in the healthcare setting in California's rural and urban areas?" According to recent literature, significant limitations to health availability have likely been exacerbated by a lack of health infrastructure or sources of care (Bauerly et al., 2019).

The CHIS reported by UCLA covers critical characteristics of asthma management. For my study, I used a quantitative correlation approach to interpret the secondary data retrieved from the CHIS, which was the premier combined dataset of telephone and web-based surveys. For the primary analysis on RQ1 through RQ3, I used crosstabulation with Pearson chi-square, Cramer's V, and phi function using the health section to compare source of health care, asthma management, and asthma episodes/attacks in the past 12 months grouped by urban and rural areas. For the primary analysis of RQ4, I performed a binomial logistics regression analysis to explore whether there was a relationship between asthma episodes/attacks in the past 12 months, health-professional-prescribed asthma action plan, controlling asthma with daily medication, and the moderating effect of ethnicity with data from the CHIS. For the primary analysis of RQ5, I performed a binomial logistics regression analysis to explore whether there was a relationship between asthma episodes/attacks in the past 12 months, health-professional-prescribed asthma action plan, controlling asthma with daily medication,

and the moderating effect of annual household income level with data from the CHIS. UCLA (2020) stated that the overall response rates for CHIS 2020 were composites of the screener completion rate and the extended interview completion rate. For CHIS 2019, the overall household response rate was 11.2%, which was the product of the screener response rate of 14.9 %, and the extended interview response rate at the household level of 75.3%).

Table 1

California Health Information Survey Response Rate

Sample	Screener	Household	Adult	Child	Adolescent
Overall conditional	14.9%	75.3%	72.3%	86.1%	27.6%
Overall unconditional	14.9%	11.2%	10.8%	12.8%	4.1%

Note. Adapted from *CHIS 2019 Methodology Report Series—Report 4: Response Rates* (p. 1-11), 2020, by California Health Interview Survey, UCLA Center for Health Policy Research (https://healthpolicy.ucla.edu/chis/design/Documents/CHIS_2019_MethodologyReport4_ResponseRates.pdf). Copyright 2020 by the Regents of the University of California.

According to the U.S. Census (2020), California appears to have the highest level of diversity relative to any other state based on education, socioeconomics, and cultural diversity. This was founded on combined research conducted by the U.S Census Bureau, the Association of Religion Data Archives, and the American Values Atlas 2020. The inclusion of asthma care characteristics as far as access and source of care determined the overarching theme of the pandemic, answering the question “Was there a difference in treatment and access for individuals with asthma?” Thus, the study would likely have provided insight to the plateau of asthma prevalence among different subgroups. Another overarching theme presented in my study related to the question “Was the healthcare

system keeping the population healthy?" The findings of this research help to fill a research gap; previous researchers have not extensively explored the casual relationship with asthma care and asthma care management in California's urban and rural health settings during the COVID-19 pandemic with a focus on the subgroup consisting of individuals aged 35-65.

This section contains five subsections. In the first part, I outline the research design and rationale, explaining the research variables and their connection to the research design. The second part contains details of the methodology used in the research. In this subsection, information about the target population, sampling procedures, power analysis, instrumentation, operationalization of constructs, data management, data analysis, procedures for recruitment, participation, and data collection is outlined. In the third part of this section, I outline the threats to validity, and in the fourth part, I outline the ethical procedures governing the research process. In the last part of this section, I summarize the main tenets of the section.

Research Design and Rationale

This study used a quantitative correlational approach, with which I explored and analyzed asthma health, asthma health management, annual household income level, ethnicity, barriers to care, and source of care. The analysis was conducted with secondary data gathered from the CHIS dataset, which was reported publicly on the UCLA website. I sought to understand the differences between rural and urban asthma management and barriers. The variables were categorical. The research variables included were the dependent variables (asthma status), and the independent variables were source of care,

access, and delaying needed care. For the primary analysis, I used the healthcare modules to analyze the asthma and asthma management metrics, grouping by rural and urban areas. I performed a binomial logistic regression to explore whether there was a relationship between annual household income level and ethnicity in outcomes measured by the CHIS. I used binomial logistic regression to predict, correlate, and summarize the relationship between two dichotomous variables (Laerd, 2020). Regression predicted the change in the outcome variable associated with a particular change in the predictor variable (Godfrey, 1985).

This study was a secondary analysis of data that were archived in the 2020 CHIS. The research design connected to the research questions by using a quantitative correlation approach. The design was an essential application to better understand the relationship between rural and urban health care systems and provided an in-depth analysis and evaluation of the data to understand the association (Janio et al., 2020; Melnikow et al. 2020; Young et al., 2021). I found that the use of secondary data alleviated issues with time and resource constraints. Furthermore, the use of the CHIS dataset provided ample resources to explore the differences between rural and urban asthma care easily. The 2020 CHIS was already published by UCLA and only required me to sign a waiver to attain the online dataset.

Using the World Health Organization (WHO) Social Determinants of Health framework for health care systems, I analyzed the association to access to care, source of care, and asthma management in California's rural and urban areas. The three components from the WHO framework (access, asthma treatment plans, and asthma

source of care) were applied in this study as follows: healthcare access, healthcare utilization (usual source of care, number of doctor visits past year), and coordinate care with a doctor's office (WHO, 2010). The study also included the ongoing social determinants interdependent components, which included annual income level, type of access healthcare, general health condition, and chronic disease management (AAP). The social determinants health system were examined interdependently to analyze the components' implications in rural and urban health systems.

The design selected for this study was previously used with other asthma care management and asthma care characteristics studies. I focused on advancing knowledge and providing opportunities for understanding urban and rural asthma care differences in a pandemic setting for future research (Aarab et al., 2019; Greenberg et al., 2018; Reynolds et al., 2020). However, given that the current study used a cross-sectional design, it would not be straightforward to explain which variable influenced the other; therefore, discussion and interpretation of results was important. For example, if an association was found between source of care and asthma management plans, the relationship likely had higher odds in the urban setting after adjusting for important confounders, and it was logical to say that asthma care sources were likely different in urban settings rather than that the lack of asthma care led individuals living in urban setting to forego care. In this regard, the cross-sectional design provided a good starting point for investigating the association without necessarily explaining the details surrounding the association. Thus, future researchers would narrow the findings down to

understand the intricate details surrounding the association, experimentally or otherwise in more robust observational designs such as prospective cohort studies

Methodology

Population

The targeted population for the study was adults between the ages of 30 and 50 who resided in the 58 counties located in California who participated in the CHIS 2020 survey. Every sample unit of the 2020 CHIS was asked a core set of questions. The CHIS data were analyzed at the county level for the state's 58 most populated counties. The remaining were combined into three different groups. The three different groups' modules were called "child," "adolescent," and "adult."

Sample and Sampling Procedures

The CHIS is a population-based survey of California's residential, noninstitutionalized population conducted continually since 2011. The CHIS is the nation's largest state-level health survey and one of the largest health surveys in the nation. The UCLA Center for Health Policy Research (UCLA-CHPR) conducted CHIS in collaboration with multiple funding sources from public, private, and non-profit organizations. The CHIS collects extensive information for all age groups on health status, health conditions, health-related behaviors, health insurance coverage, access to health care services, and other health and health-related issues. The sample was optimized to provide estimates for large and medium-size counties and statewide estimates for the overall population, including major racial and ethnic groups.

The sample design for CHIS 2020 could be summarized as a stratified address-based sampling (ABS) design with strategic oversamples of households predicted to have certain attributes. When drawing a sample for the CHIS, only records flagged as residential or mostly residential were included, as well as PO boxes defined as the only way a household can get mail (OWGM; i.e., the homeowner had requested no mail delivery at the actual household, just the PO box). Excluded were other PO boxes, along with seasonal and vacant households. The study did not cover institutionalized residences/group quarters (e.g., prisons, psychiatric hospitals, long-time care facilities, etc.).

ABS Sampling

The ABS sample for CHIS 2020 was selected via probability sampling methods and supplied by Marketing Systems Group (MSG). A recent advance in survey sampling is the use of Big Data to build predictive models of household attributes such as demographics, spoken languages, and even attitudinal metrics (Djangali et al., 2019; Dutwin, 2020; McPhee et al., 2019). The process was initiated by appending auxiliary data to prior survey data and using this information to build models that predict self-reported survey outcomes from auxiliary data. Future samples were then scored with the outcomes of those models, enabling the creation of strata that could be used to effectively target specific groups. For CHIS 2020, CHIS 2019, and CHIS 2017–2018, data were used to build the models.

Geographic Strata

The CHIS 2020 used 44 primary geographic strata as well as eight Los Angeles-specific and six San Diego-specific substrata. In addition, there were 26 Los Angeles Health Districts nested within the eight Los Angeles-specific substrata, and CHIS 2020 aimed to conduct a minimum of 100 interviews per Health District to assess the feasibility of smaller geographic stratification. The aim of CHIS 2020 was also to conduct a minimum of 20 interviews in each component county of a multicounty stratum.

San Diego Supplemental Sampling

CHIS design regularly included additional samples for specialized analyses of certain geographic areas. As had been the case in prior years, researchers chose to oversample San Diego County for additional statistical power in CHIS 2020. The oversample targeted specific overall quotas by Health and Human Services Agency (HHSA) regions, for a total of 112 additional interviews in each region.

Adult Sampling

As with previous waves of the CHIS, adults were any people 18 years of age or older. Adult selection followed the next-birthday method of within-household sampling that did not require enumerating all adults within a household. This method was intended to reduce screener duration and respondent burden while giving each adult resident an equal probability of selection. The total number of adults in the household was collected in the screener.

The 2020 CHIS household sample consisted of 22,738 interviews with 21,949 completed for interviews for the adult section. The number of participating households

and adults was not identical because some households (578) that completed the interview did not complete the full adult interview. The adult CHIS sample consisted of 16,764 adults, with the following composition by race/ethnicity: 2,576 Asians, 59 Native Hawaiians/Pacific Islanders, 905 African Americans, 293 American Indians/Alaskan Natives, 894 other single-race individuals, and 669 individuals with two or more races.

Survey Design for 2018 and Later

In the correlation study, I used a cross-sectional design to analyze the urban and rural healthcare systems in California to measure the characteristics of the system. Cross-sectional designs were used for population-based surveys and to assess the healthcare characteristics in certain geographic settings. To prevent bias, the CHIS must have enough participants not to skew the data. For the 2020 CHIS dataset, a total of 21,949 participants completed the adult survey and resided in California. For the selection process for this study, all participants were over the age of 18. Today, CHIS employs several strategies to produce high-quality data that accurately represent California's diverse population. These strategies include language inclusivity, an advance letter, incentives, respondents, a toll-free line, a website interface, maximum call attempts, high-quality interviews, and a certificate of confidentiality.

Language Inclusivity

The CHIS was conducted in English, Spanish, Chinese (Cantonese and Mandarin), Korean, and Vietnamese. Based on analyses of Census 2000 data for California, language selection was designed to maximize the inclusion of linguistically isolated households.

Advance Letter

A letter was mailed to most sampled households before an attempt was made to contact the household by telephone. The letter, which was printed in all five CHIS administration languages, alerted the household that it had received a phone call and helped to differentiate the CHIS from telemarketers.

Incentives

Since CHIS 2005, the advance letter has included a $2 bill to encourage households to participate. This modest incentive does not compensate participants for their time but helps to draw attention to the survey, emphasize its importance, and encourage participation.

Toll-Free Line

A toll-free line was available to respondents during the entire CHIS field period. Potential respondents could call to have their questions answered, schedule an interview, be assured of the legitimacy of the survey, and so forth. The toll-free number was printed on the advance letter and likely also provided by an interviewer.

Respondent Web Interface

A special website was maintained during the field period that included a frequently asked questions (FAQ) feature so that respondents could learn more about the survey. The website address was printed on the advance letter and was often provided to potential respondents by interviewers.

Maximum Call Attempts

Each sampled telephone number was dialed at least 14 times, on different days (weekdays and weekends) and at different times of the day to contact a household. If the household was initially reached at an inconvenient time, call-back appointments were made to accommodate the respondent's schedule. Messages were also left on answering machines to help differentiate CHIS from telemarketers and encourage participation in the survey.

Well-Trained Interviewers, High-Quality Interviews

CHIS interviewers received a minimum of 18 hours of training and were constantly monitored and supervised to ensure high-quality data collection. CHIS data collection was conducted by Westat, Inc., an employee-owned survey research organization with a national reputation for quality.

Certificate of Confidentiality

CHIS obtains this certificate from the National Institutes of Health. The certificate protected the confidentiality of CHIS respondents and the information they provided from forced disclosure, such as a court subpoena. CHIS steadfastly protected the confidentiality of all participants. CHIS protocols for participant recruitment, data collection, and the dissemination and storage of data were governed by the UCLA Office for the Protection of Research Subjects, the California Committee for the Protection of Human Subjects, and the federal Office of Management and Budget.

Size Determination

To meet the targets for the adult interviews outlined above, a stratified sample was selected based on the final modeled strata ratios. Where available, phone numbers were appended to the ABS sample to enable follow up protocols for nonresponse. Tables 2 & 3 contained the total numbers of addresses randomly generated and fielded by modeled strata, and it also enumerated the number of phones appended by modeled strata. Yields were based on the web experiment and adjusted to account for the design of CHIS 2020.

Table 2

Total Sample Generated and Fielded by Modeled Strata

Modeled stratum	Modeled households	Sample mailed	Mailed sample with phone appended
1 Korean household	7,181	3,501	2,271
2 Vietnamese household	9,018	3,627	2,605
3 Other Asian household	36,273	10,807	7,382
4 Hispanic or Spanish-speaking household	99,324	39,385	27,186
5 Household with adult with low educational attainment or an adult who is not a citizen	57,267	17,848	11,757
6 Residual group	422,844	120,819	82,134
7 No auxiliary data group	155,825	14,279	8,063
Total	847,930	254,796	172,511

Note. Source: UCLA Center for Health Policy Research, 2019 CHIS Survey.

All addresses sampled for CHIS 2020 were checked against known or listed addresses from the 2018 web experiment. Any duplicate addresses from the 2018 web experiment were removed from the CHIS 2020 sample prior to data collection. Further each generation of sample in CHIS 2020 was re-duped with prior releases to ensure that addresses were not duplicated. The sample for CHIS 2020 was generated monthly and

released in 9 waves. For the first 7 waves, sample was released on a weekly basis. The sample for the last 2 waves was released bi-weekly.

Table 3

Sample Release by Wave

Mail wave	Sample size	Initial mailing
1	38,267	9/26/2019
2	38,281	10/3/2019
3	38,277	10/10/2019
4	27,358	10/17/2019
5	26,577	10/24/2019
6	26,576	10/31/2019
7	17,738	11/7/2019
8	35,763	11/21/2019
9	5,959	12/4/2019

Note. Source: UCLA Center for Health Policy Research, 2019 CHIS Survey.

Weighting

To produce population estimates from CHIS data, weights were applied to the sample data to compensate for the probability of selection and a variety of other factors, some directly resulting from the design and administration of the survey. The sample was weighted to represent the noninstitutionalized population for each sampling stratum and statewide. The weighting procedures used for CHIS 2020 accomplish the following objectives: The CHIS scientifically selected participating housing units which represent all socioeconomic levels with the California. To ensure the validity and precision of the information each housing unit in the CHIS national sample was weighted and represents for the following criteria.

Adult Weighting

The adult modules weighting was calculated the adult base weight, nonresponse adjustment, pre-calibrating trimming, and calibration adjustment to the Department of

Finance Projections divided into screener interview and extended adult interview. The follow were the calculations for each area.

Adult Base Weight

$ADA0Wi$, was defined as the product of the total household weight, $HHWi$, and the number of adults adjustment factor, ADi:

$$ADA0Wi = ADi \text{ x } HHWi$$

where ADi was the number of adults in the household for respondent i. Consistent with past renditions of CHIS, values greater than three were truncated to an upper bound of three to limit the variation in the weights.

Adult Nonresponse Adjustment

Some households completed the screener interview, but the sampled adult did not complete the extended adult interview. A CART model was run to determine which variables best predicted adult response. Adults' screener respondent was the only significant variable in the CART model. The non-response adjustment cells were defined as screener respondent by geographic stratum. Cells were collapsed within stratum if cell sizes were less than 25. The adult nonresponse adjustment weight $ADA1Wi$, was the product of the number of adults adjustment weight $ADA0Wi$, and the number of adults adjustment factor, $ADA1Fi$:

$$ADA1Wi = ADA1Fi \text{ x } ADA0Wi$$

Precalibration Trimming

Finally, this resulting weight was trimmed at the 2nd and 98th percentiles within strata. A total of 849 weights were trimmed across the 22,949 cases.

Table 4

Extended Adult Interview Weighting Adjustments

Survey	Weight statistics (Adult table)
1. Number of adults adjustment	
1.1 Sample size	30,072
1.2 Sum of weights	25,304,802
1.3 Coefficient of variation	110.3
1.4 Mean nonzero adjustment	1.97
2. Adult nonresponse adjustment	
2.1 Sample size	
a. Adult respondents	22,160
b. Adult nonrespondents	7,912
2.2 Sum of weights	25,304,802
2.3 Coefficient of variation	124.8
2.4 Mean nonzero adjustment	1.40
3. Precalibration trimming	
3.1 Number of records trimmed	849
3.2 Sum of weights	24,218,796
3.3 Coefficient of variation	97.7 4
4. Final calibration adjustment	
4.1 Sample size	22,160
4.2 Sum of weights	29,963,876
4.3 Coefficient of variation	175.6
4.4 Mean weight	1,352.2

Note. Source: UCLA Center for Health Policy Research, 2019 CHIS Survey.

Sample Size

The CHIS surveys were completed across California during 2020 to which include the health module during the interviews, surveys, and phone surveys. The final available date set for analysis (*N*=21,949) responses. Out of the 21,949 responses, 1,387 reported having asthma. Multiple studies highlighted that using the G-Power software program. G-Power program made online research efficient and effective for performing various types of population analysis (Faul et al., 2009). In the study, I downloaded the

free online G-Power Software (3.1.9.2) designed for Windows 10 operating system. The tool was useful to calculate the sample size for the CHIS as a power analysis as a "Priori." I performed the selected type of power analysis to assist with determining what sample size was necessary to detect some level of effect with inferential statistics (Memon et al., 2020). Buchner et al. (2007) indicates that G-Power analysis provided an efficient method of controlling statistical power. The ANOVA: Fixed effects, omnibus, one way ANOVA) and binomial logistics regression were chosen as the study design to effectively analyze minimal sample size for each research question.

RQ1 sought to understand if having a healthcare source effects general health condition. A power analysis for ANOVA: Fixed effects, omnibus, one-way was performed using G-Power software with Priori. I assumed an effect size of 0.30, since previous studies had used the same effect size in secondary data cross sectional research studies when understanding how healthcare effects general health (Faul et al. 2009; Lewis et al., 2017). I chose an alpha of 0.05, a minimal statistical power of 0.80, and the number of levels for general health condition was five. The minimal sample required minimal sample size of 140.

RQ2 sought to understand if having to someone at Doctor's office/clinic who helped coordinate care effects asthma episodes/attacks in the past 12 months A power analysis for ANOVA: Fixed effects, omnibus, one-way was performed using G-Power software. I assumed an effect size of 0.25, since previous studies had used the same effect size in secondary data cross sectional research studies when understanding how someone at Doctor's office/clinic who helped coordinate care effects asthma episodes/attacks in

the past 12 months (Faul et al. 2009; Nurmagambetov et al. 2018). I chose an alpha of 0.05, a minimal statistical power of 0.80, and the number of levels for having to someone at Doctor's office/clinic who helped coordinate care was two. The minimal sample required minimal sample size of 128.

RQ3 sought to understand if having a usual source for healthcare effects having a doctor prescribed asthma management plan. A power analysis for ANOVA: Fixed effects, omnibus, one-way was performed using G-Power software with Priori. I assumed an effect size of 0.25, since previous studies used the same effect size in secondary data cross sectional research studies when understanding having a usual source for healthcare effected having a doctor prescribed asthma management plan (Faul et al. 2009; Nurmagambetov et al. 2018). I chose an alpha of 0.05, a minimal statistical power of 0.80, and the number of levels for usual source of health care was five. The minimal sample required minimal sample size of 200.

RQ4 identified whether professional prescribed asthma management plan and controlling asthma with medication influenced the episodes/attacks within the past 12 months. Ethnicity influence also reviewed to understand the influence on attacks/episodes in the past 12 months. A G-Power analysis with Priori was performed using the Logistics Regression with a dichotomous predictor. I assumed a two-tail test, odds ratio of 2.477, an alpha 0.05, and minimum statistical power of 0.80. The probability of an individual having an asthma episode/attack without an asthma management plan ranged in probability from 0.45 to 0.85. I chose to average both probabilities and selected 0.60 R-squared selected for RQ4 was of 0.04 because I expected a low association with ethnicity

to asthma episodes/attacks in the past 12 months. The X-Distribution that I selected was binomial predictor. I assumed an effect size of 50% because the effect of having an asthma management plan and still having an asthma episode/attack was unknown. The portion of cases on individuals with an asthma management plan was 0.90. A null hypothesis probability of the dependent variable being equal to 1 if the independent variable was equal to 1 of 0.60 produced a minimum sample size of 515.

RQ5 identified whether professional prescribed asthma management plan and controlling asthma with medication influenced the episodes/attacks within the past 12 months. Household annual income level was also reviewed to understand the influence on attacks/episodes in the past 12 months. A G-Power analysis with Priori was performed using the Logistics Regression with a dichotomous predictor. I assumed a two-tail test, odds ratio of 2.477, an alpha 0.05, and minimum statistical power of 0.80. The probability of an individual having an asthma episode/attack without an asthma management plan ranged in probability from 0.45 to 0.85. I chose to average both probabilities and selected 0.60 R-squared selected for RQ5 was of 0,04 because I expect a low association with ethnicity to asthma episodes/attacks in the past 12 months. The X-Distribution that I selected was a binomial predictor. I assumed an effect size of 50% because the effect of having an asthma management plan and still having an asthma episode/attack was unknown. The portion of cases on individuals with an asthma management plan was 0.90. A null hypothesis probability of the dependent variable being equal to 1 if the independent variable was equal to 1 of 0.60 produced a minimum sample size of 515.

The correlation coefficient was medium effect size of 0.15, α of 0.05, and a power of 0.95 were chosen based on previous studies used in social, behavioral, and biomedical sciences (Buchner et al. (2007). As of December 2020, public reported CHIS participants in California were 21,949 households. According to the CHIS summary analysis 21,949 adults from California were among those that participated in the study (UCLA, 2020). Thus, the CHIS proposed sample size of 21,949 was met for the objective of this study.

Instrumentation and Operationalization of Constructs

Instrumentation

The health system information was obtained from the UCLA Center for Health Policy Research website which holds the CHIS secondary dataset. The CHIS was the largest statewide health survey to be conducted on an annual basis that provides public health leadership, policy makers, local public health agencies, hospitals, and clinics with health information from taken from a diverse population. (UCLA, 2017). The CHIS health data published for 2020 was relevant and specific to healthcare characteristics under investigation to further understand the differences of the "Race and COVID-19" pandemic in California's rural and urban areas. The CHIS dataset provided the health system topic of health insurance coverage, utilization of healthcare, type of health care utilized, problems with access to healthcare, and management of asthma in California. The availability of the CHIS data eased the issues with access since the information was public and only required a digitally signed waiver. The CHIS had forecasted useful health data and publications on significant health concerns ranging from access, source of care,

barriers to health care asthma management, health coverage which as key to identifying the social determinants of health and improve health status.

Reliability

The instrumentation of the constructs was accomplished through address-based sample (ABS) methodology with multimode data collection that takes place on the web or by telephone. Survey data for the CHIS 2020 sample was collected using a combination of computer-assisted web interviewing (CAWI) and computer-assisted telephone interviewing (CATI). While the screening interview varied somewhat by whether the interview was conducted via CATI or CAWI, the same editing procedures were followed for all CHIS 2020 cases.

The CHIS database was useful collection of health data across rural and urban populations in California. The 2020 collected data from 58 counties oversampling the metropolitan areas San Diego. The sample from the CHIS was representational of a diverse population. Past users established that the sample likely be used to answer questions on characteristics of the health system pertaining to certain ethnic groups and SES. To build reliability, consistency, and flexibility survey questions were added, removed, and modified in each two-year cycle of CHIS to meet stakeholders' needs and monitored emerging public health concerns. The 2020 CHIS dataset had sufficient instrumentation to answer the research question as well as provided insights on the utilization, insurance coverage, and access to healthcare during COVID-19 pandemic. The information on certain ethnic groups and annual income level was useful in understanding the pandemic.

The CHIS was divided into different sections. The sections useful to my study were Section A: Demographic, Section B: General Health Conditions, Section C: Health Behaviors, Section H: Health Insurance, Section J: Health Care Utilization, Section K: Employment, Income, Poverty Status, and Section N: Geographic Information. The questions were focused on the respondent's general health status, health care access, source of care, annual income level, controlling asthma with medication, and demographic information (ethnicity), geography (rural or urban status), and asthma management. The data was imperative to answer health system characteristics pertaining to my study's the dependent variable, independent variables, and modifiers.

Reliability and Validity of California Health Information Survey Data

Reliability and validity were useful to in ensuring the quality of my study. The CHIS 2020 had both text strings and close-end response options. Coding activities included both manual and machine edited procedures to correct interviewer, respondent, and program errors and to check that updates made by data preparation staff were input correctly. Quality control procedures involved limited the number of staff who made updates, used program specifications to resolve issues in complex questionnaire sections, carefully checked updates, and performed simulation computer identified inconsistencies or illogical patterns in the data.

The data editing procedures for CHIS 2020 consisted of four main tasks: (1) managing and resolving problem cases, (2) coding question responses that were recorded as text strings, (3) verifying data editing updates, (4) assigning special codes, and (5) geographic coding.

Managing and Resolving Problem Cases

The method used to communicate problems by a filling out a problem sheet to review cases. The interviewers working with CATI system filled out a problem sheet to guide the review of problem cases. The process of documented case review ensured that the updates were recorded accurately. In cases where the interviewer did not finish the interview an explanation provided them to the interview staff to re-field for an interview.

Coding With Text Strings

Responses that had "other-specify" response required coding of narrative text strings by an interviewer. The question in my study with an "other (specify:)" category from the CHIS 2020 adult interview included usual source of healthcare (AH3). The data preparation staff reviewed the responses and up-coded, soft-range edits, or hard range edits to existing categories (if possible). Unlikely responses were called soft range or hard range. Hard range edits were from 1-20, soft range edits were 0-9. These responses that violate the soft and hard edit specifications were documented on a problem sheet for a case review.

Verifying Data Updates

The CHIS data team verified data updates by interview matching case number and ID number. The team also checks for accuracy, effects on any other questions, or logical skip patterns in the questionnaire. In addition, cases with similar problems were reviewed and updated together in manageable batches to ensure consistency in handling data problems. Following the series of updates, a program checked for all errors identified to date to ensure that editing had not created new errors. Frequency distributions and cross-

tabulations were used extensively by data preparation staff to verify data updates. Structural edits assessed the integrity of the database (e.g., which verified that all database records that should have existed, and those that should not have exist, did not), and edits that evaluated complex skip patterns were run periodically during data collection. When discrepancies were discovered, problem cases were reviewed and updated, as necessary.

Table 5

Special Codes

Code	Label	Description
-1	Inapplicable	Respondent was legitimately skipped out of a question
-3	Web blanks	Respondents that leave a question blank. This was only possible in the CAWI mode.
-6	Breakoff	Interview breakoff
-7	Refused	Respondent refused to provide a response. This was only possible in the CATI mode.
-8	Don't know	Respondent did not know how to respond to question Aside from a few select questions, this was only possible in the CATI mode.
-9	Not ascertained	Respondent was skipped erroneously from a question or data was not recorded correctly due to a system glitch.

Note. Source: UCLA Center for Health Policy Research, 2020 California Health Interview Survey.

Cronbach's Alpha

The Cronbach alpha was a method to assess the reliability to measure the internal consistency of the CHIS 2020 data (UCLA, 2019). The values range from 0-1. According to Values that were 0.7 to 1 were acceptable internal consistency. UCLA (2019) found

the data to be acceptable at a 0.89 based on sample size of 100 households, which was comparable to national study. The study by Bullinger et al. (2015) the European Quality of Life in Short Stature Youth had been used for health informatics research and had a validity of 0.84, which was deemed acceptable. Thus, the score of the CHIS data provided reliable research for my study.

The health estimates had shown to provide information on certain health trends; however, it was important to recognize that self-reported was vulnerable to selection bias. A study by Rhee et al. (2017), which used CHIS data to generate health estimates by ethnic differences and bullying victimization which compared access to care outcome. The authors utilized a good fit for the analysis (Rhee et al., 2017). The calibration sample revealed an adequate fit to the data *CFI = 0.95, RMSEA = 0.04.* The CHIS data also was utilized and accepted by large-scale studies and was not projected to skew the healthcare characteristics estimates (Gonzalez et al., 2016).

A statewide pilot study of explored an address-based sampling (ABS) frame with a mail push to web invitation and computer assisted telephone interview (CATI) nonresponse follow-up was developed in 2018. The feasibility of web-based (ABS) reviewed and implemented into the redesign of the CHIS data collection methodology. The decline of random-digit-dialing produced low response rates and the researcher looked to shift the culture. The technique resulted in higher response rates across the state compared to production CHIS and resulted in significantly lower data collection costs per complete. Given the multiple experiments being conducted during the pilot, the CHIS data team crossed the three main experiments (the within-household selection

experiment, child-first experiment, and parental incentive experiment) resulted in eight possible combinations with 3,500 sample cases in each experiment condition combination. The CHIS achieved 2,467 completes – a completion rate of 8.8% – with 2,042 complete via web and 425 completed via CATI. The total weighted response rate was 14.3%. The pilot study identified a key issue with the sample had less foreign born, less non-English speakers, more highly educated, and more affluent respondents. Therefore, for the 2020 addition language capabilities were included for the web instrument.

Operationalization of Constructs

Variables

Secondary analysis was a critical aspect that ensures that my CHIS 2020 data was operationalized and coded appropriately to allow for the multivariate, ANOVA, and descriptive analysis. The CHIS database evaluation was conducted by reviewing following guidelines: surveys purpose, other research that utilizes the same dataset, validity of health information collected, the codebook, and all applicable operations manuals provided by the UCLA website. The main variables to be used in my analysis were source of healthcare, having a health professional described asthma action plan, and asthma episodes/attacks with the past 12 month were the dependent variables as categorized by CHIS categories. The independent variables or predictors were source of care (by five level), someone at Doctor's office/clinic who helped coordinate care, controlled asthma with daily medication, and had a health professional prescribed asthma management plan. Moderating variables in included ethnicity and annual household

income. Grouping variables represented the geographical areas of interest rural and urban location. Important sociodemographic variables included educational attainment, working status, annual household earnings before taxes. These variables were introduced into the data analysis model as a predictor, as a dependent, grouping, and moderating variable. Variables explored in this analysis was discussed in this section. In the CHIS database, urban and rural census bureau designations help understand asthma within two different population types. The ethnicity variable and annual income variable determined the differences among certain ethnic groups and at different income levels

G Power Test for RQ1–5

In RQ1, I identified if there was a statistically significant association between having a source of health care coded as AH1V2 (yes, or no) and general health condition AB1 (*excellent, very good, good, fair, and poor*) among adults with asthma. The targeted population was individuals between the ages 35-65 that suffer from asthma. The dependent variable was having health care access, while the predictor was general health condition. For the RQ1, the grouping was living in urban/rural areas. The metropolitan(urban) or nonmetropolitan (rural) was coded as UR_OMB. The RQ1 helped to understand the health of the individual. Understanding the health behavior at the community level helped to understand if the system was supportive of asthma care and resources were available for the individuals that need them. Utilizing UR_OMB codes helped me to identify if there were known differences between having a source of health care and the general health condition of the participants living in rural/urban areas. The analysis conducted was the Crosstabulation with the application of the Pearson Chi-

square, Cramer's V, and Phi. The strength of the association was identified during the Cramer V and Phi results ranging from 0-1. The significance of the relationship between having a source of care and general health condition was identified during the Pearson Chi-square analysis, noting the significance was $p < 0.05$. The covariate application allows my study to looked at the differences between the rural and urban population in relation to general health condition and having a source of health care.

G Power Test. In RQ1, I sought to understand if having a healthcare source effects general health condition. A power analysis for ANOVA: Fixed effects, omnibus, one-way was performed using G-Power software. I assumed an effect size of 0.30, since previous studies had used the same effect size in secondary data cross sectional research studies when understanding how healthcare effects general health (Feaul et al. 2009; Lewis et al., 2017). I chose an alpha of 0.05, a minimal statistical power of 0.80, and the number of levels for general health condition was five. The minimal sample required minimal sample size of 140.

RQ2 investigated the health behaviors of the asthma population between the ages of 35-65 as identified in the CHIS data. The question asks if there was a statistical association with having to someone at Doctor's office/clinic who helps coordinate care coded as AJ80 (yes or no) and asthma episodes/attacks with in past 12 months coded as AB41 (yes or no). The dependent variable was asthma episodes/attacks in the past 12 months. The predictor variable was having to someone at Doctor's office/clinic who helps coordinate care. The urban/rural designator served as a grouping variable coded as UR_OMB. The information determined was on how many participants someone at

Doctor's office/clinic who helps coordinate care and had issues with asthma attacks/episodes over the past 12 month. This identified if there was a someone at Doctor's office/clinic who helps coordinate care was burdening patients who suffer from asthma symptoms, with the ultimate effect to had well managed asthma condition. Utilizing geographic code helped me to identify if there were known differences between having a someone at Doctor's office/clinic who helps coordinate care and asthma episodes/attacks in the past 12 months of the participants living in rural/urban areas. The analysis conducted was the Crosstabulation with the application of the Pearson Chi-square, Cramer's V, and Phi. The strength of the association was identified during the Cramer V and Phi results ranging from 0-1. The significance of the relationship between someone at Doctor's office/clinic who helped coordinate care and having asthma episodes/attacks in the past 12 month was identified during the Pearson Chi-square analysis, noting the significance was $p < 0.05$. The covariate application allows my study to look at the differences between the rural and urban population.

G-Power Test. RQ2 seeks to understand if having to someone at Doctor's office/clinic who helps coordinate care effects asthma episodes/attacks in the past 12 months A power analysis for ANOVA: Fixed effects, omnibus, one-way was performed using G-Power software with Priori. I assumed an effect size of 0.25, since previous studies had used the same effect size in secondary data cross sectional research studies when understanding how someone at Doctor's office/clinic who helps coordinate care effects asthma episodes/attacks in the past 12 months (Faul et al. 2009; Nurmagambetov et al. 2018). I chose an alpha of 0.05, a minimal statistical power of 0.80, and the number

of levels for having to someone at Doctor's office/clinic who helps coordinate care was two. The minimal sample required minimal sample size of 128.

RQ3, analyzes if there a statistically significant association between type of place for usual source of care coded as AH3_P1 *(doctor's office, government clinics, ER, no other place, and not usual source of care*) having a health professional prescribed asthma care plan coded as AB43 (yes, or no). The dependent variable was having a professionally prescribed asthma care plan. The predictor variable was place for usual source of care. The grouping variable was rural/urban designation coded as UR_OMB. The targeted population was between adults between the age of 35-65 and reside in California's rural/urban areas. Understanding the source of care helps to target the areas in which the participants receive most of their care and if there was an association with getting the right management in accordance with the GINA guidelines. Understanding the health practice and protocol at the system level helped to understand if the system was supportive of asthma care and resources were available for the individuals that need them. Utilizing geographic codes helped me to identify if there were known differences between having a type of healthcare and having an asthma action plan of the participants living in rural/urban areas. The analysis conducted was the Crosstabulation with the application of the Pearson Chi-square, Cramer's V, and Phi. The strength of the association was identified during the Cramer V and Phi results ranging from 0-1. The significance of the relationship between having a type of healthcare and having an asthma action plan was identified during the Pearson Chi-square analysis, noting the significance

was $p < 0.05$. The covariate application allowed my study to look at the differences between the rural and urban population in relation to each variable.

G Power Test. For RQ3, I sought to understand if having a usual source for healthcare effects having a doctor prescribed asthma management plan. A power analysis for ANOVA: Fixed effects, omnibus, one-way was performed using G-Power software with Priori. I assumed an effect size of 0.25, since previous studies had used the same effect size in secondary data cross sectional research studies when understanding having a usual source for healthcare effects having a doctor prescribed asthma management plan (Faul et al. 2009; Nurmagambetov et al. 2018). I chose an alpha of 0.05, a minimal statistical power of 0.80, and the number of levels for usual source of health care was 5. The minimal sample required minimal sample size of 200.

For RQ4, I wanted to understand does ethnicity moderate the relationship between controlling asthma with medications, having a health professionally prescribed asthma plan, and asthma episodes/attacks for the past 12 months. The target population were individuals that suffer from asthma between the ages of 35-65. The dependent variable was asthma episodes/attacks in the episodes. The predictor variables were having a health professionally prescribed asthma plan coded as AB43 (yes or no) and taking medication to control asthma coded as AB18 (yes or no). The moderator variable was ethnicity (five levels). The first part of the analysis I conducted a binomial logistics regression model to understand the moderation effect.

G Power Test. RQ4 identified whether professional prescribed asthma management plan and controlling asthma with medication influences the episodes/attacks

within the past 12 months. Ethnicity influence was also reviewed to understand the influence on attacks/episodes in the past 12 months. A G-Power analysis was performed using the Logistics Regression with a dichotomous predictor. I assumed a two-tail test, odds ratio of 2.477, an alpha 0.05, and minimum statistical power of 0.80. The probability of an individual having an asthma episode/attack without an asthma management plan ranged in probability from 0.45 to 0.85. I chose to average both probabilities and selected 0.60 R-squared selected for RQ4 was of 0.04 because I expected a low association with ethnicity to asthma episodes/attacks in the past 12 months. The X-Distribution that I selected was binomial predictor. I assumed an effect size of 50% because the effect of having an asthma management plan and still having an asthma episode/attack is unknown. The portion of cases on individuals with an asthma management plan was 0.90. A null hypothesis probability of the dependent variable being equal to 1 if the independent variable was equal to 1 of 0.60 produced a minimum sample size of 515.

For RQ5, I wanted to understand did annual household income (five levels) moderate the relationship between health professional prescribed asthma plan coded as AB43 (yes or no), controlling asthma with daily medication coded as AB18 (yes or no) and asthma episodes with the past 12 months coded as AB41 (yes or no) among adults? The target population were individuals that suffer from asthma between the ages of 35-65. The dependent variable was asthma episodes/attacks in the episodes. The predictor variables were having a health professionally prescribed asthma plan (AB43) coded as (yes or no) and taking medication to control asthma (AB1) coded as (yes or no). The

moderator variable was annual household income (five levels). The first part of the analysis I conducted a binomial logistics regression model to understand the moderation effect.

G Power Test. RQ5 identified whether professional prescribed asthma management plan and controlling asthma with medication influences the episodes/attacks within the past 12 months. Household annual income level influence was also reviewed to understand the influence on attacks/episodes in the past 12 months. A G-Power analysis was performed using the Logistics Regression with a dichotomous predictor. I assumed a two-tail test, odds ratio of 2.477, an alpha 0.05, and minimum statistical power of 0.80. The probability of an individual having an asthma episode/attack without an asthma management plan ranges in probability from 0.45 to 0.85. I choose to average both probabilities and selected 0.60 R-squared selected for RQ5 was of 0.04 because I expect a low association with ethnicity to asthma episodes/attacks in the past 12 months. The X-Distribution that I selected was binomial predictor. I assumed an effect size of 50% because the effect of having an asthma management plan and still having an asthma episode/attack was unknown. The portion of cases on individuals with an asthma management plan was 0.90. A null hypothesis probability of the dependent variable being equal to 1 if the independent variable was equal to 1 of 0.60 produced a minimum sample size of 515.

Dependent Variable

The dependent variable were aspects of asthma care from the CHIS. In RQ1, the ordinal variable, general health condition, was used for healthcare analysis. The variable

was coded as AB1 (*excellent, very good, good, fair, or poor*). In RQ2, the nominal variable, having asthma episode/attacks in the past 12 months code as AB41 (yes or no). The analysis helped to understand the aspect of asthma care. RQ3, a nominal variable, having a health professional prescribed asthma action plan was coded as AB41(yes or no). In RQ4 and RQ5, the dichotomous variable, having asthma episodes/attacks in the past 12 months was coded as AB41 (yes or no). The dependent variable definition and coding was listing in the below Table 8.

Predictor Variable

The predictor variable for RQ1 was the nominal variable, had a usual source of healthcare, by asking the participant (yes or no) was coded as AH1V2. The analysis was to understand the aspects of asthma care. In the RQ2, the nominal variable, had an asthma episode/attack in the past 12 months. The variable was coded AB41 (yes or no). This analysis helped to understand the aspects of asthma care. In the RQ3, the ordinal variable usual source of care was defining the environment in which the participant received their healthcare. The variable was coded AH3_P1 (*doctor's office/HMO/Kaiser, Government Clinic/Government Hospital, ER, no other place*). In the RQ4 and RQ5, the nominal variables, having an asthma management plan coded AB41 (yes or no) and controlling asthma with daily medication was coded as AB18 (yes or no) help by defining the environment in which the participant system to understand asthma care.

Moderator Variable

The moderator variables were ethnicity (OMBSRREO) and annual household income. In RQ4, ethnicity was a categorical variable or a discontinuous variable. The

variable had five levels and was codedas OMBSRREO (*White, African American, Asian, Hispanic, Native American/American Indian, and two or more races*). In RQ5, annual household income was categorical or discontinuous in nature. The AK22_PCAT code includes *($1-49999, $50000-99999, $100000-149999, and $150,000-above*). The moderator variables definitions and coding were listed in the below Table 8. I conducted a moderation analysis utilized the binomial logistics regression and the used the Process macro for SPSS software Version 27. This gave the study a logistics path analysis modeling for estimating both direct and indirect effects in the single mediator model (Hayes, 2020)

Grouping Variable

The grouping variable for RQ1-3 were urban or rural status (UR_OMB). The coding for the variable was found in the U.S. Census from the Office of the Management Budget (OMB) classified rural as nonmetropolitan and urban as metropolitan areas. A metropolitan area associated with a population of at least 50,000, while nonmetropolitan were less than 50,000. The nominal code was (i.e., metropolitan, or nonmetropolitan).

Table 6

Asthma Predictor, Moderator, and Dependent Variable Definitions and Coding

Variable	Measure	Definition	Use	Variable codes
AH1V2	Nominal	If an individual has a usual source of healthcare	Dependent	Yes = 1; No = 2
AH3_P1	Ordinal	What is the usual source of healthcare	Predictor	-1: N/A, 1: Doctor's office/Kaiser/ HMO; 2: Clinic/Health center/Hospital clinic, 3: Emergency room, 4: Other/No one place
AK22_PCAT	Ordinal	Annual income	Modifier	1:< 49,999;2: 50000-99,999, 3: 100,000-149,999 4: 150,000<
OMBSRREO	Ordinal	Ethnicity	Modifier	1: Hispanic, 2: White, Non-Hispanic (NH), 3: African American only, not Hispanic, 4: American Indian/Alaska Native only, 5: Asian only, 6: Native Hawaiian/Pacific Islander, 7: Two or more races.
UR_OMB	Nominal	U.S. Census urban or rural status	Grouping	1: Metropolitan and 2: Nonmetropolitan
AB41	Nominal	Asthma episode in last 12 months	Dependent	-1, NA, 1: Yes, and 2: No
AJ80	Nominal	All adults who have usual source of care and has personal DR and have asthma	Dependent	-1, NA, 1: Yes, and 2: No
AB18	Nominal	Taking daily meds	Predictor	1: Yes and 2: No
AB43	Nominal	Asthma plan	Dependent	-1: NA, 1: Yes and 2: No
AB1	Ordinal	General Health	Predictor	1: Excellent, 2: Very Good, 3: Good, 4: Fair. 5: Poor

Data Management Plan

The proposed research involved the review of public-use data form a survey a sample of 21,949 participants in the adult module, between the ages of 35-65 years. Data products from the UCLA database was made available without cost to my study and analysis. User registration was required to access or download files. As part of the registration process, I agree to the conditions of use governing access to the public release data, included restrictions against attempting to identify study participants,

destruction of data after analysis were completed, reporting responsibilities, restrictions on redistribution of the data to third parties, and the proper acknowledgement of the data resources. Register users received user support, as well as information related to errors in the data, future releases, workshops, and publication listings. The CHIS information provided for my study was not used for commercial purposes and was not redistributed to third parties. I used the SPSS software Version 27.

Data Cleaning and Preparation

The methodology utilized for the data cleaning and preparation of the CHIS 2020 dataset was to check for out of range information. During the descriptive statistics phase, I checked the minimum and maximum values associated with all variables of interest (SES and ethnicity). This validated the reliability of the data towards my study.

Statistical Analysis Plan

Descriptive Statistics Analysis

According to Nimon et al. (2019), scholar-practitioners descriptive statistics provided the opportunity to evaluate the credibility of previous studies without access to the original raw data. The use offered an alternative to assess the reproducibility and robustness of selected prior research. The descriptive statistics defined the central tendency for my study's variables (dependent, independent, and confounder) as well as defined using the SPSS software Version 27. The SPSS analyze selection from the data editor allowed my research to review the mean, minimum/maximum value, and the standard deviation which included the characterization of the posterior distribution looking at the skewness (Nimon et al., 2019). In addition, my study performed a

crosstabulation. The crosstabulation calculation shows the frequencies and helps to define the number of times and percentages for each of my variables. The constructed cross tabulation described the rural and urban population characteristic unique relationship of the dependent variable called healthcare characteristics to the independent variables in the health system, the dependent variables. The crosstabulation was presented in a 6x6 table. The left column contains healthcare characteristics, while rural and urban status (yes or no) in the other columns as well as the final column containing the *p-values.* The *p-value* highlights the significance in the rural and urban healthcare characteristics in California.

Inferential Statistical Analysis (Binomial Logistics Regression)

The inferential statistical analysis was performed utilizing the SPSS software Version 27. To predict the casual relationship between more than two variables and identifies which independent variable or confounders predicted the outcome variable. The binomial logistics regression method was applicable in my research because the dependent and independent variables were dichotomous while the moderators were ordinal (4-5 levels). The analysis was critical to determining the extend to the casual relationship.

Threats to Validity

Internal and external validity were concepts that reflect whether the results of a study were trustworthy and meaningful. While internal validity related to how well a study was conducted (its structure), external validity related to how applicable the findings were to the real world. Limiting and identifying the threats to validity was a way

for my research to show results that accurately reflect the truth. Validity was the compromised of two major components that were defined as internal and external. The external component defined the threats to the results of my study reflect what happens in the urban and rural populations. The internal component defined the threats that likely skew what caused the results. I explained the effects of both internal and external threats in relation to my study.

Internal Threats to Validity

Internal validity was the extent to which a study establishes a trustworthy cause-and-effect relationship between a dependent and an outcome. Internal validity also reflected that a given study made it possible to eliminate alternative explanations for a finding. Thus, the validity depends largely on the procedure of the study and how rigorously it was performed. The internal threats that were common with secondary survey data was self-reporting bias, timeline of the survey, and instrumentation.

Self-reporting nature of 2020 CHIS data was a known threat to internal validity due to the translation in languages and educational status likely cause differences in the accuracy of the responses given by in the ABS platform. The way that the threats were reduced through flagging interviews that likely had skewed results. The self-reporting nature of CHIS 2020 made it difficult to accurately account for utilization of health care. The threat was also addressed utilizing multiple language (English, Chinese, Spanish, Korean, and Vietnamese), well trained interviews. Web-based interviews with results that were reviewed by data teams to look for accuracy, logistical skips, and completion of survey.

The instrumentation was a known threat to internal validity. The nature of the CHIS was to collect health information via internet of over the phone to document health behaviors in both rural and urban areas. The documented health behaviors were put into specific variables that evaluated healthcare characteristics. Targeted sample collection, extended adult surveys, and oversampled in metropolitan areas were ways to ensure that households without internet access were able to collect information by an interview over the phone. The confounding variables were essential to understanding the effect of the determinants of health and health management. The CHIS 2020 research process was standardized to overcome the issues with instrumentation and replicated the process with future studies as well as changed the specificity of variable by analysis and feedback. The UCLA pilot studies especially helped to update a methodology and variable specificity.

External Validity

Threats to external validity hold health information surveys conducted within the California were found true only to that specific environment. The main identified threats within my study were generalizability. However, the state of California had the most diverse population that any other state in the United States. According to Wilson (2016), California had a unique health care footprint and landscape with an expansive health maintenance organization (HMO). Thus, the data likely held true to some states with similar health footprints of adopting a robust the HMO within the rural and urban areas. CHIS data can be generalized at the state and county levels. Rigorous sampling techniques ensure enough data were collected to describe populations throughout the state. For instance, starting in 2001, CHIS data was collected on a continuous survey

cycle year via random-dial telephone surveys with over 40,000 to 50,000 California households participating. CHIS sets minimum target numbers for each geographic area which ensured a statistically representative sample of the state's diverse population. Additionally, CHIS used many techniques to interview enough people from several ethnic groups to better characterize most major and minor racial and ethnic populations statewide. Therefore, instrumentation of findings to other areas of the United States were a limitation of the study.

Ethical Procedures

My study involved the secondary review CHIS 2020 health information collected from participants in California. UCLA was the institution that approved the collection of the 2020 dataset. The ethical procedures followed by UCLA were designed to minimize the risk of indirect identification and increase data confidentiality, sub-state geographic identifiers (e.g., county, city, and zip code) and sensitive variables, such as sexual behavior, were excluded from the CHIS PUF's. My study required the Walden's University's approval from the Institutional Review Board (IRB). I applied for approval before accessing the CHIS 2020 the dataset as well as await my statistical analysis.

The current study also involved an analysis of de-identified data to avoid instances of privacy infringement or confidentiality breaches. Data was stored safely in a computer and protected by a password, which only the researcher and research committee members could gain access to. Although the CHIS dataset used was a public-use database, I created an account with the CHIS website with my credentials before

accessing and downloading the data files. This safeguard ensured that no other person had access to the information besides the researcher and research committee members.

Summary

The research methodology Person Chi Square analysis answered the three research questions as well as identified rural and urban differences. Binomial logistic regressions analysis was used to test the association between determinants of health, health management, and rural/urban status in California. The research variables included the dependent variables source of care, health professional prescribed asthma action plan, and having asthma attacks/episodes over the past 12 months, independent variable access (source of care and source of care by type), asthma management (daily usage of medication to control asthma and), asthma management (someone at Doctor's office/clinic who helps coordinate care and health professional prescribed asthma action plan) and modifiers (annual household income and ethnicity). The grouping variable was urban and rural settings in California. Secondary analysis of the archived data was conducted after receiving IRB approval. I conducted both descriptive and inferential statistical analyses for this study. I completed a descriptive analysis using frequency tables, percentages, graphs, and cross-tabulations. I also conducted the inferential analysis using multiple logistic regressions. Quantitative correlation research was the main design used to answer the research questions. It summarized my findings to better understanding the research topic and correlated my study to examine current research that analyzes asthma care in rural/urban areas and determinants of asthma health, asthma treatment management in California. The source of information was secondary research

data, which comes from an independent survey by the CHIS 2020. The SPSS software Version 27 software tool was also the data analysis technique used in this study because of its ability to analyze large amounts of data. The correlation technique was the main SPSS tool applied in this study because of its ability to examine the association between two or more variables. The results of the data analysis process were presented in Section 3, which outlined the results and findings of the study.

Section 3: Results and Findings

In this study, I sought to analyze differences in asthma care and management as well as looking into the differences within sources and access to health care in California during the COVID-19 pandemic. The moderators were annual income level and ethnicity in the 2020 data. This provided a higher level of understanding on the determinants of health within the urban and rural setting while providing more depth to the analysis. I also included the asthma status of the adults, and the geographical grouping with rural and urban was established during the analysis phase. In this section, I discuss the quantitative analysis process, the results, and my interpretation of the results.

Collection of Secondary Data

I chose the 2020 CHIS as the secondary dataset for this analysis because it provided healthcare data during the COVID-19 pandemic. It also included sufficient variables and responses that produced the required analysis of the social determinants of health from an ethnic stratification. The dataset was downloaded from the UCLA website and then organized, cleaned, and prepared for analysis using SPSS software Version 27 and the PROCESS Marco for SPSS from the University of Calgary for inferential analysis. The potential concerns with using CHIS data included ensuring that results were representative of the population from the 58 counties in California. Other concerns were the accuracy of self-reporting and the missing data values., However, the large sample size made it least likely to have biased results. Finally, I thoroughly reviewed each record for missing data or inconsistency, and data or inconsistencies, and data records with missing data or inconsistencies, and data records with missing information were

excluded. The CHIS is the nation's largest state-level health survey and one of the largest health surveys in the nation. The UCLA Center for Health Policy Research (UCLA-CHPR) conducted the CHIS in collaboration with multiple funding sources from public, private, and nonprofit organizations. The CHIS collected extensive information for all age groups on health status, health conditions, health-related behaviors, health insurance coverage, access to health care services, and other health and health-related issues. The sample was designed and optimized to provide county estimates for California's overall population, its major racial and ethnic groups, as well as several racial and ethnic subgroups when aggregating the data at the state level. The rigorous protocols utilized when administering the CHIS at the county level ensure that the compiling, sorting, and transferring of data the UCLA which provided adequate safeguards for minimizing the survey's data discrepancies. After a final review of the dataset, I determined that the results of analysis would provide valid, reliable, and generalizable information that would be useful to local public health and health care professionals seeking to understand and improve asthma healthcare access and asthma management across California.

Descriptive Statistics

The dataset for analysis included responses from all 58 counties (44 geographic sampling strata and 14 substrata were created within the two most populous counties in the state [Los Angeles and San Diego]). The demographic population included a total sample size of 13,981 records. Tables 9 through 13 include the results of the analysis for frequency distribution for the predictor, stratification (grouping) variable, moderators, and dependent variables.

Table 7

Descriptive Statistics for Dependent, Sociodemographic, and Moderator Variable, Age 35–65

Variable name	Category	Frequency	Percentage
ASTCUR	Yes	1,373	9.6
AK22_P2	1: 1-49,999	366	25.1
	2: 50,000-99,999	344	25.1
	3: 100,000-149,999	267	19.4
	4: 150,000-above	396	28.8
AHEDC_P1	No formal (1-8 grade)	17	1.2
	Grade 9-11	18	1.3
	High school diploma	131	9.5
	Some college	210	15.3
	Vocational school	88	6.4
	Associate's degree	118	8.6
	Bachelor's degree	411	29.9
	Master's degree	279	20.3
	PhD or equivalent	101	7.4
OMBSRR_P1	Hispanic	266	19.4
	White (Non-Hispanic)	873	63.6
	African American	68	5.0
	American Indian/Native Alaskan	12	0.9
	Asian	95	6.9
	Other/Two or more races	59	4.3
URB_OMB	Urban	1,247	90.8
	Rural	126	9.2
WRKS_P1	1: Full time	773	56.3
	2: Part time	101	7.4
	3: Other employed	10	0.7
	4: Unemployed; Looking	47	32.2
	5: Unemployed: Not looking	442	32.2

Table 8

Descriptive Statistics for Asthma Health Access and Asthma Management Variables With Self-Reported Asthma, Age 35–65

Variable name	Category	Frequency	Percentage
AB1	Excellent	149	10.9
	Very good	443	32.3
	Good	496	36.1
	Fair	221	16.1
	Poor	64	4.7
AH1V2	Yes	1317	95.9
	No	56	4.1
AB18	Yes	659	48
	No	714	52
AB41	Yes	760	59.1
	No	527	40.9
USUAL5TP	Doctor's office/HMO/Kaiser	1,088	79.2
	Community/Gov clin/Comm hosp	202	14.7
	ER/Urgent care	3	1.7
	Other place/No place	24	1.7
	Inapplicable	56	4.1
AJ80	Yes	908	66.1
	No	335	25.9
AB43	Yes	1,015	73.9
	No	358	26.1

Analysis of Hypotheses

Research Question 1

Was there a statistically significant association between healthcare access and general health condition among adults with asthma between 35 and 65 years of age living in urban/rural areas?

$H0_1$: There was no statistically significant association between healthcare access and general health condition among adults with asthma between 35 and 65 years of age living in urban/rural areas.

HA_1: There was a statistically significant association between healthcare access and general health condition among adults with asthma between 35 and 65 years of age living in urban/rural areas.

Summary of Analysis for RQ1: I performed a chi-square test of independence to evaluate the association between general health condition and having a source of care. The difference between these variables was statistically significant, X^2 (4, N = 1,373) = 10.509, p = 0.033, V = .087. The strength of the association was examined using Cramer's V test valued at = 0.107, and there was weak association. The chi-square analysis for having source of care and general health condition is shown in Table 9. I used the technique in SPSS to understand each aspect of healthcare access and general health condition, which are visualized in Table 9. As indicated from the chi-square analysis, the urban areas had a statistically significant association at X^2 (4, N = 1,247) = 14.252, p = 0.007, V = .107, while rural areas were not statistically significant at X^2 (4, N = 126) = 0.859, p = 0.930, V = .083.

Table 9

Crosstabulation for General Health Condition and Access to Care by Rural/Urban

			Source of care		Total
			Yes	No	
Urban	General health condition	Excellent	134	8	142
		Very good	389	15	404
		Good	437	12	449
		Fair	189	9	198
		Poor	47	7	54
	Total		1,196	51	1,247
Rural	General health condition	Excellent	7	0	7
		Very good	37	2	39
		Good	45	2	47
		Fair	22	1	23
		Poor	10	0	10
	Total		121	5	126
Total	General health condition	Excellent	141	8	149
		Very good	426	17	443
		Good	482	14	496
		Fair	211	10	221
		Poor	57	7	64
	Total		1,317	56	1,373

a. *Chi-square tests*

		Value	*df*	Asymptotic sign (2-sided)
Urban	Pearson chi-square	14.252	4	.007
	Likelihood ratio	10.662	4	.031
	Linear-by-linear	1.167	1	.280
	N of valid cases	1247		
Rural	Pearson chi-square	0.859	4	.930
	Likelihood ratio	1.522	4	.823
	Linear-by-linear	.073	1	.787
	N of valid cases	126		
Total	Pearson chi-square	10.509	4	.033
	Likelihood ratio	8.341	4	.080
	Linear-by-linear	.888	1	.346
	N of valid cases	1,373		

b. *Symmetric measures*

			Value	Approx. sig
Urban	Nominal by nominal	Phi	.107	.007
		Cramer's V	.107	.007
	N of valid cases		1,247	
Rural	Nominal by Nominal	Phi	.083	.930
		Cramer's V	.083	.930
	N of valid cases		126	
Total	Nominal by Nominal	Phi	.087	.033
		Cramer's V	.087	.033
	N of valid cases		1,373	

Research Question 2

Was there a statistical association between having someone at a doctor's office/clinic who helps coordinate care and asthma episodes/attacks within the past 12 months among adults with asthma aged 35–65 residing in urban/rural areas?

$H0_1$: There was a statistical association between having someone at a doctor's office/clinic who helps coordinate care and asthma episodes/attacks within

the past 12 months among adults with asthma aged 35–65 residing in urban/rural areas.

HA_1: There was not a statistical association between having someone at a doctor's office/clinic who helps coordinate care and asthma episodes/attacks within the past 12 months among adults with asthma aged 35–65 residing in urban/rural areas.

Summary Analysis for RQ2: I performed a chi-square test of independence to evaluate the association between asthma episodes over the last 12 months and having someone at a doctor's office/clinic who helps coordinate care. The difference between these variables was not statistically significant, X^2 (1, N = 1,373) = 1.194, p = 0.55, V = 0.029. The strength of the association was examined using Cramer's V test valued at = 0.029, and there was weak association. Table 10 highlights the differences among rural and urban populations. I used the technique in SPSS to understand each aspect of having someone at a doctor's office/clinic who helped coordinate care and asthma episodes/attacks over the past 12 months, which are visualized in Table 10. As indicated from the chi-square analysis, the urban areas did not have a statistically significant association at X^2 (1, N = 1,247) = 0.263, p = 0.877, V = 0.015 with weak association, while urban areas were not statistically significant at X^2 (1, N = 126) = 4.230, p = 0.121, V = 0.183 with a weak association.

Table 10

Crosstabulation for Coordinate Asthma Care and Asthma Episode by Rural and Urban Areas

UR_OMB			Having asthma episode in the past 12 mo: Yes	No	Total
Urban	Having someone at doctor's clinic who helps coordinate care	NA	54	45	99
		Yes	450	373	823
		No	183	142	325
	Total		687	560	1,247
Rural	Having someone at doctor's clinic who helps coordinate care	NA	6	5	11
		Yes	41	44	85
		No	21	9	30
	Total		68	58	126
	Having someone at doctor's clinic who helps coordinate care	NA	60	50	110
		Yes	491	417	908
		No	204	151	355
	Total		755	618	1,373

Chi-square tests

UR_OMB		Value	*df*	Asymptotic sig (2-sided)
Urban	Pearson chi-square	0.263[b]	2	.877
	Likelihood ratio	0.263	2	.877
	Linear-by-linear	.144	1	.704
	N of valid cases	1247		
Rural	Pearson chi-square	4.230[c]	2	.121
	Likelihood ratio	4.339	2	.114
	Linear-by-linear	1.191	1	.275
	N of valid cases	126		
Total	Pearson chi-square	1.194[a]	2	.550
	Likelihood ratio	1.197	2	.550
	Linear-by-linear	.492	1	.483
	N of valid cases	1,373		

UR_OMB			Value	Approximate sig
Urban	Nominal by nominal	Phi	.015	.877
		Cramer's V	.015	.877
	N of valid cases		1,247	
Rural	Nominal by nominal	Phi	.183	.121
		Cramer's V	.183	.121
	N of valid cases		126	
Total	Nominal by nominal	Phi	.029	.550
		Cramer's V	.029	.550
	N of valid cases		1,373	

[a] Add note here. [b] Add note here. [c] Add note here.

Research Question 3

Was there a statistically significant association between type of place for usual source of care and having a health-professional-prescribed asthma care plan among adults with asthma between the ages of 35 and 65 residing in rural/urban areas?

$H0_1$: There was not a statistically significant association between kind of place for usual source of care and having a health-professional-prescribed asthma care plan among adults with asthma between the ages of 35 and 65 residing in rural/urban areas.

HA_1: There was a statistically significant association between kind of place for usual source of care and having a health-professional-prescribed asthma care plan among adults with asthma between the ages of 35 and 65 residing in rural/urban areas.

Summary Analysis for RQ3: I performed a chi-square test of independence to evaluate the association between the sources of care (5 levels) and health-professional-given asthma management plan. The difference between these variables was statistically significant, X^2 (4, N = 1,373) = 31.145, p = 0.00, V = .151. The strength of the association was examined using Cramer's V test valued at = 0.166, and there was weak association. Table 11 highlights the differences among rural and urban populations. I used the technique in SPSS to understand each aspect to sources of care (5 levels) and health-professional-given asthma management plan, which is visualized in Table 11.

Table 11

Crosstabulation for Usual Source of Care and Asthma Management Plan for Rural/Urban Settings

			Asthma management plan		
			Yes	No	
Urban	Usual source of care	Doctor off/HMO/Kaiser	763	235	998
		Community clin/Hospital	120	54	174
		ER/Urgent care	2	1	3
		Other place/Not one place	16	5	21
		No usual source of care	22	29	51
	Total		923	324	1,247
Rural	Usual source of care	Doctor off/HMO/Kaiser	68	22	90
		Community clin/Hospital	19	9	28
		Other Place/Not one place	2	1	3
		No usual source of care	3	2	5
	Total		92	34	126
Total	Usual source of care	Doctor off/HMO/Kaiser	831	257	1088
		Community clin/Hospital	139	63	202
		ER/Urgent care	2	1	3
		Other place/Not one place	18	6	24
		No usual source of care	25	31	56
	Total		1,015	358	1,373

Chi-square tests				
		Value	*df*	Sig (2-sided)
Urban	Pearson chi-square	30.811	4	.000
	Likelihood ratio	27.168	4	.000
	Linear-by-linear	25.308	1	.000
	N of valid cases	1,247		
Rural	Pearson chi-square	1.164	3	0.762
	Likelihood ratio	1.121	3	0.772
	Linear-by-linear	0,984	1	0.321
	N of valid cases	126		
Total	Pearson chi-square	31.145	4	0.000
	Likelihood ratio	27.657	4	0.000
	Linear-by-linear	25.958	1	0.000
	N of valid cases	1,373		

Symmetric measures

			Value	Approx. sig
Urban	Nominal by nominal	Phi	0.157	.000
		Cramer's V	0.157	.000
	N of valid cases		1,247	
Rural	Nominal by nominal	Phi	0.096	0.762
		Cramer's V	0.096	0.762
	N of valid cases		126	
Total	Nominal by nominal	Phi	0.151	0.000
		Cramer's V	0.151	0.000
	N of valid cases		1,373	

As indicated from the chi-square analysis, the urban areas had a statistically significant association at a X^2 (4, N = 1247) = 30.811, p = 0.000, V = 0.157 with a moderate association, while urban areas were not statistically significant at X^2 (3, N = 126) = 1.164, p = 0.762, V = 0.096 with a weak association.

Research Question 4

Does ethnicity moderate the relationship between controlling asthma with daily medication, having a health-professional-prescribed asthma care plan, and asthma episodes/attacks within the last 12 months between the ages of 35 and 65 when looking at California's rural/urban areas?

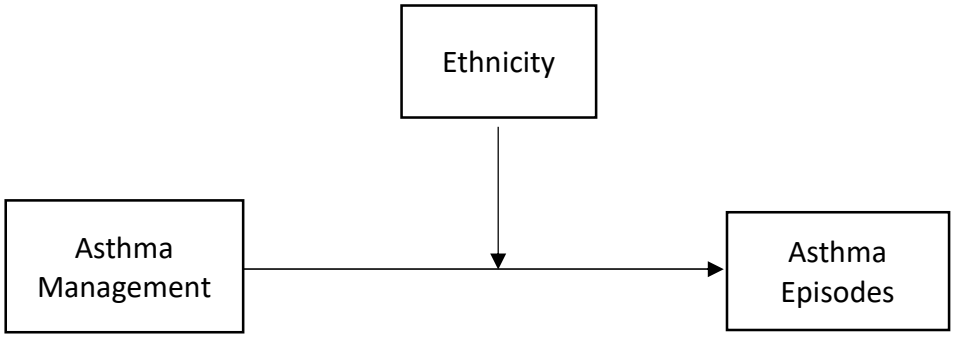
$H0_1$: Ethnicity does not moderate the relationship between health-professional-prescribed asthma management plan, controlling asthma with daily medication, and asthma episodes within the past 12 months among adults.

$H0_A$: Ethnicity does moderate the relationship between health-professional-prescribed asthma management plan, controlling asthma with daily medication, and asthma episodes within the past 12 months.

I performed a binomial logistic regression to determine whether ethnicity moderated the relationship with having an asthma management (AAP or Control with Medication) and the likely chance of having an asthma episode within the last year. Table 12 shows three component charts called Model, Model Summary and Likelihood Ratio Tests showed that with the inclusion of the interaction effect of asthma episodes over the last twelve months in the relationship between ethnicity and having and asthma management. The interaction term was not statistically significant (*b*= -0.0810, *s.e.*=0.959, *p*=.3984) in the first model, indicating that ethnicity was a not significant moderator of the effect of asthma management on asthma episodes. The interaction term was not statistically significant (*b*= -0.0239, *s.e.*=0.0896, *p*=.7899) in the second model, indicating that ethnicity was a not significant moderator of the effect of controlling asthma with medication on asthma episodes. The effect of AAP on asthma episodes was positive and significant (*b*=0.6227, *s.e.*=0.2510, *p*< 0.0131), conditional on ethnicity = 0; (*b*) the conditional effect of ethnicity was positive and not significant (*b*=0.1162, *s.e.*=.1323, *p*<0.3798), conditional on AAP = 0. The effect of controlling asthma with meds on asthma episodes was positive and significant (*b*=0.6842, *s.e.*=0.2302, *p*<.0030), conditional on ethnicity = 0; (*b*) the conditional effect of ethnicity was negative and not significant (*b*= -0.0160, s.e.=.1432, *p*<0.9109), conditional on AAP = 0. The effect of AAP was 0.6227 for ethnicity. The effect of ethnicity was 0.1162 for those individuals with an AAP. The effect of medication control was 0.6842 for ethnicity. The effect of ethnicity was -0.0160 for asthma control.

Figure 1

Process Macro Mediator Diagram for Research Question 4



Note. Prediction on Asthma Episodes in the Past 12 months (dependent) (Y) from Asthma Management (medication and plan: Independent) (X) with ethnicity (W) serving as a moderator of that relationship.

Table 12

Moderating Interaction Effect of the Asthma Episodes in Relation to Ethnicity and Having an Asthma Management Using Process Macro

Model Summary 1
Asthma episodes and asthma action plan

-2LL	Model LL	*df*	Sig	McFadden	CoxSnell	Nagelkrk
1876.1984	13.4909	4	0.0091	0.0071	0 .0098	0.0131

Model

	Coeff	SE	Z	Sig	LLCI	ULCI
Constant	1.0640	-0.4005	-2.6568	0.0079	-1.8488	-0.2791
AAP	0.6227	0.2510	2.4802	0.0131	0.1306	1.1147
Ethnicity	0.1162	0.1323	0.8783	0.3798	-0.1431	0.3754
Int_1	-0.0810	0.0959	-0.8445	0.3984	-0.2689	0.1069

Likelihood ratio test

	Chi-q	*df*	Sig
X*W	0.7128	1	0.3985

Model Summary 2
Asthma episodes and controlling with medication

-2LL	Model LL	*df*	Sig	McFadden	CoxSnell	Nagelkrk
1844.2081	45.4812	4	.0000	0.0241	0.0326	0.0436

Model.

	Coeff	SE	Z	Sig	LLCI	ULCI
Constant	-1.3732	0.4285	-3.2050	0.0014	-2.2133	-0.5335
Medication	0.6842	0.2302	2.9715	0.0030	.2329	1.1354
Ethnicity	-0.0160	0.1432	-0.1119	0.9109	-0.2967	-0.2647
Int_1	0.0239	0.0896	0.2664	0.7899	-0.1517	0.1994

Likelihood ratio test

	Chi-q	*df*	Sig
X*W	0.0711	1	0.7897

Research Question 5

Does annual income level (5 levels) moderate the relationship between health professional prescribed asthma plan (yes or no) and asthma episodes with the past 12 months (yes or no)?

$H0_1$: Annual income level does not correlate the relationship between doctor prescribed asthma plan and asthma episodes.

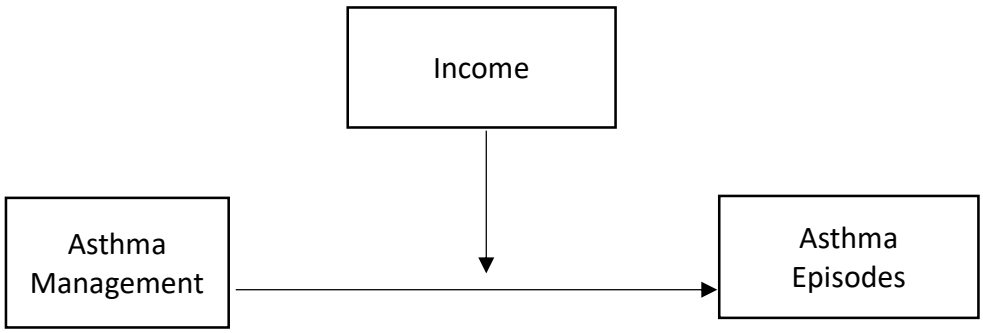
$H0_A$: Annual income level does correlate the relationship between health professional prescribed asthma plan and asthma episodes within the past 12 months.

I performed al binomial logistic regression to determine whether annual income level moderated the relationship with having an asthma management (AAP or Control with Medication) and the likely chance of having an asthma episode within the last year. Table 14 shows three component charts called Model, Model Summary and Likelihood Ratio Tests showed that with the inclusion of the interaction effect of asthma episodes over the last twelve months in the relationship between ethnicity and having and asthma management. The interaction term was not statistically significant (b= -0.0188, *s.e.*=0.1036, p<0.8558) in the first model, indicating that annual income level was a not significant moderator of the effect of asthma management on asthma episodes. The interaction term was not statistically significant (b=-0.1084, *s.e.*=0.0950, p<0.2539) in the second model, indicating that income was a not significant moderator of the effect of controlling asthma with medication on asthma episodes. The effect of AAP on asthma episodes was positive and significant (b=0.4520, *s.e.*=0.1241, p<0.0003), conditional on income level = 0; (b) the conditional effect of income was positive and not significant (b=0.0847, *s.e.*=0.0472, p<0.073), conditional on AAP = 0. The effect of controlling asthma with meds on asthma episodes was positive and significant (b=0.7313, *s.e.*=0.1109, p<0.000), conditional on annual income level = 0; (b) the conditional effect of annual income level was positive and not significant (b=0.0618, *s.e.*=0.0477, p<0.1157), conditional on AAP = 0. The effect of AAP was 0.4520 for annual income

level. The effect of annual was 0.0847 for those individuals with an AAP. The effect of medication control was 0.7313 for annual income level. The effect of annual income level was 0.0618. for asthma control.

Figure 2

Process Macro Mediator Diagram for Research Question 5



Note. Prediction on Asthma Episodes in the Past 12 months (dependent) (Y) from Asthma Management (medication and plan: Independent) (X) with annual income (W) serving as a moderator of that relationship.

Table 13

Moderating Interaction Effect of the Asthma Episodes in Relation to Annual Income Level and Having Asthma Management Using Process Macro

Model Summary 1
Asthma episodes and asthma action plan

-2LL	Model LL	*df*	Sig	McFadden	CoxSnell	Nagelkrk
1873.6709	16.0184	4	0.0030	0.0085	0 .0116	0.0155

Model

	Coeff	SE	Z	Sig	LLCI	ULCI
Constant	-0.2899	0.2144	-1.3520	0.1764	-0.7101	0.1304
AAP	0.4520	0.1241	3.6428	0.0003	0.2088	0,6952
Income	0.0847	0,0472	1.7929	0.0730	-0.0079	0.1773
Int_1	0.0188	0.1036	0.1817	0.8558	-0.1843	0.2219

Likelihood ratio test

	Chi-q	*df*	Sig
X*W	0.0330	1	0.8558

Model Summary 2
Asthma episodes and controlling with medication

-2LL	Model LL	*df*	Sig	McFadden	CoxSnell	Nagelkrk
1844.4349	48.1544	4	.0000	0.0255	0.0345	0.0461

Model

	Coeff	SE	Z	Sig	LLCI	ULCI
Constant	-0.3178	0.2176	-1.4605	0.1441	-0.7743	0.1087
Medication	0.7313	0.1109	6.5943	0.0000	0.5140	0.9487
Income	0.0618	0.0477	1.2938	0.1957	-0.318	0.1553
Int_1	-0.1084	0.0950	-1.1409	0.2539	-0.2946	0.0778

Likelihood ratio test

	Chi-q	*df*	Sig
X*W	1.3025	1	0.2538

Summary

To ensure that the data was prepared for statistical analysis, all variables were validated, recoded, and moderators were computed. I completed descriptive summaries with frequencies and percentages for dependent, health, sociodemographic variables to understand the population characteristics. Two-by-two chi-square tests of association were conducted for RQ1, RQ2 and RQ3, as well as stratification and logistic regression were conducted for, RQ4, and RQ5 after a moderator variable for ethnicity for RQ4 and

annual household income level for RQ5 were created. For the question R1, the alternative hypothesis was accepted with statistical significance for the association between healthcare access and general health condition was weak. For R2 the null hypothesis was accepted for having someone at Doctor's office/clinic who helps coordinate care and asthma episodes/attacks in the past 12 months, while the association was weak. For R3, the alternative hypothesis was accepted because there was a statistically significant association between kind of place for usual source of care and having a doctor prescribed asthma management plan, however, the association was moderate.

For R4, a logistics regression was preformed to understand ethnicity the effects of the asthma management and asthma episode/attacks in the past 12 months. The interaction term was not statistically significant moderator of the effect on asthma management on asthma episodes for model 1 at $p<0.3984$ and model 2 at $p<0.7899$.

For R4, a binomial logistics regression was preformed to understand annual income level the effects of the asthma management, and asthma episode/attacks in the past 12 months. The interaction term was not statistically significant moderator of the effect on asthma management on asthma episodes for model 1 at $p<0.8558$ and model 2 at $p<0.2539$.

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

The aim of this study was to understand asthma healthcare and asthma management during the COVID-19 pandemic with the California healthcare system. The areas of interest were sociodemographic, access, source of care, and asthma management in accordance with urban and rural populations. Approximately 1,373 individuals suffer from asthma and asthma symptoms. The landscape for healthcare has changed, and fewer individuals rely on in-person healthcare to manage their symptoms (Hodge et al., 2020; Lagakos, 2020). Those individuals who reside in rural areas are at a higher risk of having negative health consequences that lead them to using emergency medicine during severe asthma episodes (Nurmagambetov et al., 2018; Ramirez et al., 2017). In the United States, the rural and urban health systems are known to have differences in socioeconomic status, health behaviors of the population, and ability to access a health facility, as well as unique problems (Lagakos, 2020; Martino et al., 2020). The study's findings indicated that urban and rural asthma healthcare and asthma management differences were further exacerbated by the COVID-19 pandemic.

Key Findings

Rural and Urban Individuals With Source of Care and General Health

Approximately 95.9% of the respondents replied "yes" to having source of care access, with 4.1% reporting not having healthcare access. For those individuals who responded, 9.2% resided in rural areas and 90.8% lived in urban areas. Out of the 1,317 respondents with a source of care, 10.7% had excellent health, 32.3% had very good health, 36.6% had good health, 16% had fair health, and 4.3% had poor health. Out of the

56 without a source of care, 14% had excellent health, 30.4% had very good health, 25% had good health, 17.9% had fair health, and 12.5% had poor health. Out of the 1,247 who resided in an urban setting with a source of care, 61.4% had excellent health, 32.5% had very good health, 36.5% had good health, 15.8% had fair health, and 3.9% had poor health. Out of the 51 who resided in an urban setting without a source of care, 15.7% had excellent health, 29.4% had very good health, 23.5% had good health, 17.6% had fair health, and 13.7% had poor health. Out of the 126 residing in a rural setting with a source of care, 5.8% had excellent health, 30.6% had very good health, 37.2% had good health, 18.2% had fair health, and 8.3% had poor health. Also, out of the five without a source of care in a rural setting, 0% had excellent health, 40% had very good health, 40% had good health, 20% had fair health, and 0% had poor health.

The analysis showed that individuals reported differences between rural and urban areas in achieving excellent health and source of care was over 50% higher in urban setting, while approximately 15.7% achieve excellent health without source of care. Overall, the chi-square analysis showed X^2 (4, N = 1,373) = 10.509, p = 0.033, V = .087. The strength of the association was examined using Cramer's V test valued at = 0.071, and there was moderately high association. To highlight the differences in rural and urban settings, the chi-square analysis for the urban areas indicated a statistically significant association at X^2 (4, N = 1,247) = 14.252, p = 0.007, V = .107, having a high association, while rural areas were not statically significant at X^2 (4, N = 126) = 0.859, p = 0.930, V = .083 with a weak association.

These findings support the existing literature indicating that general health condition and source of care differ among rural and urban populations (ALA, 2020; CDPH, 2020; Cromatie et al., 2020). Distance from healthcare facilities had a potentially negatively impact on asthma care and health outcomes (Douthit et al., 2015; Janio et al., 2020). Asthma status likely only captured a limited portion of the population. This may have limited the insights drawn from the results of this study into the association between having asthma and attaining healthcare access. Even though only 9.6% of the respondents identified with asthma status, this number exceeds the current statistics indicating that 8.5% individuals typically have asthma in California (ALA, 2021). This suggests that the 1,373 survey respondents in this study are likely more representative of the population with asthma in California (ALA, 2021).

Coordinate Asthma Care Associated With Asthma Episodes

In analyzing data on having someone at a doctor's office/clinic who helped to coordinate care and asthma episodes, I found that 66.1% of the 908 respondents replied "yes" to having someone at a doctor's office/clinic who helped to coordinate care, while 335 reported not having someone at a doctor's office/clinic who helped to coordinate care, and 110 did not respond to the question. Out of the respondents who said "yes" to having someone at a doctor's office/clinic who helped to coordinate care, 491 reported having an asthma episode in the past 12 months, 41 lived in rural areas, and 450 lived in urban areas. For those individuals who did not identify as having someone at a doctor's office/clinic who helped to coordinate care, 204 reported having an asthma episode in the past 12 months, 1,247 lived in an urban setting, and 126 resided in a rural setting. For

those individuals who identified that they did not have someone at a doctor's office/clinic who helped to coordinate care, 151 reported that they had not had an asthma episode in the past 12 months, nine lived in rural areas, and 142 lived in urban areas. I found a weak association between having someone at a doctor's office/clinic who helped to coordinate care and having an asthma episode in the past 12 months. However, when compared, both rural and urban were not statistically significantly associated with having someone at a doctor's office/clinic who helped to coordinate care and asthma episodes/attacks in the last 12 months. These findings supported the existing literature indicating that having someone at a doctor's office/clinic who helped to coordinate care among rural and urban populations was critical to asthma care (Vohra et al., 2020; Westerhof et al., 2018). Ability to get care from healthcare facilities had a potentially negative impact on asthma care and health outcomes in both urban and rural areas (Tran et al., 2017). The question only captured a small population and likely captured a limited portion of the rural population. This may have limited the insights drawn from the results of this study into the association between having someone at a doctor's office/clinic who helped to coordinate care and having an asthma episode/attack in the past 12 months in rural settings.

Source of Care and Asthma Management Among Individuals With Asthma

Concerning the source of care and having a doctor-prescribed asthma management plan, I found that 1,015 respondents identified as having a doctor-prescribed asthma plan. Out of the 1,015 respondents, 91.2% lived in urban areas and 8.9% lived in rural areas. In my study, 358 respondents reported not having a plan. Out of this group,

90.6% lived in urban areas and 9.4% lived in rural areas. According to GINA (2020), source of care played a critical part in ensuring that individuals maintained and sustained better health outcomes. Out of the individuals with a doctor-prescribed asthma management plan living in urban areas, the highest percentage was from doctor's office/HMO/Kaiser at 81.9%, while the ER/Urgent care at .2% had the lowest percentage. When looking at the difference between rural and urban source of care and asthma management plan, it appeared that rural and urban had the same trends, with the highest percentage of plans administered in the doctor's office/HMO/Kaiser and the lowest at the ER/Urgent care. This suggested that source of care options in rural and urban areas were similar due to the availability of health care services in the given area. The respondents from rural areas reported that they did not use the ER/urgent care as a venue to manage their care. This supported literature indicating that urgent care availability is limited in rural settings (Vohra et al., 2020). In addition, this gave insight on the ability to manage asthma conditions within the doctor's office setting.

Ethnicity, Asthma Episodes, and Asthma Management Plan

Ethnicity was a moderator of the relationship between asthma management (controlling asthma with medication and AAP) and asthma episodes/attacks over the past 12 months. In the analysis, ethnicity was not statistically significant. Thus, the chance of having an asthma episode was more likely an indicator of the social determinants of health and that certain groups were not adhering to a plan (Hodges et al., 2020). The social environment was probably a factor that decreased the ability to attain medication to control asthma and increased asthma episodes as compared to other groups. These

findings were supported by the existing literature that suggested that certain groups faced different challenges when managing their asthma health and attaining adequate health care, as well as indicating that the healthcare landscape was evolving during the COVID-19 pandemic (Hodges et al., 2020; James et al., 2017).

Annual Income Level, Asthma Episodes, and Asthma Management

Annual income level was used as a moderator of the relationship between asthma management (controlling asthma with medication and AAP) and asthma episodes in this study was not statistically significant. Individuals of certain income levels were more likely to have poorer asthma management, decreased ability to control asthma with medication, and increased asthma episodes as compared to other groups. These findings were supported by the existing literature that suggested that the social determinants of health were changing as the healthcare landscape evolved during the COVID-19 pandemic (Egen et al., 2017; Hodge et al., 2020; Janio et al., 2020;).

Demographic Variable Analysis

In this study, I provided an analysis of the descriptive statistics to further define the distribution of the respondent population. Out of the surveyed respondents analyzed, most of the respondents (63.6%) were White (Non-Hispanic), 72.6% of the respondents were college educated, and 56.3% were employed full time. Although the race/ethnicity breakdown represented in the 2020 CHIS data used for this study aligned with national statistics on the population subsets of race and ethnicity in the United States (see U.S. Census Bureau, 2017), more work should be done to ensure that higher numbers of racial and ethnic minority populations are included in future research to gain a more robust

understanding of the unique dynamics that likely exist in each racial and ethnic group. Most participants resided in urban areas (90.8%), while 9.2% reported living in rural areas (see Table 9). Participants' work status was as follows: 56.3% worked full time, 7.4% worked part time, .7% had other employment, 3.4% were unemployed/looking for work, and 36.4% were unemployed/not looking for work. Average annual household income data were as follows: $49,999 and below at 26.7%, $50,000–99,999 at 25.1%, $100,000–149,999 at 19.4%, and $150,000 and above at 28.8%.

For health outcomes, 9.6% reported having asthma, and 95.9% reported having healthcare access. Most of the participants reported good health at 36.1%, while poor health had the lowest percentage at 4.7%. According to the GINA (2020), taking daily medication is critical to asthma management; 48% of the participants were compliant, while 52% were not taking daily medications. Among participants, 66.1% reported having someone at a doctor's office/HMO/clinic who helped to coordinate their care, while 25.9% did not have someone at a doctor's office/clinic who helped to coordinate care. The usual source of care that had the highest percentage was doctor's office/HMO/clinic. Kaiser, while the ER/urgent care setting was noted by 0.2%. As indicated by the GINA (2020), individuals with asthma symptoms were more successful if they had an asthma action plan. Approximately 73.9% of participants reported having an asthma plan. Asthma episodes were relevant and caused by either exposures or lack of care (James et al., 2017); approximately 59.1% of the participants had an asthma episode in the past 12 months.

Alignment With the Theoretical Framework

The use of SEM as the main theoretical framework for this study has implications for use in improving community-wide health outcomes. In my study, the model addressed individual-environment interactions. The individual-environmental interactions were an fundamental competent to both public health and healthcare studies. In my study, the SEM focused on the relationships that were found on four different levels and the individuals' person (Bandura, 1986). Based on the results of the analysis, individuals with asthma and the dynamic of the healthcare environment demands in which the participants received care could have indicated a potential bidirectional relationship between social environmental stressors and asthma outcomes as suggested by the SEM. However, as previously indicated, it was uncertain whether the actual geographic location of the individuals suffering from asthma was an influencer on the relationship to ability to attain care. Finally, the analysis suggested that certain sources of care might have decreased asthma episodes/attacks over the past 12 months, depending on the ability for healthcare professionals to develop an AAP. Therefore, future studies should dive more in depth into the interplay of source of care and health outcomes.

Limitations of Study

The study had multiple limitations that should be considered when implementing the results for healthcare decision making. First, given that this was a cross-sectional study using a secondary data set, the findings were limited to observing different associations between the variables that were available, rather than being able to definitively identify specific cause-and-effect relationships that likely existed between

source of care and asthma status. It is also important to recognize that the data were only collected from a single year, were survey based, and were self-reported. In addition, while most of the demographic information mirrors California statistics, there remains a concern that certain groups were overrepresented. For instance, the geographic data primarily represented urban residents, which raised concerns regarding the representation of rural populations. Accord to Ward et al. (2019), ethnic, low-income, and racial minorities are sectors of the population at the highest risk for adverse health outcomes. The secondary dataset used in my analysis underrepresents these populations, which limits the ability to generalize.

Recommendations

This study focused on asthma care and asthma health care with ethnicity and annual household income level examined as potential moderators. Incongruities likely existed between the results of this study, the COVID-19 pandemic influence, and California health statistics on asthma; an important insight gained from this analysis was the ability for individuals to maintain good health despite limitations of resources. Based on these results, I recommend that those conducting future studies and public health interventions and making health policy decisions incorporate and reflect on different aspects of the health care system to include a focus on supporting government care clinics and doctor's offices because these health organizations play an important role in maintaining the health and well-being of California's urban population. Developing innovative programs and services for certain groups is integral to asthma care and management.

Implications for Professional Practice and Social Change

Asthma health and healthcare are complex and multifactorial, with needed applications in both the community and healthcare reform. The findings highlighted in this research have the potential to effect positive change by promoting understanding of how the health system provides treatment for individuals with asthma symptoms. The study focused on adults between the ages of 35 and 65 because they had the highest asthma prevelance. Secondary attention was devoted to understanding asthma health care in rural and urban populations of California.

At the community level, the knowledge gained relative to asthma care could also provide a reliable approach to understanding how the COVID-19 pandemic has affected health outcomes. The information could be used to develop programs and understand whether they are working effectively with the population. Demands on resources and health services have been shown to affect healthcare. Building community-based participatory research in rural areas brought to light more of the limitations in rural settings. In the CHIS, the health modules are important to understanding health conditions in California; however, additional qualitative information on asthma healthcare may provide more insight on health opportunities. The study looked at how the community influenced asthma care and asthma management.

At the policy level, it was important to gather additional data on rural populations to better understand the interaction in the health care setting and how this influences individual health outcomes. Knowledge acquired from these strategies could provide public health officials with the needed tools for building health capacity, influencing

health policy, and funding important health sources in urban or rural areas. Continued research efforts could provide better avenues for individuals to receive care and make care accessible to the working adult population.

Conclusion

In my study, the examination of asthma, asthma care, and asthma management provided relevant insights for future health care advocates and public health programs. I found a relationship between having a source of care and general health condition with a weak relationship. I also found that having someone at a doctor's office/clinic who helps coordinate care, asthma management plan, usual type of care, and asthma episodes had a significant but weak association. As indicated, the results should be interpreted cautiously based on the population demographics and the perceived diversity in the dataset.

It is imperative that continued research focus on the new aspects of asthma care and asthma management. This study findings were conducted during a COVID-19 pandemic, which built on previous asthma care and asthma management research efforts and the findings. The study's findings highlighted the important role of health care in managing asthma symptoms. The COVID-19 pandemic More individuals were forced to have someone at a doctor's office/clinic who helps coordinate care and to rely on a different venue for care. Thus, further exploration on the demands of COVID-19 on healthcare resources and on potential negative health outcomes may result in a new, pioneering approach to addressing asthma care and targeting certain subgroups.

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