The Impact of Social Determinants of Health: Primary Caretaker's Education Level, Neighborhood Safety, and the Delays in Receiving Care Have on Obesity Amongst Minority and Non-Minority Children

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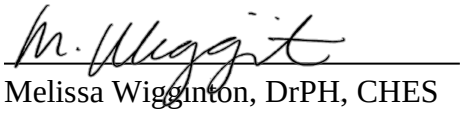

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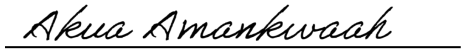

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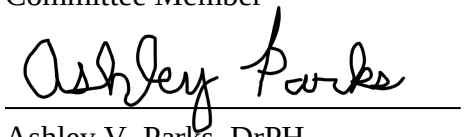

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Abstract

Childhood obesity is a public health problem that has been increasing. Researchers have reported disparities between minority and non-minority children in previous studies examining the difference in the mean body mass index (BMI) of children and social determinants of health (SDH) linked to obesity. This study aimed to examine the differences in the mean BMI of children across SDH (i.e., primary caretaker's education levels, neighborhood safety, and delays in receiving care) for minority and non-minority children in California. The researcher used an observational, cross-sectional design. The sample included 3,542 participants. Secondary data from the California Health Interview Survey (CHIS) were used to sample children between 0 to 11 years of age. A one-way ANOVA, including a post-hoc Bonferroni test and an independent samples *t*-test, was used to evaluate the difference in the mean BMI of children. There was a significant difference in the mean BMI of children and primary caretakers' education levels for minority and non-minority children. However, there was no significant difference between the mean BMI of children for neighborhood safety and delays in receiving care for minority and non-minority children. This study found that BMI decreased as parents' education levels increased. The results suggest more creation and improvement of health education programs, policies, and protective measures for children ages 0 to 11 to decrease childhood obesity rates in California.

Keywords: childhood obesity, SDH, BMI, primary caretaker's education levels, neighborhood safety, delays in receiving care.

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Introduction

Childhood obesity is a significant and challenging public health disease. Many factors can lead to the development of obesity in childhood (Centers for Disease Control and Prevention [CDC], 2022c). Obesity rates for children, adolescents, and adults have tripled globally since 1975 (World Health Organization [WHO], 2021). Any individual can develop obesity in adulthood, but obese children are more prone to become obese adults, which puts them at risk for complications throughout their lives, including heart disease, type 2 diabetes, and some types of cancer (CDC, 2022f). Children diagnosed with obesity are also at risk for various physical, emotional, and social issues (U.S. Department of Health and Human Services, 2018). Currently, "650 million adults, 340 million adolescents, and 39 million children" are obese (WHO, 2022, para. 1). However, these rates continue to increase. By 2025 it is estimated that 167 million adults and children will become less healthy due to their overweight or obese health status (WHO, 2022).

Obesity is a recognized medical condition because it can increase numerous adverse health problems that influence a variety of human functions, organs, and systems, including heart troubles, high blood pressure, pre- and diabetes, fatty liver disease, infertility, metabolic syndrome, gall bladder problems, and cancer, are just a few of the many often treatable health conditions (Macarthur, 2021). The symptoms accompanying obesity are chronic and may worsen without adequate management or medical attention (Macarthur, 2021). It is essential to understand the negative factors associated with childhood obesity to decrease its incidence. Furthermore, understanding the importance of the negative aspects may help to lower childhood obesity rates. Guiding children through interventions and protective measures to fight obesity may help improve children's overall quality of life.

Definition of Childhood Obesity

A child is diagnosed as obese when their calculated body mass index (BMI) exceeds the recommended BMI for their age (CDC, 2021b). BMI is an individual's weight in kilograms (or pounds) divided by the square of height in meters (or inches) (CDC, 2021a). After BMI is calculated, there is a percentile range that identifies children's weight status, and a BMI in the 95th percentile is considered obese (CDC, 2021b). Children's BMIs are plotted on charts where age and sex (CDC growth charts for males and females) are taken into consideration (CDC, 2021b).

Overweight and obesity are similar to one another and indicate a person's body weight exceeds what is deemed healthy or typical for someone of a certain height (T.H. Chan School of Public Health, 2022). The difference between overweight and obesity is that overweight is due to extra body fat, and obesity is too much body fat (T.H. Chan School of Public Health, 2022). Eating habits, physical activity levels, and sleep patterns are all variables that might contribute to excessive weight gain. Other factors include social determinants of health (SDH), genetics, and certain medications (CDC, 2022c).

Scope and Magnitude of Childhood Obesity

One in five children are obese (CDC, 2022a). Childhood obesity has become a global issue, rapidly gaining policymakers' and experts' attention (González-Álvarez et al., 2020). In 2020, data showed that 39 million children under five worldwide were overweight or obese (WHO, 2021). From 2017 to 2020, the obesity prevalence in the United States was 19.7%, affecting 14.7 million children (CDC, 2022d). Obesity is a complex public health disease with far-reaching consequences, including the United States' health, economy, and military readiness

(CDC, 2022f). Obesity costs the United States healthcare system roughly $173 billion annually (CDC, 2022f).

California (CA) is one of the most populated states where the number of individuals impacted by obesity and obesity-related illnesses is large, expansive, and expensive (California Department of Public Health, 2016). Compared to other states, CA spends more public and private funds on obesity-related health issues (UCLA Center for Health Policy Research, 2015). Obesity costs CA households, businesses, the healthcare sector, and the government more than $21 billion per year in lost productivity (UCLA Center for Health Policy Research, 2015). In 2014, 15% of children ages 2 to 11 living in CA were overweight or obese (California Department of Public Health, 2016). According to America's Health Rankings (2021), and in 2021, the prevalence of overweight and obesity among youth in the United States was 32.1%. CA specifically, reported a rate of 30.4%; Utah had the lowest rates of obesity, with 22.8% of youth reportedly overweight and obese (America's Health Rankings, 2021). When comparing CA's childhood obesity rates to the global and national levels, it is apparent that there needs to be improvements in lowering CA's childhood obesity rates.

Consequences and Complications for Childhood Obesity

Obesity can harm a child's physical, social, and emotional well-being (Mayo Clinic, 2020). Children who are obese can develop chronic diseases, such as diabetes, high blood pressure, and high cholesterol, which can carry on into adulthood and result in more chronic conditions or diseases that can diminish their quality of life (Mayo Clinic, 2020). Other physical complications children might experience are joint pain, breathing problems (that can lead to asthma), sleep apnea, and nonalcoholic fatty liver disease (NAFLD) (Mayo Clinic, 2020; Sharon, 2022). Obesity in childhood can lead to low self-esteem, an increased risk for depression and

anxiety, and decreases in academic performance (Mayo Clinic, 2020; Sharon, 2022). If children who are obese do not get the proper medical attention, their disease can worsen over time and lead co-morbid complications (Sharon, 2022).

Implications of Childhood Obesity

According to the California Department of Public Health (2016), CA's decrease in obesity rates met the Healthy People 2020 goal. The Healthy People 2020 objectives including reducing the proportion of children aged 2 to 5 years who are considered obese and reducing the proportion of children 6 to 11 years who are considered obese. Both objectives met the decreased desire for the United States, yet the state population is still not healthy. The Healthy People 2030 objectives include decreasing childhood obesity by "13%, from 17.8% to 15.5% of children ages 2-19" (America's Health Rankings, 2021, Goals section). Research showed behavioral interventions that employ many strategies to prevent childhood obesity are successful, but more work needs to be done to encourage Californians to practice healthy behaviors and environmental change (California Department of Public Health, 2016).

Race and Childhood Obesity

In the United States, childhood obesity is more significant among minority children than non-minority children (Inyang et al., 2018). Despite advances, obesity disparities exist, and there are higher rates of obesity among Californians with low income and educational attainment and some racial and ethnic groups in California (California Department of Public Health, 2016). Studies showed that childhood obesity is more common for specific populations and races than others (CDC, 2022d). Statistics from 2017 to 2020 indicated that the obesity of children ages 2 to 5 years old was 12.7%, 20.7% among children aged 6 to 11, and 22.2% among children aged 12 to 19 (CDC, 2022d). The data showed prominent differences in prevalence when examining race

and ethnicity, specifically “26.2% of Hispanic children, 24.8% of non-Hispanic Black children, 16.6% of non-Hispanic White children, and 9.0% of non-Hispanic Asian children were classified as obese” (CDC, 2022d, para. 2).

In minority communities, particularly non-Hispanic Black and Hispanic populations, obesity is a significant problem. Minority communities have increased chances of developing “type 2 diabetes and high blood pressure,” which puts them at a high risk of developing severe consequences from the ongoing COVID-19 pandemic (State of Childhood Obesity, 2020, para. 3). There are differences between races and childhood obesity which are complex and linked to one’s biological systems, socioeconomic status (SES), culture, relationships, and genetics which are stated to likely play a role in the disparities in childhood obesity prevalence among groups (Caprio et al., 2008).

Taveras et al. (2013) conducted a study to examine racial and ethnic differences in childhood obesity, overweight, and adiposity. The study showed that black and Hispanic children had higher BMI z-scores and prevalence of overweight and obesity compared to non-Hispanic white children (Taveras et al., 2013). The findings suggest that factors such as rapid weight increase in children, poor sleep, eating fast food and sugary drinks, and more can help explain racial and ethnic differences in childhood obesity in infancy and early childhood. Addressing these factors makes it possible to reduce obesity among black and Hispanic children (Taveras et al., 2013). Although studies and statistics have shown disparities among racial groups and childhood obesity, it remains unclear which risk factors trigger and clarify the differences (Inyang et al., 2018).

Parent's Education Level and Childhood Obesity

Parents play a critical role in molding their children's health behaviors (Muthuri et al., 2016). There is a link between parent education and child weight status regarding health outcomes (Muthuri et al., 2016). Parents who have achieved higher levels of education tend to have better health literacy and have more vital problem-solving skills, which may lead to healthier food choices for themselves and their children (Hasson et al., 2018).

Research has examined the correlation between parental education and the likelihood of children being overweight or obese. In Matthiessen et al. (2014) study, which included a random sample of 512 children ages 4 to 14, it was found that Danish parents' education was associated with overweight children, and children were likely to be overweight if their parents were less educated. Muthuri et al. (2016) conducted a study on 4,752 children ages 9 to 11 and found that children from Colombia and Kenya, with parents reporting a higher level of education, were overweight due to social norms compared to children from Brazil and the USA. Specifically, social norms in developing countries, such as Kenya and Columbia, praise overweight and obesity because it represents a sign that they are living a good life. Conversely, in Brazil and the USA, it was found that fathers who accomplished some college education or higher had fewer overweight children (Muthuri et al., 2016). In summary, research has shown that in developing countries, children who are overweight or obese are considered healthy and food secure.

Antonogeorgos et al. (2013) conducted a study to examine the effects of parental education and the knowledge of the Mediterranean diet and obesity in children aged 10 to 12 years old. The results from the study showed that 27.7% of children were overweight, 6.3% were obese, and 12.3% had high faithfulness to the Mediterranean diet (Antonogeorgos et al., 2013). The study showed a link between a parent's education level and children's BMIs. The findings

suggested that parental education does play a factor in children developing obesity and following the Mediterranean diet (Antonogeorgos et al., 2013).

Finally, Koivuniemi et al. (2021) conducted a four-month study in Finland to examine if parental factors were related to children's (aged 2 to 6) diet quality. Out of 766 children, 13% of children had a good diet quality, 55.4% had moderate diet quality, and 30.9% had poor diet quality (Koivuniemi et al., 2021). The findings showed that a higher diet quality in younger children was associated with parents having a healthier diet and higher education (Koivuniemi et al., 2021). Studies also linked high maternal education to good diet quality in children. Parents with lower educational attainment may have a limited understanding of nutrition, limiting the dietary options available to their children (Koivuniemi et al., 2021). Overall, many studies showed parental factors, including parents' education levels, are linked to children's diets.

Neighborhood Safety and Childhood Obesity

The lack of safe neighborhoods can prevent children from being physically active and playing outdoors, leading to obesity (An et al., 2017). Research studies and systematic reviews showed that dangerous neighborhoods can influence children being obese because it discourages physical activity, including outdoor activities and park usage, and encourage sedentary behaviors, including watching television and playing computer games (An et al., 2017). Some parks in specific neighborhoods pose a risk for children because of graffiti, the homeless who use the areas as shelters, and the fact that they have become hotspots for drug use, trafficking, and gang activity (Reis et al., 2020).

A study by Reis et al. (2020) in Montclair, CA, suggested there may be a link between the built environment and childhood obesity. The study showed that children whose parents expressed heightened concerns about neighborhood safety were twice as likely to be overweight

or obese as those whose parents expressed fewer concerns (Reis et al., 2020). Research showed that parents who felt that their neighborhood was unsafe were more hesitant about their children playing and exercising outside (Reis et al., 2020). These concerns were shown to result in children having lower physical activity levels and lower caloric expenditure, thereby increasing their chances of developing obesity (Reis et al., 2020).

Additionally, a study by Kranjac et al. (2021) in Houston, Texas, suggested that neighborhood disadvantages lead to childhood obesity. In this study, neighborhood disadvantages were described as the effects of neighborhood environments such as lack of infrastructure and societal disarray to criminal activity and delinquency (Kranjac et al., 2021). Findings showed that children's chances of being obese increased as neighborhood disadvantages increased (Kranjac et al., 2021). Results also showed that obesity rates were higher among children who lived in more disadvantaged neighborhoods (Kranjac et al., 2021). Thus, neighborhoods can either improve or exacerbate obesity-related health behaviors. For example, living in an unsafe environment with high crime rates can potentially interfere with children's ability to participate safely in physical activity, increasing their chances of developing childhood obesity (Kranjac et al., 2021). On the other hand, living in a safe environment helps diminishes a child's risk of developing obesity and other diseases by enabling the child to participate in outdoor activities safely (Kranjac et al., 2021).

Delays in Receiving Care and Childhood Obesity

There are many reasons children may experience delays in receiving care, including appointment difficulty, insurance coverage, access to resources, and referral problems, and these delays which can increase their chances of obesity or worsen their childhood obesity (Obesity Action Coalition [OAC], 2022). Healthcare professionals, health plans, delivery systems, and

information technology contribute to a child's healthy development and obesity prevention and treatment (CDC, 2022e). In the last decade, access to obesity treatment has become more limited, causing employers and insurance companies not to include obesity management services for individuals and their children (OAC, 2019). As a result, individuals face significant barriers to using their insurance for weight counseling or medications (OAC, 2022).

The OAC found that most individuals have health insurance that covers hospitalizations, physician visits, and regular prescriptions for blood pressure medications (ConscienHealth, 2015). However, the research demonstrated that individuals reported their insurance would not cover referrals to a specialized physician that can help with obesity management for themselves or their children if needed (ConscienHealth, 2015). Childhood obesity results in substantial healthcare costs for parents as it may increase specialist visits, the need for costly prescriptions, and emergency room visits (Wilfley et al., 2017). Due to the high cost for parents, many children may experience barriers resulting in delays in care or treatment (Wilfley et al., 2017). As a result of this healthcare-related financial strain, children and their families postpone or decline critical care (Wisk & Witt, 2012).

Due to high healthcare costs, insurance coverage, or other barriers to receiving care, parents may not be able to take their children to regular doctor visits, specialty visits, or follow doctors' advice on protective measures. These factors can result in a decrease in children's health. A study by Wisk and Witt (2012) showed that financial burden and conflicting insurance were predictors of whether families with children receive care. Findings also showed that the high financial duty of health care might explain why children and their families have poor health and well-being (Wisk & Witt, 2012). Improving the chances of receiving timely and preventive care and minimizing the prevalence of delayed or declining care may enhance health outcomes

(Wisk & Witt, 2012). For children who are obese, improving the care within the health systems and providing accessibility to evidence-based programs are essential to reducing delays in receiving treatment (Wilfley et al., 2017).

Summary of Evidence

Childhood obesity is a complex, ongoing problem that has existed for many years. The complexity of the disease derives from multiple factors that can lead to children developing obesity. While CA's childhood obesity rates are lowering, improvement is still necessary. Research showed that minority children are more prone to be obese than non-minority children (CDC, 2022d). Additionally, parents' educational level is correlated to the risk of childhood obesity (Hasson et al., 2018). Parents with higher education may be more knowledgeable about a healthy lifestyle for their children than parents with little to no education. Neighborhood safety is a critical risk factor for childhood obesity. If a child lives in a high crime rate neighborhood or their parks are not safe due to homelessness and drug and sex trafficking, parents may keep them inside, resulting in less physical activity and more sedentary time (Reis et al., 2020). Finally, delays in receiving care and specific access to healthcare coverage also play a critical role in a child's health because some insurance companies do not cover obesity health-related care. Although studies have shown a difference in mean BMI for minority and non-minority children, as well as SDH linked to obesity, more studies are needed to examine how parents' education levels, neighborhood safety, and the delays in receiving care influence childhood obesity among minority and non-minority children.

Purpose of the Study

Given the findings highlighted in the literature, the purpose of this study was to examine the differences in mean BMI of minority and non-minority children across different SDH in CA.

Specifically, the current research study aimed to determine if there were differences in the mean BMIs of children related to primary caretakers' education levels, neighborhood safety, and the delays in receiving health care. This study may support the creation and improvement of health education programs, policies, and protective measures for children ages 0 to 11 to decrease childhood obesity rates in California.

Research Questions

The following research questions were addressed in this study:

1. Is there a difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children in California?
2. Is there a difference in the mean BMI of children across neighborhood safety for minority and non-minority children in California?
3. Is there a difference in the mean BMI of children across delays in receiving care for minority and non-minority children in California?

Hypotheses

The first hypothesis was that there would be a difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children in CA. The second hypothesis was that there would be a difference in the mean BMI of children across neighborhood safety for minority and non-minority children in CA. The third hypothesis was that there would be a difference in the mean BMI of children across delays in receiving care for minority and non-minority children.

Method

Design

This study used an observational, cross-sectional design to measure the differences in mean BMI across SDH factors for minority and non-minority children in CA. The SDH factors included primary caretakers' education levels, neighborhood safety, and delays in receiving care. This study used secondary data from the 2020 California Health Interview Survey (CHIS).

Procedures

This study utilized secondary data from the 2020 CHIS. The CHIS is the country's largest state-based health survey (UCLA Center, 2012a). The UCLA Center for Health Policy Research, in conjunction with the California Department of Public Health and Health Care Services, conducts the CHIS (UCLA Center for Health Policy Research, 2012d). CHIS is a cross-sectional survey that provides representative statistics for all 58 counties in CA (Society of General [SGIM], n.d.; UCLA Center for Health Policy Research, 2012a). The survey continuously collects self-reported data on various topics (SGIM, n.d.; UCLA Center for Health Policy Research, 2012a). It collects state data on children, adolescents, and adults through a web-based and phone survey that asks about various health-related issues, such as diabetes, health insurance coverage, and obesity (SGIM, n.d.). CHIS surveys also collect environmental, behavioral, and social aspects, such as neighborhood safety and public assistance program eligibility (SGIM, n.d.). Many policymakers and researchers widely use CHIS surveys and health experts to help understand CA's statistical picture of the diverse population's health and healthcare requirements (UCLA Center for Health Policy Research, 2012a).

In the past, CHIS selected households from a sample of telephone numbers, but since 2019 they switched their random selection to a sample of addresses (UCLA Center for Health

Policy Research, 2012b). Each questionnaire is administered yearly, with the web version being self-administered and the telephone version administered by trained interviewers. The telephone interviewers speak with the household's most knowledgeable parent or guardian about a child's health (UCLA Center for Health Policy Research, 2012a). All interviews are structured, have quality data, and are kept confidential between individuals and government agencies. The CHIS provides a statistical picture that can help public health leaders and policymakers better understand and address the health needs of Californians (UCLA Center for Health Policy Research, 2012a).

The CHIS questionnaires administered on the web and through the telephone contain the same questions and information. The questionnaire has nine sections. Section A: Demographics Part I, Health Conditions includes questions on gender, age, height and weight, breastfeeding, school attendance, general health, asthma, and other conditions (UCLA Center for Health Policy Research, 2012c). Section B: Dental Health includes questions on delays in care (dental) (UCLA Center for Health Policy Research, 2012c). Section C: Diet, Physical Activity, Park Use includes questions on dietary intake, commute from school to home, name of the school, and park use (UCLA Center for Health Policy Research, 2012c). Section D: Health Care Access and Utilization includes questions on usual source of care, emergency room visit, visits to a medical doctor, personal doctor, care coordination, developmental screening, timely appointments, communication problems with a doctor, and delays in care (UCLA Center for Health Policy Research, 2012c). Section E: Public Programs includes questions on TANF/CalWORKs, food stamps, and WIC (UCLA Center for Health Policy Research, 2012c). Section F: Parental Involvement includes questions on the First 5 California "Talk, Read, Sing Program" and "Kit for New Parents" (UCLA Center for Health Policy Research, 2012c). Section G: Child Care and

Social Cohesion includes questions on childcare (UCLA Center for Health Policy Research, 2012c). Section H: Demographics, Part II has questions on race/ethnicity, country of birth (mother), country of birth (father), languages spoken at home, and primary caretaker (UCLA Center for Health Policy Research, 2012c). Lastly, Section H: Demographics, Part III includes questions on follow-up and close (UCLA Center for Health Policy Research, 2012c). The CHIS is administered in English, Spanish, Chinese (Cantonese and Mandarin dialects), Korean, Tagalog, and Vietnamese to reach California's diverse population and ensure the data represents the health of every Californian (UCLA Center for Health Policy Research, 2017).

The CHIS is highly reliable because the highest research techniques and standards are used (UCLA Center for Health Policy Research, 2017). Some methods confirm the data quality. First, it includes a large sample of individuals surveyed from diverse populations (UCLA Center for Health Policy Research, 2017). Second, computers randomly draw individuals from geographic areas to eliminate bias (UCLA Center for Health Policy Research, 2017). In addition, in each household, only one adult and an adolescent or child are randomly selected and interviewed (UCLA Center for Health Policy Research, 2017). Lastly, the survey is conducted in different languages to reach CA's diverse populations (UCLA Center for Health Policy Research, 2017). The CHIS data have high credibility because UCLA Center for Health Policy Research for Health Policy Research forms it. The UCLA Center for Health Policy Research for Health Policy Research, part of the UCLA School of Public Health, is one of the nation's major health policy research centers and California's primary source of health policy information (UCLA Center for Health Policy Research, 2017).

Participants

The target population for this study included children, both girls and boys, aged 0 to 11 randomly selected from the 2020 CHIS dataset. The original dataset included a total of 3,548 participants. The participants who responded to the web CHIS 2020 Child Computer Assisted Web Interviewing (CAWI) Questionnaire and the telephone CHIS 2020 Child Computer Assisted Telephone Interview (CATI) Questionnaire about adult primary caretakers' education levels, neighborhood safety, and delays in receiving care were selected, and missing responses were excluded. Adjusting the dependent variable of BMI to remove outliers (deleting the top 1% and bottom 1%) and factoring in the race of participants, 1,443 participants responded to the primary caretakers' education levels and neighborhood safety and 1,376 responded to the delays in receiving care question. These samples exceeded the minimum sample size required for this study as determined by G*Power Software version 3.1 (Faul et al., 2007). According to G*Power calculations, assuming a beta of 0.95, an alpha of 0.05, and an estimated effect size of 0.25, a minimum sample size of 390 participants was required to effectively power the statistical analyses.

Independent Variable

The independent variables for this study included the primary caretakers' education levels, neighborhood safety, and delays in receiving care. Primary caretakers' education levels were measured by the question QC2020_H24, *"What is the highest grade of education you have completed and received credit for?"* This variable was recorded as an ordinal variable with ten levels, "-9-Not Ascertained," "-5-Adult/Household Info Not Collected," "1-No Formal Education or Grade 1-8," "2-Grade 9-11," "3-Grade 12/H.S. Diploma," "4-Some College," "5-AA/AS Degree or Vocational School," "7-BA or BS Degree/Some Grade School," "9-MA or

MS Degree," and "10-PH.D. or Equivalent." For this study, the primary caretakers' education levels remained an ordinal level variable but was recoded into seven levels: "1-11th grade or less (or no formal education)," "3-Grade 12/HS diploma," "4-Some College," "5-AA/AS Degree or Vocational School," "7-BA/BS Degree/Some Grade School," "9-MA/MS Degree," and "10-PH.D. or Equivalent." Responses "1 and 2," were collapsed into "1" due to a small number of respondents, and "-9" and "-5" were recoded as system missing.

The second independent variable was neighborhood safety, and it was measured by question CG42, *"Feel Safe in Neighborhood."* It was recorded as a nominal variable with eight levels, "-9- Not Ascertained," "-8-Don't' Know," "-7-Refused," "-1-Inapplicable," "1-All of the time," "2-Most of the time," "3-Some of the time," and "4-None of the time." For this study, neighborhood safety remained a nominal level variable but was recoded into four levels, "1-All of the time," "2-Most of the time," "3-Some of the time," and "4-None of the time," and "-9," "-8," "-7," and "-1," were recoded as system as missing.

The third independent variable was delays in receiving care which was measured by question QC2020_D30, "*During the past 12 months, did you delay or not get any other medical care you felt (CHILD) needed—such as seeing a doctor, a specialist, or other health professional?"* Delays in receiving care was recorded as a nominal variable with seven levels, "-9-Not Ascertained," "-8-Don't Know," "-7-Refused," "-2-Proxy Skipped," "-1-Inapplicable," "1-Yes," and "2-No". For this study, delays in receiving care remained a nominal level variable but were recoded into two levels, "1-Yes," and "2-No," and "-9," "-8," "-7," "-2," and "-1" were recoded as system missing.

Dependent Variable

The dependent variable in this study was BMI. BMI was calculated and measured using *HEIGHT-INCHES (PUF RECODE)* and *WEIGHT-POUNDS (PUF RECODE).* BMI was calculated using (weight in pounds x 703)/ height in inches x height in inches). BMI in the CHIS dataset was recorded as a ratio variable. The researcher deleted the top 1% (BMI less than 8.36) and the bottom 1% (BMI more than 43.39) to remove outliers.

Data Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 27. For research question one, "*Is there a difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children in California?,*" a one-way ANOVA was performed to measure the mean difference in BMI based on the primary caretakers' education levels. For research question two, "*Is there a difference in the mean BMI of children across neighborhood safety for minority and non-minority children in California?,*" a one-way ANOVA was also performed to measure the differences in mean BMI between levels of neighborhood safety. Lastly, for research question three, "*Is there a difference in the mean BMI of children across delays in receiving care for minority and non-minority children in California?,*" an independent samples *t*-test was conducted to measure the mean difference in BMI between delays in receiving care. To access if there were any differences in the results among minority children versus non-minority children, the dataset was split by a recoded race/ethnicity variable. The variable used was *Race-UCLA CHPR Definition, Unabridged (PUF 1 Yr Record).* Race was recorded as a nominal variable with five levels, "1-Latino," "4-Asian," "5-African American," "6-White," and "7- Other Single or Multiple Race."

For this study, race remained a nominal level variable but was recoded into “1- Minority Race” and “6-Non-Minority Race” where “1,” “4,” “5,” and “7” were combined into Minority Race.

Results

Demographics

The sample size in this study included n = 3,548 minority and non-minority children whose caregivers responded to the 2020 CHIS. The aim was to explore the differences in mean BMI across primary caretakers' education levels, neighborhood safety, and delays in receiving care for minority and non-minority children. The mean BMI for minority children was 18.06 (n = 1818), and for non-minority children it was 17.10 (n = 1443) . Most of the study participants were male (n = 1858, 52.4%). Based on the age categories examined, 52.9% of participants (n = 1879) were 0 to 5 years old, and 47.1% were 6 to 11 years old (n = 1669). Most of the CHIS participants classified themselves as White (n = 1525, 43.0%) followed by other single or multiple races (n = 1062, 29.9%) (see Table 1 in Appendix).

Major Findings

A one-way ANOVA was used to evaluate the first research question, *"Is there a difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children in California?"* A statistically significant difference was found in mean BMI across primary caretakers' education levels for both minority ($F(6,1245) = 8.69$, $p < .05$) and non-minority children ($F(6,1251) = 3.80$, $p < .05$). A Bonferroni post hoc test was used to determine if there were significant differences in mean BMI between specific education levels. This analysis revealed that there were some significant differences between those who identified as a minority race. Specifically, children's whose caregivers reported that their highest level of education was 11th grade or less (or no formal education) (M = 19.50, sd = 5.629) had significantly higher BMIs compared to those whose caregivers reported their highest education level as AA/AS or Vocational School (M = 17.48, sd = 4.322), MA/MS (M = 16.99, sd = 4.118),

and PhD or Equivalent (M = 17.12, sd = 3.864). When examining non-minority individuals, the Bonferroni post hoc test revealed that there was a significant difference in BMI when comparing AA/AS or vocational school (M = 18.14, sd = 4.593) to BA/BS or Some Grad School (M = 16.93, sd = 3.551) and MA/MS (M = 16.69, sd = 3.746) (see Table 2 in Appendix).

A one-way ANOVA was used to evaluate the second research question, " *Is there a difference in the mean BMI of children across neighborhood safety for minority and non-minority children in California?*" There was no significant difference found in mean BMI across categories of neighborhood safety for minority ($F(3,1814) = .088$, $p > .05$) and non-minority groups ($F(3,1439) = 2.24$, $p > 0.05$). Neighborhood safety and BMI did not differ among children from minority and non-minority populations (see Table 3 in Appendix).

An independent samples *t*-test was used to evaluate the third research question, "*Is there a difference in the mean BMI of children across delays in receiving care for minority and non-minority children in California?"* No significant difference was found between mean BMI and delays in seeking care, for both minority ($t(1816) = .871$, $p > 0.05$) and non-minority participants ($t(1441) = .745$, $p > 0.05$) (see Table 4 in Appendix).

Discussion

Childhood obesity is a significant public health problem because children who are obese are more probable to carry over their obesity to adulthood and develop comorbid diseases or health complications (CDC, 2022f). Childhood obesity also affects children on all levels—physically, emotionally, and socially (U.S. Department of Health and Human Services, 2018). The study aimed to determine if there were statistically significant differences in BMI between children's primary caretakers' education levels, neighborhood safety, and delays in receiving care.

Summary of Major Findings

The first research question was, *"Is there a difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children in California?"* Results found a statistically significant difference for both minority ($F(6,1245) = 8.69$, $p < .05$) and non-minority children ($F(6,1251) = 3.80$, $p < .05$). Therefore, the original hypothesis that there would be a difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children was supported. After computing a Bonferroni test, there was a significant difference in minority children's BMI when comparing caregiver education: 11th grade or less (or no formal education) ($M = 19.50$, $sd = 5.629$) to AA/AS or Vocational School ($M = 17.48$, $sd = 4.322$), MA/MS ($M = 16.99$, $sd = 4.118$), and PhD or Equivalent ($M = 17.12$, $sd = 3.864$). There was also a significant difference in non-minority children when comparing AA/AS or vocational school ($M = 18.14$, $sd = 4.593$) to BA/BS or Some Grad School ($M = 16.93$, $sd = 3.551$ and MA/MS ($M = 16.69$, $sd = 3.746$). These results coincide with the current research supporting the role parental education plays in mediating whether children developed childhood obesity. According to Antonogeorgos et al. (2013), out of

1,125 school children, 27.7% of children were overweight, 6.3% were obese, and 12.3% of the children were committed to the Mediterranean diet. However, roughly 50% of the children had at least one parent with a higher level of education, and both parents of 26.5% of the sample had academic backgrounds (Antonogeorgos et al., 2013). Children who followed the Mediterranean diet more closely had a 25% lower risk of becoming overweight or obese (Antonogeorgos et al., 2013). Children who grew up in households with at least one parent with little education were more likely to be overweight or obese (Antonogeorgos et al., 2013). Research by Matthiessen et al. (2014) also supported that children were likely to be overweight if their parents were less educated. Muthuri et al. (2016) found that children with fathers with some college education or more were less likely to be overweight. Finally, Koivuniemi et al. (2021) findings indicated that good diet quality among children was associated with higher educational achievement among parents. This study's results further support how parental education is critical for lowering BMI for children in CA.

The results for the second research question, *"Is there a difference in the mean BMI of children across neighborhood safety for minority and non-minority children in California?"*, showed no significant difference in the mean BMI for children across neighborhood safety for minority and non-minority children in CA. These findings do not support the original hypothesis. Additionally, the lack of difference in the mean BMI of children across neighborhood safety was found to oppose the current literature. In one study, An et al. (2017) found that unsafe neighborhoods lead to children not participating in outdoor physical activities, which ultimately led to an increase in childhood obesity. Reis et al. (2020) also found that parents with deep concerns about their neighborhood safety had children who were twice as likely to be overweight or obese as those whose parents showed fewer concerns. Finally, Kranjac et al. (2021) found that

children who lived in a disadvantaged neighborhood (e.g., poor neighborhood environment, lack of infrastructure and societal disarray to criminal activity and delinquency) had higher obesity rates. Despite studies showing neighborhood safety as a factor for high BMI, this research study's findings showed neighborhood safety does not play a role in children developing obesity. This study may have not correlated with other studies due to the sample size, cultural differences, or outdated research. The variables might have overlapped too much, there might not have been enough children in the groups to create a difference, or the cities used in the study neighborhoods might have been improved over the years, resulting in children participating in more outdoor physical activity.

For the third research question, *"Is there a difference in the mean BMI of children across delays in receiving care for minority and non-minority children in California?"*, it was hypothesized that there would a significant difference in the mean BMI of children across delays in receiving care for minority and non-minority children in CA. Results found no significant difference in the mean BMI of children across delays in receiving care for minority and non-minority children in CA. These findings oppose the original hypotheses as well as the current literature (Wilfley et al., 2017; Wisk & Witt, 2012). Wilfley et al. (2017) found that the high cost of insurance resulted in delays in care or treatment that can further lead to developing health problems or worsening health among children. Wisk and Witt (2012) found that financial burden and conflicting insurance are predictors of whether children receive the health care needed. Although these studies demonstrated that delays in care due to lack of insurance can result in health issues that can lead to or exacerbate obesity, the findings from this current study showed no difference between the mean BMI of children and delays in receiving care. These findings might have resulted from the study sample size being underpowered compared to other studies,

the variables including cultural differences, or the delays in children receiving care barriers may have been improved throughout the years causing little to no delays for children to receive the proper care needed.

Public Health Implications

The current study focused on examining the differences in the mean BMI of children across the SDH of primary caretakers' education levels, neighborhood safety, and delays in receiving care) for minority and non-minority children. Results show a significant difference between the primary caretakers' education levels and children's BMI, but no significant difference was found between neighborhood safety and delays in receiving care and BMI. Findings from this research showed that parental education is key to reducing childhood obesity, so policymakers, public health officials, the community, health departments, non-profit organizations, and schools should use this finding to protect and improve children's health. The findings can be used to host community child health education classes for parents, prepare and hand out educational flyers to parents regarding children's diet and health, as well as create more evidence-based childhood obesity prevention programs that target more involvement from parents. These interventions could emphasize the benefits of higher education and the importance of physical activity and healthy diets for children. Public health officials can enhance children's health outcomes by providing more preventative measures and promoting in minority communities, especially to parents, on the correlation between children's health, obesity, and higher education.

Providing preventative measures, such as more resources and obesity evidence-based interventions, can help protect and decrease the prevalence of childhood obesity among minority children. Childhood obesity prevention programs exist throughout CA, but more should be

implemented to focus on obesity at a community level so that everyone can help one another. To combat childhood obesity, the significant results from this study should be used to help promote CDC's (2022e) proven strategies for overweight and obese children, which are early care and education (ECE), healthcare, and community efforts.

ECE are a critical part of children's lives since they spend some time there (CDC, 2022e). Due to the high number of children enrolled in ECE, it is suitable environment for helping children to begin building a healthy life (CDC, 2022e). Sending home resources to parents on the importance of having knowledge about their children's health and supporting parents achieve higher education may help lower obesity rates. To support healthy eating and living, ECE programs can enhance nutrition, boost physical activity levels, restrict screen time, and encourage breastfeeding mothers.

A child's healthy development and the prevention and treatment of obesity are supported by healthcare providers, insurance companies, delivery methods, and technology-based information (CDC, 2022e). According to the CDC (2022e), the US Preventive Services Task Force recommends children are screened for obesity at age six and older (CDC, 2022e). Those diagnosed with obesity should be offered referrals to comprehensive family care and behavioral interventions to help improve their weight status (CDC, 2022e).

Community efforts are a significant factor in reversing the obesity epidemic because a healthy lifestyle for children can be promoted in various settings (CDC, 2022e). Public health officials can focus on healthy eating and good quality of life in school communities by encouraging children to drink water, having healthy eating options, having a local school wellness policy, and increasing physical activity in their physical education classes (CDC, 2022e). School communities can also incorporate obesity prevention programs focusing on

parents to help them gain more knowledge and resources for helping their children. This study showed that higher education is linked to lower BMI levels in children; therefore, evidence-based programs that encourage parents to learn more about childhood obesity and how to prevent it may help parents lower their child's BMI.

Overall, this study can help public health scientists increase efforts for marketing strategies and programs for lowering minority children's BMI levels by supporting parental education and creating more health education programs targeting parents. These programs could include hosting more community health education classes that emphasize achieving a higher education to support children's health. This study can provide public health officials with an understanding that when parents have more education, and thus, more knowledge, children's BMI levels decrease. This study could inform obesity health education programs and policies by showing the value of incorporating parents' involvement and supporting higher education.

Study Limitations

The strength of this study was the use of the CHIS dataset. The CHIS measures have high reliability and validity (UCLA Center for Health Policy Research, 2017). CHIS was created and distributed by the UCLA Center for Health Policy, which is part of the UCLA School of Public Health. Many public health scientists use CHIS because the UCLA School of Public Health is one of the nation's major health policy research centers and a primary source of health policy information (UCLA Center for Health Policy Research, 2017). The CHIS uses the best standards for research, collects data from diverse populations, computers are used to pull random individuals from geographic areas to eliminate bias, the survey is conducted in different languages, and one adult and one child are randomly selected and interviewed from each household (UCLA Center for Health Policy Research, 2017).

There are also limitations to this study that must be considered. First, the study's large sample size could have raised the possibility of a type 1 error. There was a total of 3,548 participants in the study. However, according to G*Power, only 390 participants were required to adequately power the statistical tests. The higher sample size was used to ensure there were enough respondents for each educational level group. Second, the study used secondary self-reported data from primary caretakers regarding their children. Self-reporting information can cause bias due to the primary caretaker not answering the questions truthfully. When individuals self-report information, they may pick the socially acceptable response as opposed to the reality. Self-reporting data also creates bias because individuals or parents may not be able to appropriately evaluate themselves or their children. Overall, self-reported answers can lead to individuals and parents providing invalid responses. Third, the researcher could not confirm that participants in the online survey were above 18 before the study's online survey was used to gather data. Lastly, using BMI, especially among children is a limitation because parents or the primary caretaker may report the measurements inaccurately. Future research should consider the limitations of this study and conduct research on children's neighborhood safety and the delays in receiving care and BMI among minority and non-minority children by considering a different sample size, cultural differences, looking at more recent data, or using a dataset that does not has self-reported answers.

Conclusion

Childhood obesity is more prevalent among minority children than among non-minority children in CA (CDC, 2022d). Childhood obesity can affect a child's physical, emotional, and social well-being. This study examined the difference in mean BMI of children across SDH, specifically primary caretakers' education levels, neighborhood safety, and delays in receiving

care, for minority and non-minority children in CA. The study demonstrated a significant difference in the mean BMI of children across primary caretakers' education levels for minority and non-minority children. The higher a primary caretaker's education level was, the lower the BMI level in minority and non-minority children in CA.

However, the study displayed no significant difference in the mean BMI of children across neighborhood safety and delays in receiving care for minority and non-minority children in CA. These findings were likely due to parents incorporating physical activity inside the house, low crime rates in specific neighborhoods so children can play and participate in physical activity outside, and parents having insurance that covers obesity services or paying out of pocket for their child's healthcare needs to see a provider. This study showed the significance of knowledge and higher education in parents affecting their children's BMI. To prevent high obesity rates among children living in CA, specifically minority children, public health officials must work to address the inequities and promote education for parents to help their children have a healthy quality of life.

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Appendix: Tables

Table 1

Participants Demographic Characteristics of 2020 CHIS Sample (n=3548)

Demographic Variables	n	%	μ
Gender			
Male	1858	52.4	
Female	1690	47.6	
Mean BMI			
Minority			18.06
Non-minority			17.10
Age			
Age 0-5	1879	52.9	
Age 6-11	1669	47.1	
Race			
Latino	472	13.3	
Asian	409	11.5	
African American	80	2.3	
White	1525	43.0	
Other Single or Multiple Race	1062	29.9	

Note: n= Total Number and %= Valid Percent. The mean for

Table 2

One-Way Analysis of Variance Comparison of the Difference in the Mean BMI of Children Across Primary Caretaker's Education Levels for Minority and Non-Minority Children

	N	Mean	SD	F	P
Children's BMI Rate by Primary Caretaker's Education Level					
Minority Children				8.69	.000
Non-minority Children				3.80	.001
Minority Race					
*11th Grade or Less (or no formal education)	76	19.50	5.629		
Grade 12/HS Diploma	141	19.65	5.883		
Some College	137	19.18	5.923		
*AA/AS or Vocational School	177	17.48	4.322		
BA/BS or Some Grad School	365	17.72	4.244		
*MA/MS	249	16.99	4.118		
*PhD or Equivalent	107	17.12	3.864		
Non-minority Race					
11th Grade or Less (or no formal education)	7	15.30	2.714		
Grade 12/HS Diploma	80	17.68	4.190		
Some College	125	17.60	4.466		
*AA/AS or Vocational School	165	18.14	4.593		
*BA/BS or Some Grad School	548	16.93	3.551		
*MA/MS	378	16.69	3.746		
PhD or Equivalent	140	17.02	3.611		

Note: The one-way ANOVA revealed a significant difference in the mean BMI of children across primary caretaker's education levels at the $p < .05$ level for minority ($F(6,1245) = 8.69$, $p < .05$) and non-minority children ($F(6,1251) = 3.80$, $p < .05$) for the seven education level groups. Source:2020 CHIS Sample (n = 2,695). * Indicates significant differences from the Bonferroni post hoc results amongst the findings within the education groups.

Table 3

One-Way Analysis of Variance Comparison of the Difference in the Mean BMI of Children Across Neighborhood Safety for Minority and Non-Minority Children

	N	*M*	*SD*	F	*P*
Children's BMI Rate by Neighborhood Safety					
Minority Children				.088	.967
Non-Minority Children				2.243	.082
Minority Race					
All of the Time	650	18.10	4.727		
Most of the Time	986	18.05	4.957		
Some of the Time	157	17.91	5.600		
None of the Time	25	18.33	5.728		
Non-minority Race					
All of the Time	739	16.89	3.792		
Most of the Time	653	17.27	3.946		
Some of the Time	47	18.13	4.246		
None of the time	4	17.45	1.949		

Note: The ANOVA revealed no significant difference in the mean BMI of children across neighborhood safety at the $p > 0.05$ level for minority ($F(3,1814) = .088$, $p > .05$) and non-minority children ($F(3,1439) = 2.24$, $p > 0.05$) for the four safety groups. Source: 2020 CHIS Sample (n = 3m261)

Table 4

Independent Samples T-Test Comparison of the Difference in the Mean BMI of Children Across Delays in Receiving Care for Minority and Non-Minority Children

	N	*M*	*SD*	*t*	*P*
Children's BMI Rate by Delays in Receiving Care					
Minority Children				.871	.544
Non-Minority Children				.745	.765
Minority Race					
Yes	89	18.51	4.736		
No	1729	18.04	4.953		
Non-minority Race					
Yes	67	17.45	3.721		
No	1376	17.09	3.888		

Note: The independent samples *t*-test revealed no significant difference in the mean BMI of children across delays in receiving care for minority ($t(1816) = .871$, $p > 0.05$) and non-minority participants ($t(1441) = .745$, $p > 0.05$). Source: 2020 CHIS Sample ($n = 3{,}261$)