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A Comprehensive Look Into the Rates of Obesity in African American and White 6-11-Year-Old Children Relating to Their Socioeconomic Status and Caloric Intake from Fast Food

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A COMPREHENSIVE LOOK INTO THE RATES OF OBESITY IN AFRICAN
AMERICAN AND WHITE 6-11-YEAR-OLD CHILDREN RELATING TO THEIR
SOCIOECONOMIC STATUS AND CALORIC INTAKE FROM FAST FOOD

by

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of the Requirements for a Degree with Honors
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ABSTRACT

Obesity levels in adults and children in the United States and around the world have been closely monitored for years. Research in the field of obesity has demonstrated a clear understanding that with increased calorie consumption compared to calories expended, an overall weight gain will occur. Through a collection of cited resources about the factors that affect obesity, a research problem arose considering what is accounting for the increase in calories in groups of children with high rates of obesity. Socioeconomic status has a major influence on the environment that children are raised in, and this factor can affect both their physical and mental health. To offer an explanation of where the excess calories in children with obesity may be stemming from, it was hypothesized that Black children ages 6-11 have higher rates of obesity compared to white children, which may be caused by a higher rate of caloric intake from fast food consumption resulting from living in low-socioeconomic environments.

Through a systematic review, data was obtained from the Centers for Disease Control National Health and Nutrition Examination Survey, the United States Census, and the World Health Organization to determine if Black children had higher rates of obesity compared to white children aged 6-11, if they were more likely to live in low socioeconomic status compared to white children, and if low socioeconomic status contributed to higher rates of fast-food consumption. This collected aggregate data was compared using a 2-proportion Z-test to test for any statistically significant differences between caloric intake from fast food between high and low socioeconomic status. Additionally, the differences between Black and white 6–11-year-olds who have obesity

and also the differences in Black and white children's socioeconomic status were compared using a 2-Proportion Z-Test. Understanding these relationships will help to identify the interconnectedness of these factors. Results showed that Black children had higher rates of obesity compared to white children ($p < 0.00001$), were more likely to be living in poverty compared to white 6–11-year-old children ($p < 0.0001$) and that living in poverty contributes to an increase in caloric intake from fast foods ($p = 0.015$).

ACKNOWLEDGEMENTS

I would first and foremost like to thank my parents for their unwavering love and support as I navigate through my growth as a student and as an individual. They provided me the building blocks I needed to work hard towards my goals and have done more for me than I could ever repay. I would also like to thank my siblings for their support and for their friendship throughout my life. I can't imagine life without you guys. To the University of Maine and all of the professors that have helped me further my education, thank you for your mentorship and nourishment these past four years. I'd also like to express my gratitude to my committee members, Lynn Atkins, Mark Haggerty, Mary Camire, and Jade McNamara for your guidance and flexibility throughout this process. Thank you to my advisor, Dr. Leonard Kass for your encouragement and insight as a resource for me during the completion of this project. Students everywhere benefit from teachers like all of you.

TABLE OF CONTENTS

| | |
|---|----|
| INTRODUCTION | 1 |
| BACKGROUND | 3 |
| What defines Black, White, and Obesity? | 3 |
| Factors that Affect Obesity | 4 |
| Calorie Intake | 4 |
| Socioeconomic Status | 6 |
| Genetics | 7 |
| Exercise Levels | 9 |
| Culture | 10 |
| METHODOLOGY | 12 |
| Statistical Analysis | 15 |
| RESULTS | 17 |
| DISCUSSION | 20 |
| Are African American 6–11-year-old children more obese than white 6–11-year-old children? | 20 |
| Could these differences in obesity rates be a result of genetics? | 20 |
| Could differences in physical activity levels produce these differences in obesity rates? | 21 |
| Are Black children more likely to live in a lower socioeconomic status? | 22 |
| Is socioeconomic status directly related to increased calorie consumption from fast foods? | 23 |

| | |
|--|----|
| What steps can be taken to help? | 24 |
| CONCLUSION | 26 |
| REFERENCES | 27 |
| AUTHOR'S BIOGRAPHY | 31 |

LIST OF FIGURES

Figure 1. The Obesity Rates in Black and White Children (Ages 2-11) 17

Figure 2. The Obesity Rates of African Children (Ages 2-11) Compared to Obesity Rates
in African American Children 18

Figure 3. The Percent of Black and White Children ages 6-11 who Participate in 60
minutes of Physical Activity 5 Days a Week 18

Figure 4. The Percent of 6–11-year-old Black and White Children Living Below the
Poverty Line 19

Figure 5. The Percent of Caloric Intake from Fast Food at High and Low Socioeconomic
Status 19

INTRODUCTION

Childhood obesity is a worldwide epidemic that is increasing rapidly. The CDC reports that obesity was prevalent in 20.3% of all children ages 6-11 (1). It is critical to track the obesity levels and rates in America so that we can uncover the origin of the crisis, which is the first step in coming up with a solution. It has been established that children who have obesity during childhood are more likely to have obesity in adolescence, and if obesity is prevalent at preschool age, then that child is five times more likely to also have obesity as an adult (1). Obesity is associated with a vast array of serious health conditions, which is why the prevention of obesity in children and adults is especially crucial.

For children and adults, there are many factors that influence obesity rates. Some of the most important are caloric intake, socioeconomic status, physical activity, genetics, and culture. It has been well researched that a caloric surplus may be the most influential cause of obesity. This is because the human body maintains homeostasis by balancing an equilibrium between energy input, calorie intake, and energy output. When that equilibrium is lost, a weight gain or loss will be experienced (6).

Through research of obesity and the risk factors involved in this epidemic, a systematic review was performed to determine if, and why, African American children have the highest rates of obesity. Children are raised in many different situations and lifestyles, which sparked my curiosity about which part of a child's environment affects their risk of obesity most significantly. The disparities in the obesity crisis between

different races is a health problem relating to differences in education, income, and inequality, all of which contribute to lifestyle.

High caloric intake can cause a caloric surplus, where the number of calories consumed is larger than calories expended, which has shown to correlate with higher rates of obesity. I hypothesize that Black children ages 6-11 have higher rates of obesity compared to white children, likely from their higher rate of caloric intake from fast food consumption resulting from living in low-socioeconomic environments.

BACKGROUND

What Defines Black, White, and Obesity?

Biologists do not accept the categories of “black” and “white” people. We recognize that skin pigmentation is literally skin-deep. Biologically speaking, it makes no more sense to refer to or categorize humans on the basis of their distribution of melanocytes and more than we were to categorize “long-noses” and “short-noses”, or “large-ear” and “small-ear” people. However, the following considerations make “black” (along with its more accepted euphemism, “African American”) and “white” children categories of some utility in this study. Firstly, the U.S. government collects data based upon these categories. Secondly, people are willing to self-categorize based upon this fiction. Thirdly, the level of non-scientifically based prejudice is prevalent in the U.S., and possibly also around the world, that lends itself to unwarranted pigeon-holing people into sub-socio-economic classes. It is this disparity between so-called “black” and “white” children in their economic opportunities, directly or indirectly related to such unfounded prejudices, that I wish to consider in this thesis along with various other factors possibly related to levels of obesity.

Childhood obesity is defined as a condition where a child is significantly overweight for their age, height and gender. It is a serious disease that can result in a host of other health issues in the body, including diabetes, heart disease, hypertension, and mortality, showing its need to be closely examined. Obesity is measured using BMI, or body mass index (2). BMI is calculated by dividing a person’s weight in pounds by their

square of height in inches, multiplied by 703 (2). For example, if a person weighed 220 pounds and measured 5 foot 9 inches, their calculated BMI would be equal to 32.5. A BMI that is higher than what is considered a healthy range for your height is then considered either overweight or obese (2). In the example above, the BMI calculated is considered an obese BMI. The healthy range of BMI for a 5-foot 9-inch individual is 18.5-24.9, and the calculated BMI of 32.5 is well above that range. A child is considered overweight if their BMI is between the 85th and 95th percentile range, and obese if their BMI is at or above the 95th percentile range (1).

Factors that Affect Obesity

Calorie Intake

Caloric intake is argued to be one of the key factors for obesity in children. The metabolic fuel for most tissues in the human body is glucose, a simple sugar produced from the breakdown of food intake and circulates the bloodstream until it is consumed by tissues in the body, facilitated by insulin (6). When you eat a meal containing carbohydrates and sugars, the glucose levels in the bloodstream are increased. This signals the pancreas to release insulin, which signals the liver to produce the enzyme glycogen synthase. Glycogen synthase then converts glucose into glycogen that is stored. In order to maintain weight, the number of calories consumed must be equal to the number of calories expended throughout the day (6). If a person is consuming more calories than they are expending, their weight will increase. There are many ways that calorie intake can be increased in a child's diet. For example, ultra-processed foods, which are becoming increasingly common worldwide, may facilitate overeating because

they provide a quick spike in blood sugar, followed by a spike in insulin and then a fast drop in blood sugar, leaving a feeling of hunger (3). Ultra-processed foods are high in calories, salt, sugars, and fats (3). Children in America today are eating too many empty calories, which come from foods composed mainly of sugar and fats that provide food energy with minimal nutrients (4). The most-popular categories of foods that consist of empty calories are sugar sweetened beverages, grain desserts, high-fat milk, pizza, and French fries (4). This paper will focus on the caloric intake that children receive from fast food restaurants because it is the most accessible and most marketed form of unhealthy food for children (5). The use of fast-food outlets has been linked to weight gain over time and consists of an overall less healthy diet and a greater chance of obesity (5).

These fast-food diets are high in carbohydrates, sugars, and fats, which promote deposition of calories into fat cells rather than lean tissues and would result in an increase in weight because of a lower metabolic rate and an increase in hunger (6). Most potato products, refined grains, and added sugars digest quickly and have a high glycemic index. Glycemic index (GI) is a way to rank carbohydrate foods into how quickly they are broken down into simple sugars (6). A high glycemic index means that the carbohydrates consumed are broken down quickly, and a low glycemic index means that the carbohydrates are broken down gradually into the bloodstream. A low glycemic index prolongs digestion and keeps you feeling full for a longer duration of the day (6).

A glycemic load (GL) is the carbohydrate content multiplied by the GI of food. Meals with a high glycemic load lower energy expenditure, increase voluntary food intake, and decrease fat oxidation. Over time, fat storage is increased with multiple postprandial cycles (3-5 hours after eating) following high GL meals (6). Eventually, fat

cells reach a limit in which they cannot expand storage capacity, which is where weight gain plateaus and the amount of circulating metabolic fuels increases.

Socioeconomic Status

Social inequalities correlate with education, income, and occupation, and these can affect dietary habits. For example, having less education about healthy eating, having fewer cooking skills, and having less time for home cooked meals are all ways that social inequalities affect a person and a family's diet (7). Low-income groups spend less money on food overall and less money per calorie. This means that families are spending their grocery money on processed foods that cost less, but are higher in empty calories, fats, and sugars. In neighborhoods where fast food outlets are plentiful, there is an influential relationship with diet and weight (7). These neighborhoods have higher numbers of fast-food restaurants and are usually underprivileged areas that have low educational attainment. A study by the International Journal of Behavior Nutrition and Physical Activity found that a higher percentage of body fat, odds of obesity and increased BMI are all positively associated with a higher proportion of fast-food restaurants in neighborhoods. These factors were also found to be associated with a lower household income. The biggest thing about these fast-food outlets that appeal to low-income families is the accessibility, ease, and ultimately, the low cost of the food itself (7).

Among youths, the rate of obesity decreases with increasing levels of education of the head of the household for every race (8). Low-income children are also likely to be living in houses experiencing food insecurity, and although the relationship between obesity and food insecurity seem paradoxical, they coexist in many children. This is

because the fear of not knowing when your next meal will be ultimately may cause a child to eat extremely fast, as well as overeat when food is available to them, affecting their weight and obesity levels. Low-income neighborhoods have limited access to food stores that provide fresh produce and whole grains and instead are saturated with fast food outlets and gas stations with shelf stable foods (9). Food Stamps are not known to support healthy eating patterns and play a significant role in the dietary patterns among low-income families. Food insecure households are often stocked with microwaveable and frozen dinners that contribute to obesity (9). Children are also mentally affected by the food insecurity in their families. The chronic stress in these children activates the hypothalamus pituitary adrenal axis, which triggers a hormone cascade and cortisol release. Cortisol stimulates highly palatable food intake and can lead to excess caloric intake. The stress may also cause children to eat more as a coping mechanism (9).

Genetics

It is not clear how much of a role genetics plays in obesity. Genetics may contribute up to 70% risk for the disease in some people, and only 25% in others (10). Also, genetic obesity risk does not always translate to actual obesity. The most common type of obesity is polygenic obesity and is multifactorial, meaning it has shown strong interaction between both genes and environment (10). Some genes that are obesity susceptible are FTO, leptin, and melanocortin-4 receptor. FTO is an enzyme known as the fat mass and obesity-associated protein that is encoded by the FTO gene (11). Variants in the FTO gene might provide signals that promote obesity through eating. Compared to the other genes the FTO gene shows the largest effect on BMI and risk of

obesity, however it was found that FTO cannot predict obesity (11). Obesity rarely occurs in families in an inheritance pattern from a single gene. MC4R is a gene that stimulates appetite when it is bound by alpha-melanocyte stimulating hormone, and affected children feel extreme hunger and overeat (12). However, changes that diminish the function of this gene was only found in approximately 5 percent of people with obesity in various ethnic groups (12). The brain regulates a person's food intake by responding to signals from the pancreas, digestive tract, and adipose tissue. It coordinates signals transmitted from hormones, including leptin, insulin, and ghrelin, with other inputs and responds to either eat more and reduce energy or vice versa (12). Genes are the basis for the signals and responses that guide food intake, and any number of slight changes in the genes can affect their activity levels.

African American children have less visceral and hepatic fat than white and Hispanic children, which is the deep fat around your abdominal organs and the fat in your liver, respectively (13). However, African American and Hispanic children have lower insulin sensitivity than white children (13). This means they have increased insulin resistance, which means their cells don't use insulin as effectively, increasing their blood sugar and therefore their insulin levels. As a consequence of insulin resistance, the higher circulating insulin levels in African American children causes a predisposition for Type 2 diabetes and obesity. Another risk factor for the development and risk of diabetes is that African Americans have lower rates of basal lipolysis than whites. Lipolysis is the process where lipid triglycerides are broken down in order for the body to obtain energy from fat (13).

Exercise Level

Physical activity is important for a healthy lifestyle, but especially in children. In childhood, many important habits are established, and it is essential to develop habits as healthy as possible. Adequate physical activity levels in children results in lower cardiovascular problems, lower anxiety levels, better musculoskeletal development, and a lower body weight (14). Obesity causes a multitude of health problems, including sleep problems, asthma, inactivity, high blood pressure, inflammation, and a negative self-image. It also puts children at a risk for developing other diseases in their adult life (15). Moderate to vigorous physical activity is therefore necessary in preventing disease. At least 60 minutes/day of physical activity is recommended for disease prevention and health benefits in children starting at 5 years old. Light physical activity also has potential benefits as well, since any physical activity in general is always better than no physical activity (16). In society today, physical activity may be decreased because of an exceptional increase in screen time. Many observational studies find a relationship between screen media exposure and a higher risk of obesity, which may be due to an increase in eating while viewing, exposure to unhealthy food and drink marketing, and a lack of physical activity (17).

During exercise, the major sources of fuel for the body are fats and carbs (18). Glucose is derived from carbohydrate intake in the diet, which is stored as glycogen in the liver and skeletal muscle. Glucose is delivered to active muscle groups by an increased blood flow and higher metabolic rate (18). Glucagon is a hormone secreted by the pancreas that tells the liver and muscles to convert glycogen to glucose for the body's

cells to use as energy. Glucagon is released in response to exercise, so that the body can provide more energy to the cells and maintain homeostasis (18).

With decreased levels of physical activity, the body is more likely to be at risk for a multitude of health concerns, including high cholesterol, cardiovascular disease, a variety of cancers, type 2 diabetes, high blood pressure, and low bone density (19). Since physical activity uses your glycogen stores as energy for your active cells, then it will decrease the storage of glycogen in your body. This in turn will decrease the body mass of the individual because the depletion of glycogen storage causes the body to burn fat for energy. The CDC reports that only a small number of children participate in physical activity for 60 minutes daily. They also found that students who participate in physical activity received higher grades, had better attendance, memory, and classroom behavior than children who were not physically active (19).

Culture

Worldwide, there have been patterns of physical inactivity that lead to an increased risk of obesity, including increased use of motor transport, fewer recreational activity opportunities, and increased sedentary lifestyles (20). Acculturation and globalization have led to changes in food preferences, forms of physical activity and inactivity, and educational and economic opportunities. Acculturation, when a minority culture adopts and adjusts to a new dominant culture, can affect obesity because it can encourage the abandonment of traditional practices, behaviors, and beliefs that may prevent obesity, and the adoption of new behaviors that increases obesity risk. An example of this is that first generation Latinos were found to consume higher amounts of

fruits and vegetables, and lower amounts of soda compared to whites. However, with succeeding generations, soda intake increased while fruit and vegetable consumption decreased. By the 3rd generation, the eating habits of Latinos were worse than their white counterparts (20).

In the U.S, globalization, which is the process of the interaction and integration of companies, people, and government globally, has been linked to fewer home cooked meals, increased snacking, higher calorie consumption in restaurants, and increased fast-food availability in schools (20). Immigrant families tend to eliminate certain traditional foods and accept foods associated with mainstream culture due to increased affordability, accessibility, and familiarity. School age children often reject home cooked meals in favor of the higher calorie foods they see at school or on television (20). The Kaiser Family Foundation found that African American children had longer periods of television exposure than white children, and Hispanic children had less than African Americans but more than white children. Exposure to fast food advertisement was seen to be 60% higher in African American children (20).

METHODOLOGY

To answer the hypothesis as to whether Black children ages 6-11 have higher rates of obesity compared to white children, caused by a higher rate of caloric intake from fast food consumption resulting from living in low-socioeconomic environments, multiple questions were asked. These questions were useful in gathering data on the obesity rates between Black and white children, the low socioeconomic status differences between Black and white children, and the differences in calorie intake from fast food at high and low socioeconomic status. These questions and the method of obtaining the data for answering them are listed below.

The question “Are African American 6–11-year-old children more obese than white 6–11-year-old children?” was asked earlier. Aggregated data to answer this question was obtained from the Center for Disease Control National Health and Nutrition Examination Survey (NHANES). This was obtained by searching the database by age, race, and obesity rates. The proportion of Black and white 6-11-year-old children with obesity was recorded out of the total sample examined by NHANES. This data was then transformed into a bar graph to compare Black and white children with obesity in a 2-Proportion Z-Test. This was useful to determine whether there were statistically significant differences between the obesity rates of Black and white children.

The initial question was broken down further to determine if those obesity rates could be a result of genetics or physical activity differences between these two groups. To answer the question as to whether or not genetics could be the cause of the hypothesized obesity differences between Black and white children, the differences in the

obesity rates of African Americans compared to African children were gathered. This was achieved by using aggregated data from the Center for Disease Control National Health and Nutrition Examination Survey, filtering by age, race, and topic for the obesity rates of Black 6-11-year-olds. The number of Black 6-11-year-old children with obesity was recorded out of the total sample examined by NHANES. The World Health Organization was utilized to obtain data on the obesity rates of children in the Central African Public, filtering by country, age, and obesity. The collected data contained the number of children aged 6-11 out of the total number of people in the Central African Republic. This data was then put into a bar graph to show any visual similarities between the two groups.

The second question “Could differences in physical activity levels produce these differences in obesity rates?” was answered using aggregated data from the Center for Disease Control National Health and Nutrition Examination Survey, filtering by age, race, and the percent of Black and white 6-11-year-olds who participated in 60 minutes of physical activity 5 days a week. Sixty minutes a day, 5 days a week was chosen as the criteria for the data because that is the recommended amount by pediatricians for children in that age range (14). This data was then inserted into a bar graph to show any visual differences between the two groups.

To determine which group of children lived more often in a lower socioeconomic status compared to the other, the question of whether Black children were more likely to live in lower socioeconomic status compared to white children was asked. Data obtained to answer this question was collected from the data exploration page on the U.S Census Bureau website, searched exclusively for the poverty levels by age of Black Americans

and the poverty levels by age of white Americans. The proportion of Black and white 6–11-year-old children living below the poverty line out of all of the Black and white Americans living in the U.S from the Census sample was obtained for analysis. This aggregated data was then established in a bar graph, and the proportions of the poverty levels of the two separate groups was analyzed and compared using a 2-Proportion Z-Test to verify any statistical differences between them.

The final question “Is socioeconomic status directly related to increased calorie consumption from fast foods?” was asked to determine if any socioeconomic status was associated with fast food consumption. The aggregated data collected to answer this question was collected from the Center for Disease Control National Health and Nutrition Examination Survey, filtering by income, food, and the topic of the caloric intake from fast foods at different socioeconomic levels. The proportion of calorie intake from fast food restaurants out of the total number of calories consumed by people living below the poverty level and the proportion of calorie intake from fast food restaurants out of the total number of calories consumed by people living above the poverty level was taken directly from the NHANES data. This data was then inserted into a bar graph and the differences in the proportion of calories consumed from fast food between high and low socioeconomic status was compared through a 2-Proportion Z-test to determine whether the alternate hypothesis was accepted.

The data collected had to meet the inclusion criteria of a published date at or after the year of 2016 in order to be utilized. Low socioeconomic status was defined by being at least 130% below the poverty line, and high socioeconomic status was defined by being 350% above the poverty line when obtaining data on socioeconomic status. Calorie

intake from fast food was defined by calories consumed from quick service restaurants (ex. McDonald's, Wendy's, Burger King), by all individuals in the sample. All cited literature was obtained through the resources of Google Scholar and PubMed, using filters such as date published, and content contained. Google Scholar was used more than PubMed, however, because it allows for a wider range of sources with every search.

Statistical Analysis

A 2-proportion Z-Test was used to determine statistical significance of the data collected because a 2-proportion Z-test is used to compare differences between the proportions of two separate groups. The null hypothesis for a 2-Proportion Z-test claims that the two proportions are the same, while the alternative hypothesis claims that the two proportions are different. The hypothesis for each comparative analysis is stated below.

Obesity Rates:

$$H_0: p_1 = p_2$$

$$H_a: p_1 \neq p_2$$

Where p_1 is the proportion of Black 6–11-year-old children with obesity out of the total sample from NHANES, and p_2 is the proportion of white 6–11-year-old children with obesity out of the total in the sample from NHANES.

Socioeconomic Status:

$$H_0: p_1 = p_2$$

$$H_a: p_1 \neq p_2$$

Where p_1 is the proportion of Black 6–11-year-old children living below the poverty line out of all of the Black Americans living in the U.S from the Census sample, and p_2 is the proportion of white 6–11-year-old children living below the poverty line out of all White Americans living in the U.S.

Calorie Consumption from Fast Food:

$$H_0: p_1 = p_2$$

$$H_a: p_1 \neq p_2$$

Where p_1 is the proportion of calorie intake from fast food restaurants out of the total number of calories consumed by people living below the poverty level and p_2 is the proportion of calorie intake from fast food restaurants out of the total number of calories consumed by people living above the poverty level from the NHANES.

If the calculated p-value for a given 2-Proportion Z-test was less than the alpha level ($\alpha=0.05$), then the null hypothesis is rejected and the alternative hypothesis is accepted.

RESULTS

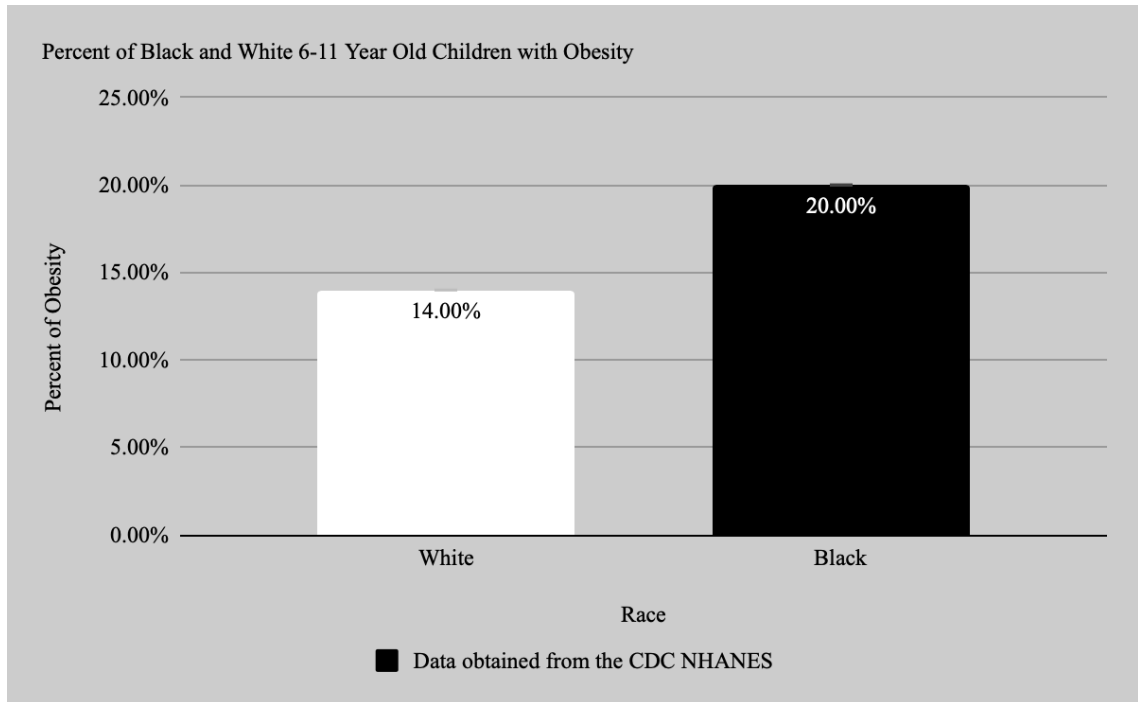


Figure 1. The Obesity Rates in Black and White Children (Ages 6-11). Standard Deviations for White and Black, were 1.4 and 1.6, respectively. Data obtained directly from CDC Health and Nutrition Survey, reference #21. $p < 0.0001$ (significant at $\alpha < 0.05$).

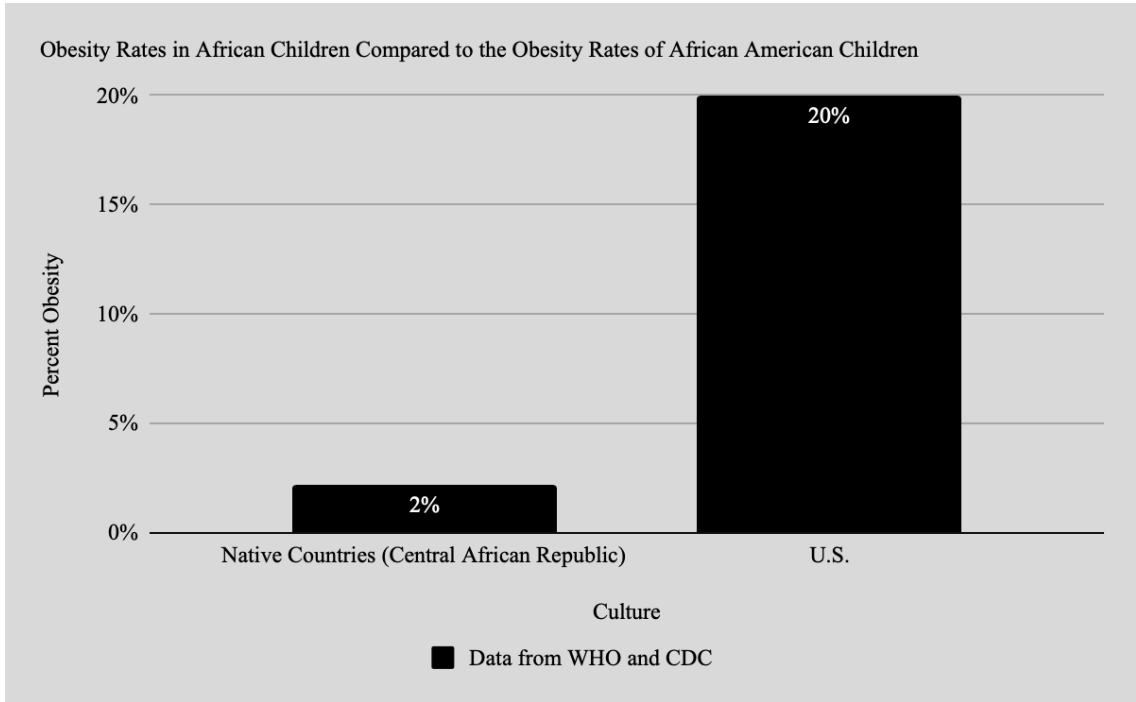


Figure 2. The Obesity Rates of African Children (Ages 2-11) Compared to Obesity Rates in African American Children. Standard Deviations for U.S. and African Countries are 1.6 and 1.3 percent, respectively. Data obtained directly from CDC Health and Nutrition Survey and the World Health Organization, reference #21, #22.

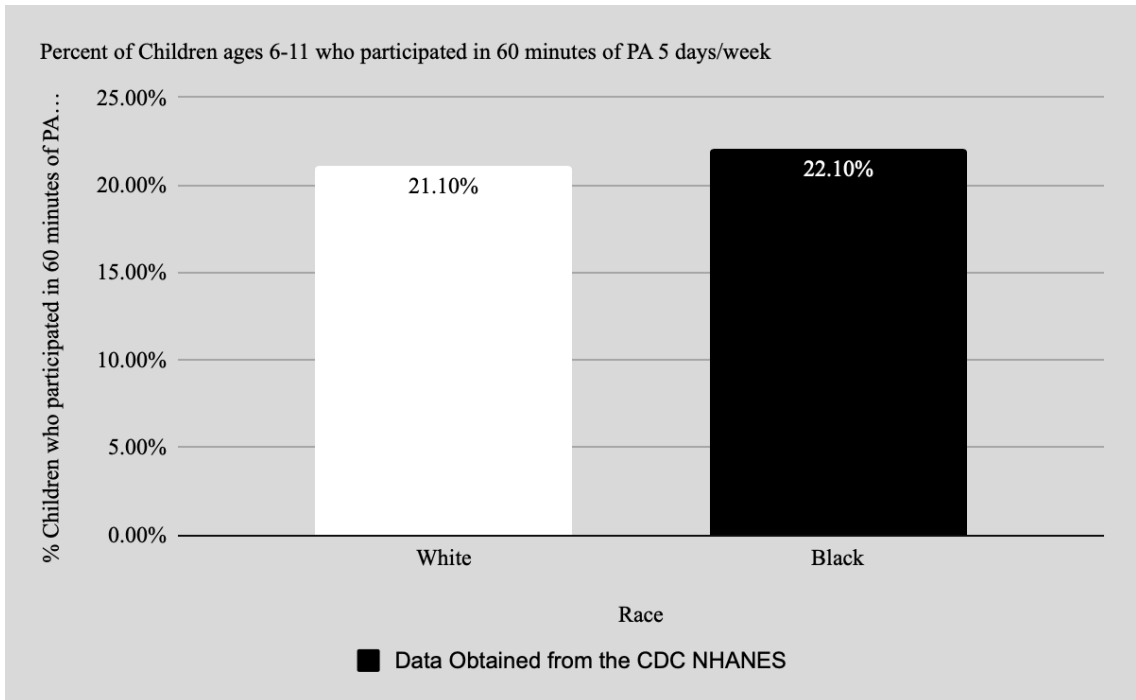


Figure 3. The Percent of Black and White Children ages 6-11 who Participate in 60 minutes of Physical Activity 5 Days a Week. Standard Deviations not given. Data obtained from the 2018 U.S Report Card on Physical Activity in Children and Youth, reference #25.

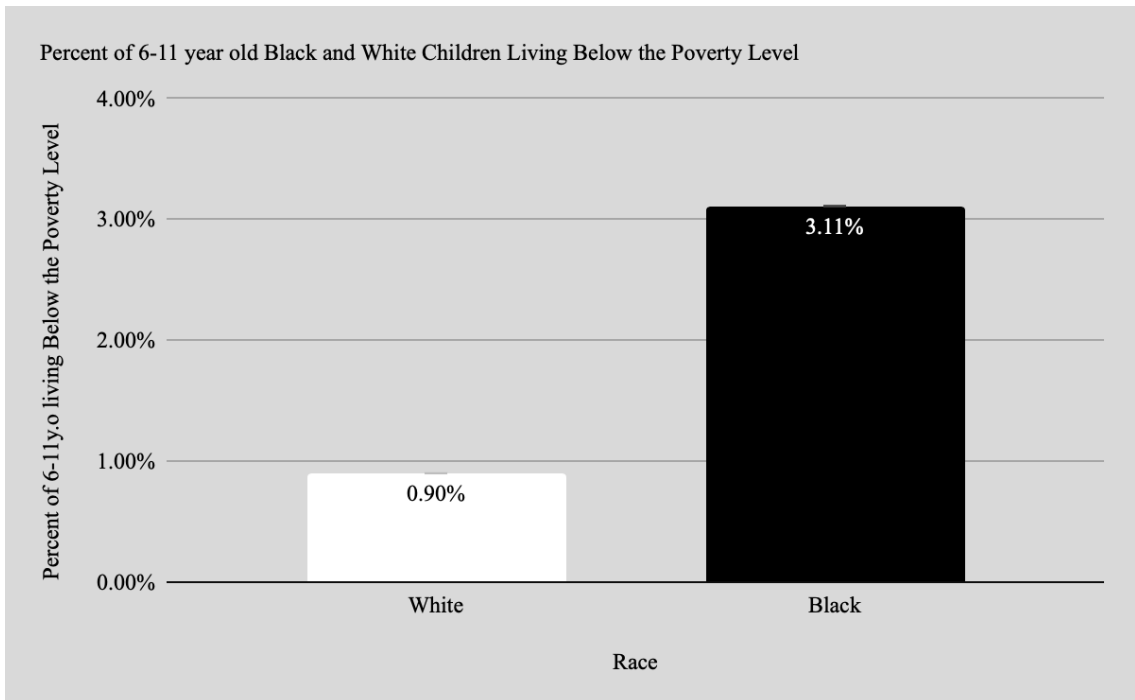


Figure 4. The Percent of 6–11-year-old Black and White Children Living Below the Poverty Line. Standard Deviations for White and Black were 0.1 and 0.2 percent respectively. Data obtained directly from the U.S Census, reference #23,24. $p < 0.00001$ (significant at $\alpha < 0.05$).

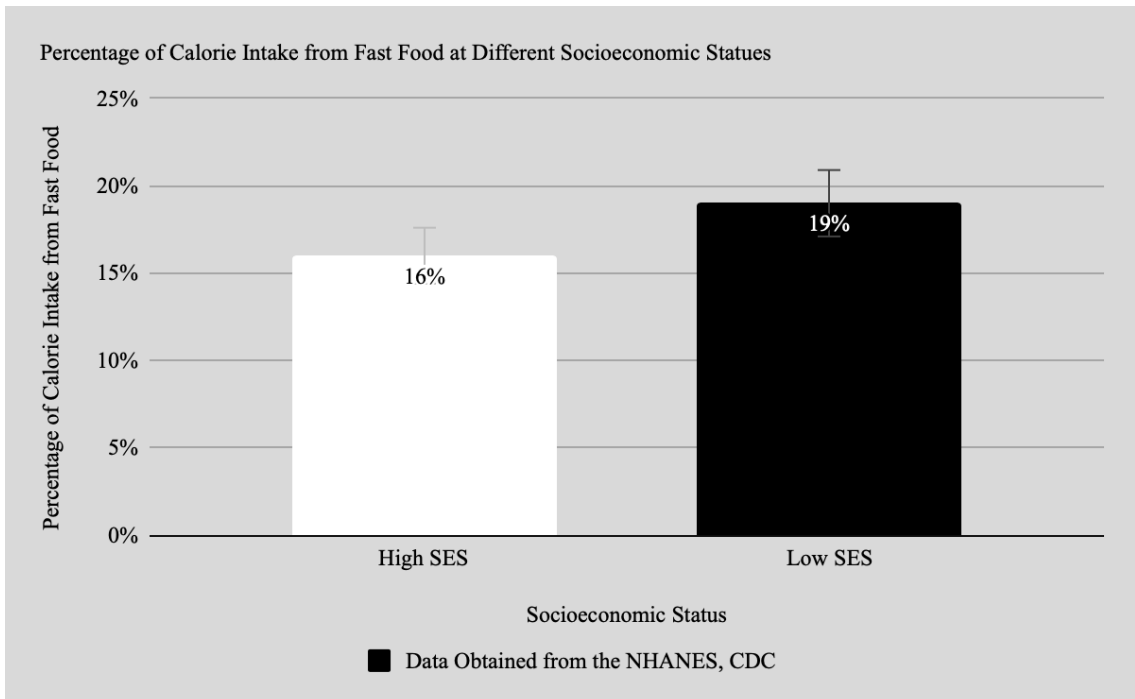


Figure 5. The Percent of Caloric Intake from Fast Food at High and Low Socioeconomic Status. Standard Deviations for Low SES and High SES were 1.0 percent each. Data obtained directly from CDC Health and Nutrition Survey, reference #26. $p = 0.015$ (significant at $\alpha < 0.05$).

DISCUSSION

Are African American 6–11-year-old children more obese than white 6–11-year-old children?

Figure 1 shows the incidence of obesity in Black and white children in the United States in 2016. According to the CDC National Health and Nutrition Examination Survey, 1,908 Black children and 1,336 white children were considered obese in the 6–11-year-old age group, out of the 9,544-sample survey. This corresponds to 20 percent of Black children and only 14 percent of white children. After running a two-proportion Z-Test, it was found that this difference in percent of children who have obesity between these 2 races is significant ($p < 0.00001$). Therefore, it can be stated that Black children are more likely to be obese than white children, under these circumstances.

These results support the original claim that there are differences in the obesity rates of certain children between different races. There are also differences in the calorie intake of elementary aged children of different races, since calorie intake is directly proportional to weight gain. This leads to further correlations between where the calories are coming from and the environment of the children that are receiving those excess calories.

Could these differences in obesity rates be a result of genetics?

If genetics were the sole component of the obesity differences in children, then comparatively, a child in their native country should also show similar levels of obesity to a child in America of the same race. Figure 2 shows that African children seem to have lower rates of obesity than African American children. This information suggests that

genetics has a minimal impact on obesity rates in children. These results build on existing evidence that shows that obesity rarely occurs in an inheritance pattern in families from a single gene (12). The genes that have been found to have an association with obesity, (FTO, MCR4) have been shown to not lead or predict obesity levels but may increase appetite. This research supports the data found that genes do not have an independent effect on obesity rates in children.

Could differences in physical activity levels produce these differences in obesity rates?

Physical activity plays a large role in obesity and the regulation of weight. In order to maintain body weight, caloric intake must be equal to calories expended. If there is an increase in calories consumed, then there must be an equal increase in calories expended through physical activity. When there is an increase in calorie consumption and no increase in physical activity, then there will be a gain in weight. An even greater weight gain may occur if there is an increase in calorie consumption and a decrease in physical activity, which often occurs in unison with habits that cause high rates of caloric intake.

Children specifically, are recommended to participate in an average of 60 minutes of physical activity at least 5 days a week (16). This physical activity can come from a various number of places for 6-11-year-olds, including outside games with peers, recess, playing at the park, or sports. However, often African American children are growing up in neighborhoods where crime rates are high, parents work long hours, or there are no parks nearby (17). This causes a disadvantage that results in African American children being forced to stay inside where there is supervision, indoor games, and safety. Due to

this disparity, one would assume that African American children would exercise less often than white children, which would ultimately raise their risk of obesity.

The data collected does not contribute to a clear understanding of this relationship. Figure 3 shows that Black children participate in 60 minutes of physical activity daily more often than white children, but the differences between the two was very small. Therefore, it can be inferred that the differences seen in the obesity rates between African American children and white children is not solely resulting from physical activity or inactivity.

Are Black children more likely to live in a lower socioeconomic status?

Figure 4 shows the percent of 6–11-year-old African American and White children living in poverty in 2019. According to the U.S Census, 1,090,550 African American 6-11-year-olds and 2,121,906 white 6–11-year-old children were living below the poverty line in 2019 (23), (24). This may seem counterintuitive; however, these amounts are vastly different when compared to the proportion of African Americans to white Americans living in the U.S. Out of the total number of Black people living in America in the sample, a total of 3 percent are 6-11-year-olds living below the poverty line while only 0.9 percent of white children that age are living below the poverty line (23), (24). After running a two-proportion Z-Test, it was found that this difference in percent of children living in poverty between these two races is significant ($p < 0.00001$). Therefore, it can be implied that Black children are more likely than white children to live below the poverty line in our sample.

These results should be taken within context while considering the discrepancy between the obesity rates of African American and white 6-11-year-olds. This most likely results from the labor and market discrimination which forces African Americans into less-secure jobs with lower wages and no benefits. This leads to an unequal distribution of wealth in America and leaves African Americans with less upward mobility and forces them into underprivileged areas. Socioeconomic status is influential in determining the type of food, as well as one's education surrounding food, resources that children have in their childhood, parents working multiple jobs, and various stressors with any given culture.

Is socioeconomic status directly related to increased calorie consumption from fast foods?

Through research, the importance of socioeconomic status in the types of foods that people consume has been shown. 'Food deserts', which are areas where community members are unlikely to find healthy, affordable foods, have become increasingly common in minority neighborhoods (27). Large convenient stores and gas stations overwhelm these areas, which drive out or turn away the building of grocery stores because of competition within the market. This causes the population in those areas to shop for groceries at these chain convenience stores or gas stations, which lack fresh produce and fresh foods (27). Fast foods restaurants are also oversaturating these areas.

Figure 5 shows the percent of calorie (kcal) intake from a consumption of fast foods at a high and low socioeconomic level. Data from the CDC showed that children living 130% below the federal poverty guidelines consumed 363 calories from fast food restaurants out of an average of 1,879 calories consumed daily. This caloric consumption

can be compared to children living 350% above the federal poverty line who consumed 321 calories from fast food out of an average of 1,931 calories consumed. The percentages are calculated to be 19% and 16% calorie intake from fast food respectively (26). After running a 2-proportion Z-test, it was found that this difference in calorie consumption from fast food at high and low socioeconomic status was statistically significant ($p=0.015$). Therefore, it can be stated that at a low socioeconomic status, fast food is more likely to be consumed than at a higher socioeconomic status. Thus, socioeconomic status is most likely contributing to Black children's calorie surplus, causing higher rates of obesity. This most likely results from the accessibility, price, and ease that fast food restaurants have, along with the oversaturation in low socioeconomic areas and high advertisement of these food companies. Mitigating the risk of conditions caused by socioeconomic status should be at the forefront of public health initiatives to combat obesity in America.

What steps can be taken to help?

I am suggesting that the following 10 steps can be taken to decrease childhood obesity in the United States, both locally and nationally.

1. Implement education on healthy eating habits into school systems to teach children about food and its health benefits.
2. Raise the minimum wage so that parents don't have to work multiple jobs to pay for basic needs, which will also free up time to cook dinner for their families.
3. Give new parents free education lessons on food health and nutrition.

4. Teach parents/children gardening techniques to start their own vegetable gardens at home, which will drop the price of vegetables immensely if they can get produce from their own backyards.
5. Offer free/inexpensive cooking classes for families that are unfamiliar with cooking/cooking with whole foods.
6. Include more money in food stamps so that parents can afford to buy fruits, vegetables, and other whole foods.
7. Require minimums for fruits and vegetables bought by families using food stamps.
8. Change school lunch options to incorporate more healthy foods and less processed ones.
9. Restrict how many fast-food chain restaurants can be in a given area.
10. Open grocery stores in areas of low socioeconomic status to eliminate or reduce food deserts.

CONCLUSION

In this analysis of national data, it was found that African American children ages 6-11 are more likely to be living in poverty compared to white 6–11-year-old children ($p < 0.0001$). Living in poverty contributes to an increase in caloric intake from fast foods ($p = 0.015$). As a result of these factors, African American children are more likely to have increased caloric intake from fast food, and based on research shown, increased caloric intake signifies higher rates of obesity. This helps provide a possible explanation as to why African American children have higher rates of obesity compared to white 6-11-year-old children ($p < 0.0001$).

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