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**The Impact of Socioeconomic Status on the Prevalence of Childhood and Adolescent
Obesity**

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Abstract

The prevalence of childhood and adolescent obesity has been growing steadily in the United States. A review of nine studies of the relationship between socioeconomic status (SES) and obesity prevalence in children and adolescents suggests a strong inverse relationship exists. Large populations of children and adolescents between the ages of 2 and 17 across the United States were studied. The studies build upon research by looking at how the existing inverse relationship is impacted by factors of food insecurity, neighborhood conditions, gender, and race. Results reveal an association between poor neighborhood conditions and youth obesity, but are less conclusive regarding the association between food insecurity and youth obesity. Significant differences among genders and races were not found to exist. This research begins to study the multitude of factors that may account for the association between low SES and high obesity among children and adolescents in the U.S. Future research must consider other possible intervening variables, such as parent education level, parent employment status, and nutrition education of youth and how they factor into the problem. As this epidemic continues to grow, it will be important to understand these phenomena so that interventions can be designed to help ameliorate the issue.

The Impact of Socioeconomic Status on the Prevalence of Childhood and Adolescent Obesity

Childhood and adolescent obesity is a public health issue that is growing rapidly, both domestically and globally (FRAC, 2015). In childhood and adolescence, obesity, as distinct from overweight, is defined as having a BMI at or above the 95th percentile (CDC, 2015a). Currently, it is estimated that 17% of youth in the United States between the ages of two and nineteen are considered to be obese (CDC, 2015b). Obesity in children and adolescents is especially problematic as it increases the likelihood of development into an obese adult and the risk of chronic diseases, such as diabetes and cardiovascular disease (WHO, 2016). While obesity can exist anywhere, it is thought that it is more prevalent in areas of low SES (FRAC, 2015), especially in developed countries. The American Psychological Association (2016) defines SES as the “social standing or class of an individual or group.” This includes factors such as income, education level, and occupation. This literature review serves to examine the relationship between SES and the increasing prevalence of childhood and adolescent obesity in the United States. In addition, it considers how this relationship may be further correlated with other factors such as food insecurity, neighborhood conditions, race/ethnicity, and gender. It is crucial to determine the role SES plays in the growing rate of childhood and adolescent obesity in order to develop strategies to intervene at an early age, thereby decreasing potential risk of adult obesity and future chronic illnesses.

Methods

A literature search was conducted using PubMed, Web of Science, and CINAHL Complete databases. Keywords such as “childhood obesity,” “adolescent obesity,” “socioeconomic status,” “poverty,” “income,” and “food insecurity” and any related synonyms were combined in various ways to guide searches. Studies published more than fifteen years ago were excluded. Studies included in this review were exclusively conducted in the United States and focused on youth between the ages of two and eighteen. Nine studies regarding children, obesity levels, SES, and factors related to SES, such as food insecurity and environmental conditions were identified. All nine studies had been published since 2005.

Authors	Sample	Weight Measurement	Food Security Measurement	Neighborhood Conditions Measurement
Casey et al.	Unknown number of youth, ages 3-17	Anthropometric measures of height and weight	Parental questionnaire (US Food Security Scale)	---
Gundersen et al.	2516 youth, ages 8-17	Anthropometric measures of weight, height, waist circumference, triceps skinfold, trunk fat mass, and percentage body fat	Parental questionnaire (USDA’s Household Food Security Survey Module)	---
Jyoti et al.	13,500 3 rd grade children	Anthropometric measures of height and weight	Parental questionnaire (USDA’s Household Food Security Survey Module)	---
Li et al.	613 African American elementary school students	Parent reported height and weight	---	Home addresses and distances from stores measured via arcGIS
Metallinos-Katsaras et al.	28,353 children participating in programs with Women, Infants, and Children (WIC)	Anthropometric measures of height and weight	Parental Questionnaire (Core Food Security Module)	---

Saelens et al.	730 families with children living in King County, WA or San Diego County, CA	Anthropometric measures of height and weight	---	Neighborhoods supportive and unsupportive of physical activity and healthy eating measured via arcGIS
Singh et al.	44,101 youth, ages 10-17	Parent reported height and weight via telephone survey	---	Parental survey of perceived neighborhood conditions
Singh et al.	44,101 youth, ages 10-17	Parent reported height and weight via telephone survey	---	---

Results

Relationship Between Childhood and Adolescent Obesity and Socioeconomic Status

The majority of the articles included in this review evidenced an inverse association between obesity and SES, linking low SES with greater rates of childhood and adolescent obesity (Casey et al., 2006; Li, Robinson, Carter, & Gupta, 2015; Metallinos-Katsaras, Must, & Gorman, 2012; Saelens et al., 2012; Singh, Siahpush, & Kogan, 2010a; Singh, Siahpush, & Kogan, 2010b). The remaining studies alluded to this association, but did not make it explicit. This development confirms a noted trend over time, as reported by Shrewsbury & Wardle (2008), whose work replicated Sobal & Stunkard's (1989) much outdated seminal study. While the latter found inconsistent relationships between SES and childhood obesity (Sobal & Stunkard, 1989), by 2008, the association between SES and obesity was predominately inverse and the positive associations seen 15 years earlier, had all but disappeared (Shrewsbury & Wardle, 2008). The more recent articles included in this literature review affirm that youth from low-income families were found to be obese in greater numbers than youth from high-income families (Casey et al., 2006; Jyoti, Frongillo, & Jones, 2009; Metallinos-Katsaras et al., 2012;

Saelens et al., 2012; Singh et al., 2010a; Singh et al. 2012b). For example, one study surveyed 44,101 youth regarding BMI and family income and found 243% higher odds of obesity in children below the poverty line than children with a family income exceeding 400% of the poverty threshold (Singh et al., 2010b). While there is consistency across studies indicating the relationship between low SES and higher rates of obesity, individual articles detail additional specific factors that might be driving this. It is important to consider these additional determinants to better develop interventions to address this public health issue.

Neighborhood Conditions

Four studies examined neighborhood conditions associated with low SES and how these conditions might contribute to childhood and adolescent obesity rates. Poor neighborhood conditions examined generally included unsafe surroundings, poor housing, lack of access to sidewalks, parks, and recreation centers, lack of supermarkets, and close proximity to convenience stores. All four of the studies found higher rates of childhood and adolescent obesity in neighborhoods characterized by these poor conditions (Galvez, et al., 2009; Li et al., 2015; Saelens et al., 2012; Singh et al., 2010a). One study quantified this conclusion by finding that children in poor housing were at 30-60 percent higher odds of being obese or overweight and children in neighborhoods lacking access to sidewalks, playgrounds, and recreation centers were at 20-45 percent higher odds of being obese or overweight than children in better resourced living conditions. This study suggested that unsafe neighborhoods and lack of access to sidewalks, parks, and recreation centers limit the physical activity of children, which may contribute to these higher rates of obesity (Singh et al., 2010a). In terms of proximity to food sources, one study found that the majority of fast food and convenience stores in many

neighborhoods were located in areas of low-income youth (Li et al., 2015). Galvez et al. (2009) built upon this finding and also observed a positive association between the presence of convenience stores and childhood BMI in low-income neighborhoods.

Food Insecurity

Four studies looked at food insecurity in relation to low SES and the potential association between food insecure households and obesity among youth (Casey et al., 2006; Gundersen, Garasky, & Lohman, 2009; Jyoti et al., 2005; Metallinos-Katsaras et al., 2012). The USDA (2016) defines food insecurity as “access by all people at all times to enough food for an active, healthy life.” Studies reviewed presented a variety of results and lacked consensus regarding the relationship between food insecurity and obesity among youth of low SES. Three of the four studies found childhood and adolescent food insecurity to be significantly associated with childhood obesity. These studies suggested that this is because food insecurity results in the low consumption of healthy foods, which may contribute to weight gain (Casey et al, 2006; Jyoti et al., 2005; Metallinos-Katsaras et al., 2012. Gundersen et al. (2009), however, did not find a significant association between food insecurity and childhood and adolescent obesity. It is important to note, however, an association between food insecurity and overweight was still found to exist. The researchers of this study proposed that this may be due to other factors, such as minority group membership and poor housing, which are more common among both low-income and food insecure youth. It is important to note that while all four studies used anthropometric measurements to determine the BMIs of children and adolescents, they all used different questionnaires to measure food insecurity (Casey et al., 2006; Gundersen et al., 2009; Jyoti et al., 2005; Metallinos-Katsaras et al., 2012).

Gender

While many of the studies discussed the factor of gender and its influence on the relationship between SES and childhood and adolescent obesity, findings among them varied greatly. Of the studies that considered gender, a statistically significant difference in obesity prevalence by gender among children and adolescents of low SES was generally not found (Casey et al., 2006; Gundersen et al., 2009; Jyoti et al., 2005; Li et al., 2015; Metallinos-Katsaras et al., 2012; Singh et al., 2010b). For example, none of the studies that focused on food insecurity found a significant difference in obesity rates between food insecure boys and food insecure girls (Casey et al., 2006; Gundersen et al., 2009; Jyoti et al., 2005; Metallinos-Katsaras et al., 2012). One study did note that there was a significantly higher association of food insecurity and higher BMI among boys than girls, but the association of food insecurity and obesity, specifically, remained consistent across genders (Jyoti et al., 2005). Only two of the four studies specifically on neighborhood conditions analyzed the factor of gender (Li et al., 2015; Singh et al., 2010a). Li et al. (2015) found that among youth living in what researchers deemed poor conditions, boys had a significantly higher prevalence of overweight than girls, but no significant difference across genders was found regarding prevalence of obesity. On the other hand, Singh et al. (2010a) found that when looking at neighborhoods considered to have the least amenities, there was a significantly higher prevalence of obesity among girls than boys.

Race/Ethnicity Differences

Most of the studies used in this review described varying rates of obesity across races, but little was found to suggest that differences in the relationship between SES and obesity exist across races. For example, Singh et al. (2010a) found that Hispanic, non-Hispanic white, and

American Indian children are at 3.4 to 3.8 higher odds of obesity than Asian children. In addition, the obesity rate for Hispanic youth is increasing over time at a faster rate than that of other races. However, these relationships did not just exist among children and adolescents of low SES. When looking at food insecurity, specifically, results regarding differences across races were not conclusive. While Gundersen et al., (2009) suggested that the association between food insecurity and high obesity in youth of low SES did not differ among races, the results of another study argued otherwise. This study, conducted by Casey et al., (2006) found child food insecurity to be significantly associated with obesity for white children only. When looking at neighborhood conditions in regards to childhood and adolescent obesity, researchers came to the conclusion that the impact of these environments were generally similar for children across all racial groups (Galvez et al., 2009; Li et al., 2015; Saelens et al. (2012); Singh et al., 2010a).

Discussion

A body of literature on the relationship between obesity prevalence in youth and SES has grown rapidly since Sobal and Stunkard's (1989) major review. Studies have consistently come to the conclusion that low SES among children and adolescents is associated with increased prevalence of obesity. This timely study builds upon previous research by considering some of the additional specific factors that may be contributing to this association and underscores the need to further refine which factors are most contributory to the public health issue of childhood and adolescent obesity. In addition, this study also examines the interrelationship among the various contributing factors. However, limitations exist that must be taken into consideration when looking at these findings.

First, there are many confounding variables that may influence the relationship between SES and obesity that were not highlighted by the existing literature. Even though food insecurity, neighborhood conditions, gender, and race were considered, factors such as parent education level, parent employment status, level of physical activity, nutrition education of youth, etc., were not accounted for within these articles. It is possible that differences in some of these factors may contribute to the unequal prevalence of childhood and adolescent obesity, however these additional variables would need to be controlled to accurately isolate the single impact of SES. Second, some of the studies in this review used parent-reported height and weight, rather than anthropometric measures, to calculate the BMIs of children and adolescents. While some of the studies used suggest that parental and self-reported height and weight are reliable indicators of childhood and adolescent obesity, this method may not necessarily represent the actual prevalence. Third, the methods used for measuring child and adolescent food insecurity levels varied greatly and may have contributed to the inconclusive findings of the literature regarding that factor and how it contributes to this relationship.

Despite these limitations, the existing literature provides data that could affect potential interventions to address the problem of high obesity rates in youth of low SES. For example, it is likely that an increase in access to resources would lead to better quality food and diminished food insecurity; likewise, more money allocated towards low-income neighborhoods would improve the amenities that neighborhoods provide that relate to obesity, i.e. parks and playgrounds. In addition, prevention programs and social policies should be put in place with the aim of improving the environments that contribute to the growing rates of obesity. While it may not be realistic to completely alter SES, this research serves to show the many factors related to low SES that can be improved upon.

Future research in this area should examine other confounding factors that may contribute to the association found. Factors such as parent employment status and parent education level may affect both SES and obesity rates. It is necessary to learn more about these various areas in order to truly understand the relationship between SES and obesity prevalence in children and adolescents. In addition, the factor of food insecurity still seems to be unresolved as some studies suggest it is associated with obesity and some studies suggest otherwise. Future researchers should develop a more standardized method for measuring this factor in order to truly understand the role of food insecurity in this issue. In addition to looking at contributing factors, future research on this topic should attempt to determine if some factors play a larger role in the association than others.

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