THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS AND OBESITY AMONG RURAL ADOLESCENTS

A RESEARCH PAPER
SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE

MASTER OF ARTS
PHYSICAL EDUCATION

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JULY, 2010
The prevalence and severity of adolescent obesity in the United States has been documented, along with some potential factors that influence this epidemic. Race and socioeconomic status are factors that have been found to play a role in obesity-related behaviors, especially among urban populations. The purpose of this study was to explore the relationships among socioeconomic status, environment, and obesity.

Participants were 263 seventh, eighth, and ninth-grade students from a small school in rural east central Indiana. They completed a survey, consisting of demographic information, body mass index (BMI), socioeconomic status (SES), and the environment. The mean and standard deviation were found for BMI, SES Score, and Environment Score.

Nearly 51% of the sample surveyed was overweight or obese. The prevalence of overweight or obesity was seen throughout the entire group, not just within a certain SES group or environment group (i.e. in-town students vs. rural students). A Pearson’s
correlation was conducted to examine the relationship between SES and obesity and the relationship between the environment and obesity. There was no significant correlation between SES and obesity or between obesity and the environment.

The high prevalence of overweight and obese adolescents among this sample group indicates the need for appropriate interventions to reduce obesity.
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The Relationship Between Socioeconomic Status and Obesity Among Rural Adolescents

INTRODUCTION

Obesity in this country is no doubt on the rise and is affecting people all over the United States. We know that the prevalence of obesity in adolescents has increased over the past several years and that obesity tracks into adulthood. Some research has found that the rate of obesity is steadying (Borders, Rohrer, & Cardarelli, 2006). However, the percentage of obese adolescents is still higher now than it was in the past two decades (Davison & Birch, 2001). Obesity is a risk factor for several diseases, and this poses a threat to overall health and well-being. Several factors may be involved in the process of becoming obese. Genetics, diet, and physical activity level have all been identified as factors that play a direct role in body composition.

It is a widely accepted phenomenon that lower socioeconomic groups are at a higher risk for obesity than higher SES groups (Wang & Zhang, 2006). What about these low SES groups in certain environments, such as urban or rural locations? Few studies have examined how rural populations are affected by obesity. Therefore, the purpose of this study was to explore the relationship between socioeconomic status and obesity, specifically in rural adolescents.
Currently almost 18% of children in the United States, 12-19 years old, are obese (CDC, 2006). Obesity has become epidemic throughout the world, but is particularly troubling in developed countries, especially the United States. Healthy People 2010 has identified overweight and obesity as 1 of 10 leading health indicators (CDC; Singh, Kogan, & van Dyck, 2008). Several factors, from genetics to dietary intake to physical inactivity, have been studied to determine what has caused the prevalence of obesity in the United States.

Other than physical activity levels, diet, and genetics, emerging data suggests that there may be other causes that lead to obesity, such as socioeconomic status and the environment. People of low socioeconomic status (SES) and in racial/ethnic minority groups are disproportionately affected (Ahn, Juon, & Gettelsohn, 2008; Wang et al., 2006). Along with SES, the environment may be an underlying cause of obesity. “Researchers increasingly examine how the built environment (e.g., home, school, community) increases adolescents’ risk of overweight by discouraging healthy nutrition and physical activity” (Ahn, et al., 2008, 2). To understand obesity, we must develop insights about environmental and economic factors that may contribute to the problem. Adolescents who become obese are very likely to remain obese as adults. This can lead
to several health problems and even death. Addressing the causes of the problem early in an individual’s life is crucial if obesity is going to be managed and ultimately prevented.

Children are becoming overweight or obese earlier in life. We know that energy intake and lack of energy expenditure can lead to weight gain or obesity, but what influences this relationship of energy? According to the ecological systems theory, child development occurs as a result of interactions within and among family and societal environments. These environments are influenced by the community and society at large (Davison, & Birch, 2001). An ecological approach to obesity is that people have a normal response to an abnormal environment (Egger & Swinburn, 1997). If society is selling high fat energy foods at low prices, most low income families will purchase these types of food. If children have no place to play due to inaccessibility of facilities or safety, they are sedentary. High energy intake with little energy expenditure results in weight gain and ultimately obesity.

According to the Center for Disease Control (CDC), normal body mass index [BMI=weight (lbs.)/height (in) x 703] for individuals according to their age and sex should be between the 5th and 85th percentiles of their respective growth chart. Overweight BMI is between the 85th ≤ 95th percentile; whereas obesity has a BMI of ≥ 95th percentile. Those children at risk for becoming obese or maintaining obesity are those who are at the 85th percentile or above.

For the past few decades, obesity has been on the rise nationwide, particularly those groups who are considered to be on a lower socioeconomic rung. It has been found that boys and girls in low-SES categories are at highest risk and are disproportionately
affected for becoming obese (Sherwood, Wall, Neumark-Sztainer, & Story, 2009; Vieweg, Johnston, Lanier, Fernandez, & Pandurangi, 2007; Wang et al., 2006;).

However, a study done by Wang and Zhang (2006) reported that not all low-SES groups were at increased risk for being overweight or obese. Diverging from the popular belief that higher SES groups are less likely to become obese, Wang and Zhang found that even though this may be true for some white populations, high SES groups of blacks were at high risk for obesity (Wang and Zhang, 2006). Nonetheless, socioeconomic status cannot be overlooked as a probable factor for obesity.

*Socioeconomic Status (SES)*

There are several variables one could use to determine SES. Oftentimes, SES is assessed by parent income, education, and occupation. The need for free or reduced lunches can also be taken into account. Those who come from families with lower incomes and lower levels of education are usually grouped in a lower SES category. Being in a low SES group can be a factor for obesity, because those who struggle financially often have a hard time supplying adequate, healthy amounts of food for themselves and their children, which in turn leads to food insecurity and unhealthy eating habits. Those who struggle financially also have been found to experience more stress. Stress, food insecurity, and financial strain have all been associated with obesity risk (Chambers, Duarte, & Yang, 2009). There is no doubt that anyone could be at risk for obesity, however, research shows that those in lower SES groups are at a higher risk.

Being overweight or obese is the direct result of consuming energy, via food and drink, and failing to be physically active. Energy intake and physical inactivity are influenced by several factors, including social, economic, and physical environments
(Ahn, Juon, & Gittelsohn, 2008). Where we live and how we are raised directly influences our attitudes and behaviors. Having already briefly discussed the economic environment, let us take a look at how the physical environment can affect our risk of obesity.

*The Physical Environment*

The physical environment in which we live can also play a huge role in our risk of becoming obese. These physical environments are characterized as rural or urban communities. Urban communities are those within city limits whereas rural communities are made up of the surrounding areas, outside of city limits. Wang et al., (2006) reported that urban low-SES African-American communities are at high risk for obesity and therefore have a need for health promotion programs. Other research shows that residents living in rural or non-metropolitan areas appear to have a higher risk of obesity than persons residing in urban or suburban regions (Borders, Rohrer, & Cardarelli, 2006; Lewis, et al., 2006). Both areas show susceptibility for children becoming obese; but within these different environments, children may be at high risk due to dissimilar reasons. For the scope of this paper, rural populations are identified as those who reside outside of the city limits.

In a study done by Loucaides, Plotnikoff, and Bercovitz (2007), urban and rural populations had similar BMI results and their physical activity levels were similar. However, those from urban areas were more physically active traveling to and from school, opposed to the rural population whose physical activity took place mainly in their physical education classroom (Loucaides, et al., 2007). The environment and resources
available where one lives can affect activity levels, thusly affecting the risk of becoming obese.

If recreational facilities are available, those in the lower SES groups may not be able to afford memberships for their families, however; most often in rural settings, recreational facilities are few and far between and parks and playgrounds are not even available out of the city limits. Transportation to and from a recreational facility or school may make it difficult for some to participate in physical activity, such as sports, especially the lower SES groups (Bove, & Olson, 2006; Lewis, et al., 2006). Gordon-Larsen, Nelson, Page, and Popkin (2006) found that groups with a higher education had a much larger variety of physical activity facilities compared to those who were less educated (Gordon-Larsen, Nelson, Page, & Popkin, 2006). Urban areas may not even have facilities in their vicinity; and lower SES families living in rural areas cannot get their children to the facilities, due to transportation challenges. “The upstream contextual factors such as income inequality, poverty and crime rates may influence obesity prevalence partly through their effects via the physical or built aspects of the neighborhood environment, such as access to recreation facilities, outdoor parks, playgrounds and other amenities for physical activity” (Singh, et al., 99, 2007). Besides availability and accessibility, safety is also a concern in certain environments.

Literature has shown that due to safety concerns, such as crime rate, facilities are locked and parents do not let their children go outside to play (Scott, Cohen, Evenson, Elder, Catellier, Ashwood, & Overton, 2007; Wang, et al., 2006). In areas where crime rates are not so high, there are other safety concerns, especially in rural areas. A study conducted by Bove and Olson (2006) showed that homes located away from the center of
town were on highways or streets that had no sidewalks or streetlights and rural roads were muddy or snow and ice covered during inclement weather making it difficult to walk. If children are staying inside, no doubt physical activity levels decrease.

A study conducted by Nelson, et al. (2006) reported that time spent watching television may be stabilizing but with advances in technology, children are spending more time in other sedentary behaviors, such as computer and video games. (Nelson, Neumark-Stzainer, Hannan, Sirard, & Story, 2006) To avoid boredom, children find other means to occupy their time, such as video-game playing or computer messaging. If children are not provided the opportunity to engage in physical activity, we cannot expect them to take the initiative to maintain a healthy weight or to lose weight.

Behavior changes are occurring in children that reflect inactivity patterns. Like the ecological system theory suggests, obesity is influenced by our behavior. Our individual behavior is persuaded by our direct environment: family, friends, and school. Our direct environment is influenced by our society, culture, or community: SES, neighborhood safety, or accessibility to recreational facilities (Davison & Birch, 2001). We are shaped by the layers of our environment, all of which contribute to our weight status.

The world around us keeps changing, and we the people, try to keep up with the change. Not every change that occurs is a positive one though, especially when it comes to our health. The United States has created an environment in which it is easy to become obese. To curb the obesity epidemic, we must look at underlying factors that could affect this plague. We know that lack of physical activity and genetics play a role in becoming obese, but understanding what lies beneath these issues may hold the key to intervention.
It is common belief that the lower one’s SES - the greater their risk of obesity, as previous research has shown. Urban populations have also been found to be at higher risk for obesity. How obesity affects rural populations, more specifically adolescents, has yet to be identified. The purpose of this study was to investigate the relationship between SES and obesity and between the environment and obesity. Examining and understanding the relationship between socioeconomic status and obesity along with the environment may help us better define and manage this health problem.
METHODS

Participants

One rural school in east central Indiana participated in the present study. Participants in this study were seventh, eighth, and ninth-grade students enrolled at this school. Participants were recruited by physical education teachers, as all participants were enrolled in the general physical education class. Two hundred and sixty-three students participated in the study, with a response rate of 98%. Four surveys were not completed.

Instruments and Procedures

Prior to distribution, all participants were informed about an upcoming survey which they would fill out for a potential future research project. Participants were also informed that the survey was voluntary and at any point they could drop out of the study. They were informed that the survey was anonymous and would only be seen by those conducting the study. Once students consented to participate in the study, they were given the survey which was constructed by the investigator. The survey focused on demographic information, SES, BMI, and environment. After the surveys were handed out, students were reminded to leave their name off of the survey and if they had any questions, the investigator was available to answer them.

All surveys were completed once height and weight measurements were taken. Height and body weight measurements were taken by the physical education teachers.
Participants were instructed to dress for physical education class (shorts, t-shirt, socks, etc) and to leave shoes off until height and weight were measured. Participants were weighed to the nearest 0.1 lb. on a digital scale. One weight measurement was taken and the participant recorded their own weight. Height was then taken using a taped pre-measured wall and participants were measured to the nearest .5 inch. Participants recorded their own height. All surveys were then placed in the manila envelope and collected by the investigator. BMI was then calculated for each participant.

Definitions of overweight

Body mass index (BMI) was calculated for each individual on the basis of measured weight and height. BMI is equal to weight (lbs.) divided by height (in.) squared times 702. In the present study, the adolescents’ body weight status was classified on the basis of the age and gender specific BMI percentiles provided in the 2000 growth charts of the Centers for Disease Control and Prevention: obesity was defined as a BMI > 95th percentile, and overweight was defined as a BMI > 85th percentile.

Sociodemographic characteristics

Gender, age, and ethnicity/race were based on self-report on the survey. Socioeconomic status was based on self-report, as each participant marked their eligibility for free, reduced or pay full price school meals. From this data, participants were given an SES score. Participants were also given an environmental score, which was determined by location of residence, and how far away their residence was located from the nearest school, park or recreational facility. SES score was calculated based on free and reduced lunch eligibility. A numerical value was given for each SES group.
Free school meal participants received a score of 0, reduced lunch participants received a score of 1, and those participants who paid full price for meals received a score of 2. The environment score was given by summing questions 8 & 9 on the survey. Participants received a 1 if they lived outside the city limits and received a 0 if they lived within city limits. They also received a score of 3 if they lived more than 10 minutes away from an activity center (such as a park, recreational facility, or school), a score of 2 if they lived 5-10 minutes away, a score of 1 if they lived 2-5 minutes away, and they received a score of 0 if they lived 1 minute away. SES score was based on a 2 point scale, the higher the SES number, the higher their socioeconomic status. The environment score was based on a 4 point scale. The higher the environment score, the further away the participant was from town or an activity center.

**Statistical Analysis**

SPSS version 17.0 (Statistical Package for the Social Sciences) was used to conduct descriptive and correlational analyses. Descriptive statistics were performed to show the demographic characteristics of the study sample. Pearson correlations were run to examine the relationship between obesity and socioeconomic status, as well as the relationship between obesity and the environment.
RESULTS

The sample was relatively evenly distributed by gender. There were 112 females and 147 males who participated. The mean age of the participants was 14.2, with approximately 94% of the sample being white. Five participants were non-white Black students, 3 were non-white Hispanics, 1 was a non-white Asian, and 6 participants labeled themselves as “Other.” All students in this study had physical education class at least twice a week for 90 minutes; some weeks, they had it 3 times per week. Demographic characteristics of the sample are provided in Table 1.

Table 1. Characteristics of Adolescent Participants at Time of Enrollment (N=259)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>147</td>
<td>57</td>
</tr>
<tr>
<td>Female</td>
<td>112</td>
<td>43</td>
</tr>
<tr>
<td><strong>Age</strong></td>
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<td>16</td>
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<td>8.5</td>
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<tr>
<td>17</td>
<td>1</td>
<td>.4</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>.8</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>244</td>
<td>94</td>
</tr>
<tr>
<td>Non-white Hispanic</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>Non-white Black</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>
Across the sample, 51% of the group was found to be overweight or obese. Obesity accounted for approximately 30% of the entire sample. In this study, males had a slightly higher mean BMI at 25.1, while their female counterparts had a mean BMI of 24.3. Eighty out of 147 boys (54%) were found to be overweight or obese, while 54 out of 112 girls (48%) were found to be overweight or obese. The mean BMI for the white population in this sample was 24.6. The non-white Asian population, which consisted of only one participant, had a mean BMI of 20.3. The group labeled “Other” had a mean BMI of 24.4, while the non-white Hispanic population had a mean BMI of 28.8, and the non-white Black population had a mean BMI of 31.0.

SES score was based on school meal eligibility. Sixty-one percent of the sample population paid full price for their school meals. Twenty-seven percent of the sample population received free meals, and 12% received meals at a reduced cost. On a 2 point scale, 0=paying full price, 1=reduced meals 2=free meals, the mean SES score was .66.
This means most of the students in this particular study did not show signs of financial struggle because the mean score was between paying full price and receiving reduced school meals. However, those who did receive free school meals did have the highest mean BMI in this study sample. The mean BMI for free meal participants was 26.1, the mean BMI for reduced meal participants was 23.8, and the mean BMI for those who paid full price for their meals was 24.3. The environment score was based on a 4 point scale. The higher the score, the further away from the city/town or activity center participants were. The mean environment score for this sample group was 2.2. Most of the boys and girls in this sample were close to the middle of the scale, implying that most students lived in an environment that was not conducive to physical activity. Those in the group who received the highest environment score of 4, did record the highest mean BMI level at 25.2. Those in the group with the lowest environment score of 0, had a mean BMI level of 24.7.

A Pearson’s correlation was run to examine the relationship between obesity and SES, using $p \leq 0.05$ for significance level. Figure 1 presents the correlation between BMI and socioeconomic status variables across the sample. The test revealed that the relationship between the two variables was slightly positive, but the relationship was not significant, $r = 0.127$, $p > 0.05$. This would accept the null hypothesis of there being no relationship between obesity and SES. In this study, the lower the socioeconomic status
the higher the BMI hypothesis does not hold true.

![Correlation of BMI and SES](image)

**Figure 1.** The correlation between BMI and SES (socioeconomic status).

A Pearson’s correlation was also run to examine the relationship between obesity and the environment, using $p \leq .05$. Figure 2 presents the correlation between BMI and the environment variables across the sample. The test revealed a small negative relationship between obesity and the environment, but indicated that the relationship between the two was not significant, $r=-.018$, $p>.05$. Results from this correlation would accept the null hypothesis, that there is no significant relationship between obesity and the environment.
Figure 2. The correlation between BMI and the Environment.
DISCUSSION

Healthy People 2010 has identified overweight and obesity as 1 of 10 leading health indicators for Americans (CDC, 2000; Singh, Kogan, & van Dyck, 2008). In view of the fact that adolescent obesity has become an epidemic in this country (CDC, 2000), it is important to further our understanding of potential factors contributing to this health problem. In this study, two variables were examined related to obesity. Both variables, SES and the environment, did not show any significance across the study.

Previous studies reported that boys and girls in low-SES categories are at highest risk and are disproportionately affected for becoming obese (Sherwood, Wall, Neumark-Sztainer, & Story, 2009; Vieweg, Johnston, Lanier, Fernandez, & Pandurangi, 2007; Wang et al., 2006). Results from this particular study did not support this finding. In fact, SES was not a significant obesity factor for any one particular group. These findings are consistent with another recent study that suggests SES disparities in overweight status have been narrowing. Wang and Zhang (2006) discovered that the ratio in the prevalence of overweight between high and low SES adolescent boys and girls decreased significantly. (Wang & Zhang, 2006). Nonetheless, socioeconomic status should not be overlooked as a probable factor for obesity. In 2009, Sherwood, et al., found that low-SES youth, and in some cases, middle-SES youth, are not only at increased risk for overweight but are also more like to stay overweight (boys) or become overweight (girls) as they get older. (Sherwood, et al., 2009).
According to the ecological systems theory, childhood development occurs as a result of interactions within and among family and societal environments (Davison & Birch, 2001). It is impossible to overlook the environment as an apparent factor contributing to adolescent obesity, however, these findings do not support that the environment has an effect on obesity. Over half of the study sample proved to be overweight or obese according to their BMI statistics but there was no significant correlation found specifically between obesity and the environment.

The findings from this study do confirm that there is no doubt a problem with adolescent obesity, as 30% of participants were found to be obese. This is steadfast with other preceding study results. The Center for Disease Control and Prevention (2000), found that 17.6% of children aged 12-19 years old are obese; whereas, this same age group of children in the 1970’s had an obesity rating of only 5 percent.

This study does not have a number of strengths, but there are a few to mention. First and foremost, this study looked at rural adolescents opposed to the most commonly looked at population of urban groups. Secondly, 98% of the study sample participated in and completed all aspects of the study. Lastly, the study was relatively equally represented by both genders. However, some limitations also need to be taken into account when interpreting the findings. Variable discrepancies found in this study compared to previous research may be due to the limitations of the study. First, the sample size was small when considering the rural population as a whole. For this particular study, 259 students participated. Secondly, the study surveyed only 7th, 8th, and 9th grade students, which represents only a small portion of adolescents, and those
students were conveniently recruited. Additionally, the sample lacked diversity. Almost every participant in the study was white, with the exception of 15 students. Finally, the design of the study was correlational which does not allow us to infer causal relationships between obesity and predictor variables. Although we would like to find the root causes of obesity, this particular study examined only the relationship among socioeconomic status, the environment, and obesity. While the results show insignificant relationships between SES and obesity, and the environment and obesity, the sample size needs to be larger and other factors should be taken into account, such as gender and ethnicity, when delving for potential risk factors of obesity.

The United States has created an environment in which it is easy to become obese. Fast food restaurants can be found on virtually every city block or a few short miles away from country residents; and they offer a new and larger “dollar menu.” These types of venues attract the typical American citizen who is in search of a cheap convenient lunch or dinner. It would be difficult to find a recreational facility or school as often as a fast food restaurant. To curb the obesity epidemic stakeholders must look at underlying factors that could affect it. We know that lack of physical activity, diet, and genetics play a role in becoming obese, but understanding what lies beneath these issues may hold the key to intervention. Findings from this study would argue that designing obesity prevention and treatment interventions that reach and address the needs (not wants) of American rural youth is of high priority due to the prevalence of overweight. To be successful in achieving the goal of obesity prevention, it will take a joint effort from the individual, home, school, and community.
References


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APPENDIX
Complete the following questionnaire by answering all items honestly and to the best of your ability. Do NOT put your name on this paper. Responses to this questionnaire are kept confidential; only researchers of the study will see results.

1. ID #: _________
2. Age: __________
3. Sex: M _____ F _____
4. Ethnicity: White ______
   Non-white Hispanic ______
   Non-white Black ______
   Non-white Asian ______
   Other ______
5. Height: _____ (in.)
6. Weight: _____ (lbs.)
7. What type of school lunch do you qualify for?
   Free _____ Reduced _____ Pay full price _____
8. Where do you live? Inside city limits ______ Outside city limits ______
9. How far away (in minutes), by car, is the closest park, recreational facility, or school playground?
   1 min. ______ 2-5 min. ______ 5-10 min. ______ More than 10 min. ______
10. Calculated BMI: ______