Impact of State Laws on Childhood Obesity

April 11th, 2011

Clayton Bott-Wentworth

Abstract

The obesity epidemic in America is becoming more and more pronounced, especially for children and teenagers. Obesity is a term used to describe body weight that is much greater than what is considered healthy by medical professionals. Children with obesity struggles most often bring these struggles into adulthood. Relevant state laws were passed in recent years to help children make healthy choices. These laws include physical education requirements and nutritional standards on food options and junk food availability. This paper investigates the impacts that state legislations have on childhood obesity prevalence. State legislation variables were taken from the School Health Policies and Programs Study (SHPPS) conducted in 2006. Along with these state regulated variables, other key socio-demographic, regional, and educational variables were controlled for in the overall model. The findings revealed that nutritional standards set by state legislation for the requirement of healthy food options was significant at the 10% level, whereas the requirement of physical education was not a significant predictor of childhood obesity. In addition, median income per household was found to be significant at the 10% level.

Introduction

The obesity epidemic in America is becoming more and more pronounced, especially for children and teenagers. Obesity is a term used to describe body weight that is much greater than what is considered healthy by medical professionals. When looking at childhood obesity, it is important to discuss the health risks that apply, as well as the impact of this disease on the childrens' future as obese adults. The CDC regulated growth charts for children and young adults, 2-19 years of age, have corresponding parameters for appropriate height and weight distribution among children and adolescents categorizing obesity. The percentile with which a child falls within determines their health status as either overweight or obese. Although these charts can be used for adults, children are categorized more specifically, looking at age and gender; this helps to classify the child with obesity or not, to better understand the epidemic. Obesity can effortlessly affect children and adults alike, but children are less capable of correcting such an illness. Even though children face a greater struggle, there must be other ways to externally lessen the childhood obesity prevalence. Such a way is using state enacted legislation to build a stronger and healthier environment for children in primary and secondary schools. Carefully planned state level legislation would be the most cost effective method in changing the social behavior of children successfully and curbing America's childhood obesity epidemic.

"Overweight and obesity may soon cause as much preventable disease and death as cigarette smoking. People tend to think of overweight and obesity as strictly a personal matter, but there is much that communities can and should do to address these problems" (Anderson 2003). The correlation between obese children and obese adulthood is something that is seriously affecting costs in America's healthcare system. The separate health consequences of individuals

and economic cost are completely intertwined with each other; as health decreases costs increase and must be considered within the same frame of mind. Children who suffer from obesity, especially those who are older than 3 years of age, are at risk for becoming adults with obesity related issues. This is an issue that must be stopped, starting in schools. The National Hospital Discharge Survey looks at the correlation between the increase in childhood obesity rates and economic costs in dollars (G. Wang 2004). There are multiple health problems associated with obesity, especially diseases and problems that come later in life. Children with obesity struggles most often bring these struggles into adulthood and develop more serious health issues such as diabetes, sleep apnea, gallbladder disease, and the burdens that correlate with these issues (BCBSA 2007). Coronary heart disease, types of cancer (breast, and colon), and strokes are more serious and life threatening diseases associated with obesity (CDC 2009). With the increasing trends in obesity, the amount of people suffering from obesity-related diseases increases, and impact medical costs and the increase of hospital stays due to these health issues. These obesity related costs accounted for 9.1% of the total United States healthcare expenditure, reaching close to 100 billion dollars (CDC 2010). This essentially puts an unneeded burden on the allocation of United States federal taxes.

The statistics for children and adolescents with obesity have progressively increased over recent years. Between 1976-1980 and 1999-2000, as well as 1988–1994 and 2007–2008 the prevalence of obesity increased. Adolescents between the ages 12-19 were at the highest percentage of obesity between the years 2007-2008. During the same years 16.9% of children 2-19 years old in the United States were founded to be obese (CDC 2010) (Y. Wang 2007). The economic impact of obesity, dealing with the healthcare system, is directly and indirectly affected by obesity related health problems. Medical costs are directly impacted as they increase

because of preventive, diagnostic, and treatments services for patients with obesity related disease. Indirect economic burdens relate to morbidity and mortality rates. For example, if an obese child in the future is sick and idle, they are inactive in the workforce and unable to contribute to society's economy, creating economic inefficiencies. The future economic contribution of a person, who dies prematurely due to obesity, negatively hampers the economy due to the lost potential opportunity cost of the deceased individual.

The current obesity rates in children, and the increasing trends that exist in America, are drawing attention from the US government (Boehmer 2008) (Thompson 2005). Because of this, there are federal and state efforts being made to produce legislature that will help decrease the obesity rates in children and eventually prevent these rates from dramatically increasing, as they have been in the past and present. Often times, the barriers typically identified are the lobbyists of large firms that produce unhealthy consumer foods (Dodson 2009). Standards in schools have only recently been more heavily regulated, including school nutrition and administrative structure, vending machine stipulations, health education, and physical education programs. Legislation in the community was found to be the second most emphasized, including additional walking and biking paths and safe routes to school to increase caloric expenditure. In addition to primarily analyzing the state level legislation within the school environment, this paper also looks at other secondary state level variables, and their effects on childhood obesity. Some of these variables include poverty rates, race, geographic location, and household income. Enacting state-level effective and strong legislation is easiest and cost effective in changing social behavior of the children in state regulated schools, and in curbing America's child obesity epidemic.

Literature Review

To first understand how to pursue this topic further and build a solid foundation to the research, it is important to understand the child obesity environment in general. Many factors contribute and influence obesity rates, but the most important is the state legislation, which impacts middle and high school environment. These are generally physical activity and fitness, health education, and nutritional standards. These three are the main areas for which states typically focus on, in attempt to reduce the childhood obesity prevalence. Each of these three topics has experienced an increase in the number of times they have been proposed legislation and enacted bills within the past decade (Boehmer 2008). This is becoming a more revealed epidemic as it gains greater media exposure and documentaries are made about unhealthy foods, and their effects on the body. However, the childhood obesity prevalence still remains at an alarming rate in the United States, which is combated by the specific areas within the physical activity and fitness programs, health education, and nutritional standards.

Physical education and activity is one of the major options for which states may pursue to fight childhood obesity. Physical education is another term typically used to describe gym class which has various physical activities taught to middle and high school students. Specific elements which states may propose and enact include general increases in physical education class time during the day, and the frequency which it is offered throughout the week. Typically gym class is offered for 40 minute sessions, 3 to 4 times a week, for elementary and middle school students. This is due to the general opinion that physical education is seen only as an extracurricular class which is secondary to the major subjects taught in schools such as math, history, science, and language arts. Even after being considered a secondary requirement, physical education also has competition from other extracurricular classes that the typical middle

and elementary school include in their grade level specific curriculum. Other extracurricular classes are computer, library music, and foreign language classes. This competition of classes occurs at the lower grade levels, when preventing childhood obesity is the most critical (Whitaker 1997). The lower grade levels typically have recess during mid-day, which is a good form of caloric expenditure; however, many states are beginning to slowly remove recess from elementary schedules. This trend, combined with both primary and secondary schools considering physical education a non-academic subject with marginal importance, will lead to greater child obesity prevalence (NAPSE 2010). With the link of physical education increasing caloric expenditure for children established, it is clear that such negatively enacted legislation for physical education would hamper the fight against childhood obesity.

While health education is important to the mixture of nutritional standards and physical education legislation, it can be considered not as critical since it plays only an indirect role in knowing what the proper balance is between consumption and expenditure of calories. This is typically why, when considered, the less significant health class education is usually combined in the same category as physical education. By combining these two elements into one category it forms the opportunity for better rounded legislation to be enacted with greater ease, as well as making it easier to summarize the two forms of education when conducting empirical research (Cawley 2009). Though health education differs from physical education, as it is conducted within a classroom similar to other academic courses, it does play a supportive role in reinforcing the elements of physical education and nutritional standards in lives' of children and adolescents (NCAAHPERD 2008). Health education curriculums typically cover many topics, unfortunately diluting and drowning out the importance of nutrition and dietary behavior, along with the benefits of physical activity and fitness (NCAAHPERD 2008). From this, schools would need to

alter the health education curriculum, to achieve greater reinforcement and emphasize, above all else, the importance of fighting obesity through superior knowledge of healthy nutritional standards and proper physical activity on a daily basis.

The other accompanying topic of legislation, used to fight against the increasing childhood obesity prevalence, is setting the nutritional standards within the state regulated school environment. This category encompasses many options for primary and secondary schools to use in creating a healthier environment for children and adolescents. Students' intake almost half of their daily calories at school; therefore, the way they eat during the school day greatly affects their weight and health (Schanzenbach 2008). Schanzenbach used obesity statistics from the time students entered school in kindergarten, until the time they graduated a year later, with a sample size of 1,000 different schools in the U.S., surveying 15,000 students. The study measured the weight gain, and BMI of students who buy school lunches, as opposed to those bringing their lunch from home. She found that out of a group of students who enter kindergarten at the same obesity rates, those who buy school lunches are more likely to have problems with obesity, as compared to those who do not. The data collected proved that 14% of students are obese that buy lunch, compared to 11% of students who do not within the sample taken. This extrapolates to equaling an additional 60 calories per lunch meal provided for by public schools (Schanzenbach 2008). Additionally, the National School Lunch Program is responsible for reducing lunch prices for approximately 60% of the United States student population, especially those in public schools (NSLP 2010). Because this program directly affects students' nutrition, it has the power to better the nutritious value that students are getting in their lunches at school. The data clearly points to the unhealthy nature of what US school lunches provide for the student body currently, and the importance of nutrition standards in school provided lunches in future generations.

School lunches are not the only topic included within enacted nutritional legislation, which can aid in reducing the childhood obesity prevalence in America. In general, it is necessary to take actions to beneficially change food prices, expose individuals to less food, and market unhealthy foods as unappealing (Frieden 2010). To achieve this, government has to play a more substantial role in subsidizing farmer's markets to ensure that healthier and fresher options are provided within school systems. Such an example would be providing locally grown vegetables for lunch salads, at a cheaper purchase price, while increasing the price for hamburger and French fries. Another effective method in changing food prices, is adding a school wide tax on high-fructose or unhealthy food and drink items. These taxes can be accompanied with vending machine restrictions, as most vending machines only offer snacks which are high in fat and sugar. Such steps of tax reform and restrictions, on unhealthy offered lunch foods and vending machine snacks, could drastically change the nutritional standards in the school environment.

These restrictions, coupled with a strong marketing and advertising campaign from within the school system using methods such as counter-advertising, will improve the look of healthy foods to children, and expose the harmful effects of unhealthy products. By doing this, it will increase the probability of children making healthier food and drink choices within schools overall. This technique has worked with cigarettes and tobacco usage in the past, and such a methodology should similarly reduce consumption of unhealthy products (Economos 2001). Essentially, public health agencies must aid the states' schools to continue to strive for positive influence on state law makers, in order to alter state laws for the interest of improving nutritional standards within schools.

The constraints of funding plagues the progressive steps necessary to enact physical education, as well as classroom taught general health education about obesity, and providing healthier foods with stricter nutritional standards in schools (Leviton 2008). Because each of the three main legislative topics requires capital funding, schools are reluctant to allocate funding on what is typically deemed superfluous to the areas of academic achievement standards in schools. The uneven balance between academics and health has become a more pronounced issue as culturally America stresses the importance of grades. The USDA apportioned 4 million dollars to schools during 2006, requiring them to establish wellness programs aimed at enhancing their health and physical education, along with more stringent nutritional standards (Leviton 2008). However, this amount of money is vastly insignificant compared to what it would cost to initiate a major impact on childhood obesity within America's schools. As depressed school budgets remain, post 2008 financial crisis, progress towards strengthening school legislation for health education, physical education, and tougher nutritional standards will be deferred until the US economy significantly improves.

Even though there is still needed legislative action, there is hope in reducing childhood obesity. This can be done by examining the leading states with the lowest prevalence in childhood obesity statistics. As correcting the prevalence of childhood obesity is a difficult trend to stop, understanding why it is lower or higher in any specific state is equally complex and difficult. In an attempt to summarize many of the contributing factors to why states such as Colorado and Oregon have the lowest obesity and childhood obesity statistics respectively, one can point largely at the environment and community behaviors surrounding them. No set of specific laws can account for why Colorado and Oregon has constantly posted the lowest rates. A major influence that explains why some western states have lower rates is the culture of health

that is found there. This might explain why the US Olympic headquarters is subsequently located in Colorado. In contrast, the region break down shows the clear culture of obesity and the lack of initiative put into legislation in combating childhood obesity in the southern states. The states that succeed the most, particularly Colorado, are those who bring the public, private, and academic sectors together, each agreeing on common goals (Hill 2008). Using Colorado as a model of how other states fight obesity through unity, may allow other southern states to reduce the childhood obesity prevalence more successfully.

Data and Descriptive Statistics

To give a better illustration and deeper analysis into the most recent child obesity figures and the predicting factors included in the model, a selected number of variable's descriptive statistics are reported. The sample for this analysis is taken at the state level including all 50 states in the main regression model using SHHPS 2006 data. A sample period of 2010 obesity rates are regressed with independent variables of two nutritional standards, physical education requirements, race, region, high school dropout percentages, and a lagged variable of 2007 child obesity rates. The 2010 child obesity percentages represent a three year average of 2008, 2009, and 2010. The mean of all the state's child obesity prevalence percentages in 2010 was 15.23%. This can be compared to the mean reported in 2007 of 14.12%, which increased 1.11%. The 2010 standard deviation for child obesity percentages was calculated to be 3.37%. The max and min of the reported childhood obesity figures in 2010 start at a low of 9.60% (Oregon) and reached a high of 21.90% (Mississippi). This can be compared to the 2007 range category of child obesity percentages from 8.50% (Utah) to 20.90% (West Virginia). The overall range of

obesity percentages decreased in 2010 compared to 2007, though the minimum and maximum percentages increased in 2010. This shows a trend of child obesity percentages becoming more concentrated through the smaller range while increasing on average between 2007 and 2010. Another important fact to note is that the number of states with obesity percentages over 20%, in 2007 there was three, whereas in 2010 the number of states over the 20% threshold was eight.

The key variable this paper analyzes is the state-level nutritional requirements in schools and available options given to students. The nutrition variables are from the SHPPS survey. I focus on two variables: nutritional standards for various foods offered and prohibition of junk food at school. Information from two tables of the SHPPS survey report (5.4 and 5.6) are used. One table consists of five questions about whether or not states required schools to offer three or more different types of milk for breakfast or lunch, required to offer a choice of entrees, vegetables, and fruits for lunch, and states that require or recommend that schools restrict fried foods. There are three responses: required, recommended, or neither. The categories were combined to a single number for each individual state by assigning 1 for required, 0.5 for recommended and 0 for neither. The range of the scores reached a high of four for New Mexico which requires three milk options for lunch and breakfast, two or more fruit options, two or more entre options, and recommends more than two non-fried food options and restrictions to the availability of fried foods. Contrasting this strong position in nutritional standards are New Jersey, Oklahoma, and Indiana who report zero requirements or recommendations for any of the nutritional categories asked in the question. While 47 states have at least a requirement or recommendations in the five categories asked in the question pertaining to nutritional standards in SHHPS table 5.4.

To gain an addition look into the nutritional environment in schools a narrowly focused question was given about junk food to states in the 2006 SHPPS survey report table 5.6. The questions asked in what degree do schools limit or prohibit the offering of junk food in various school events and locations. Such school settings include, but are not limited to, after school programs, a la carte during breakfast or lunch, concession stands, school stores, student parties, and vending machines. Similar to the previous nutritional and physical education variables, states reported recommended, required, or neither of the two. Again a score was summed across all settings of each state that had junk food restrictions to create the junk food variable. The best overall score was six reported by Alabama. This strong effort was opposed by ten states scattered around the country who reported zero limitation or control of the junk food offered in their school systems. Junk foods here are defined as foods or beverages that have low nutrient density, that is, they provide calories primarily through fats or added sugars and have minimal amounts of vitamins and minerals (CDC 2007). The mean for the junk food variable is 2.4 out of a possible score of 6.

One of the school legislation variables analyzed is physical education. This variable is used as it plays an important role in the amount of calories a child may expend on any given school day. The data for this variable was taken from the School Health Policies and Programs Study (SHPPS) conducted in 2006. This survey at the time was the largest widespread and most comprehensive evaluation of school health policies and programs ever taken on a state level bases in the United States. The survey reported on the state level, and I drew information from three questions about the school-level (elementary, middle, and high school) requirement on physical education. The question asks whether states required, recommended, or had no laws requiring a number of physical education regulations. To construct the PE variable, I assigned 1

if the state required PE classes and 0 for no requirement. A sum was taken across each of the school levels for all 50 states. In particular a total of 37 states had some degree of required physical education laws enacted by 2006.

Another set of state-level variables for physical education were examined as well in a separate regression model. They are from the CDC's more recent survey titled School Health Profile Report of 2008. They include whether or not a school system requires physical education or not averaged across 6^{th}-12^{th} grades and whether or not there are school fund physically active intramural sports available to students (states excluded in the data set are GA, NM, & LA). Besides school environment predictors, other variables were analyzed and controlled for in model four. Two notable variables were median income per household for 2006 and the high school dropout rate per state for 2006-2007. Both of these figures can represent the possible strength of the individual family unit and its ability to provide a healthy environment at home through proper exercise and nutritional meals. In addition, region and race characteristics of the state are also included.

Model Design and Discussion of Main Results

Figure two summarizes the main regression results based on several different specifications. Model one includes the requirement of physical education across school levels converted into a dummy variable on the basis of 1 given complete requirement for elementary middle and high school levels and 0 if not, nutritional standards for all foods offered in schools, and the specific prohibition of junk food variables. Model two adds racial and regional demographic percentages. Model three adds high school dropout percentages of 2006-2007 and

the median household income of 2006. Model four adds the lagged variable of 2007 obesity rates to avoid potential omitted variable bias. Model four is the preferred model which combines all the relevant variables to predicting childhood obesity.

Model four revealed the nutritional standards to be significant at the 10% level, along with negative coefficients showing an inverse relationship between obesity and nutritional standards for models three and four respectively. In particular, if there is one additional requirement (or two recommendations) on nutritional standards which is passed through legislation, the obesity rate reduces by 0.6%, with significance at the 10% level. The income variable was found to have significant t-statistic at the 1% level in model three and 10% in model four. This decrease in significance is explained by the introduction of the last variable in fourth model. The reason for the changes in the significance from the initial school variables to all the additional ones added in the subsequent models is largely because the income and lagged variables took a large percentage of significance in the prediction of childhood obesity from the other school and demographic variables. This change in significance shows the effects of omitted variable biases by not including income and the lagged variable of 2007's childhood obesity in the first and second models.

In model one the variable for the prohibition of junk food within schools showed a positive relationship of .0061 with a t-statistic of 2.19 significant at the 5% level. This result is opposite to the original hypothesis, anticipating that the prohibition of junk food or food with little to no nutritional value would have a positive effect in the fight against obesity. This would ultimately indicate an inverse relationship between increasing the prohibition of junk food and a decrease in childhood obesity prevalence across states, although that is not what the regression results of the first model revealed.

Model two again used the School Health Policies and Programs Study variables of nutrition and PE coupled with the race and regional variables. The referent groups for these variables were the white demographic and southern region respectively. The referent group is left out of the regression to give a basis for comparison to the other variables within the general category. Within the second model the race demographics of black and Hispanic showed significant t-statistics at the 5% level. Both of the black and Hispanic variables in the second, third, and fourth models reported positive coefficients. These positive coefficients signify that if states gained 1% more black or Hispanic population that childhood obesity would increase by the respective coefficients. These results were also found to be significant throughout the separate regressions at or below the 5% significance level demonstrating the importance of controlling for the different demographics within the sample. Although, the prohibition of junk food at school events and locations variable was significant at the 5% level and 10% level for model one and two respectively, its statistical significance drop in models three and four. This change was accompanied by an increase in significance for the nutritional standards variable for school offered foods in the model three and four. The reason for this change is because the controlling for the median U.S. household income in the third model as well as the lagged variable of 2007 childhood obesity.

Pair-wise correlation tables (figures 4-5) where created in order to test for multicollinearity or correlations between two independent variables. In the correlation table with School Health Profile data more insight was revealed about income and its effects on obesity and school legislative variables. The high income states showed that they were less likely to have enacted nutritional standards. Higher income states also have lower childhood obesity prevalence. If state income is omitted from the regression, the coefficient for the nutritional

standards variable can be biased. In fact, they are not statistically significant in model one and model two reflecting omitted variable bias.

Regressions with CDC: School Health Profile Survey

After investigating the school variables of required physical education across elementary, middle, and high school levels from the SHHPS data set of 2006, a more in-depth approach was taken in explaining the area of physical education. This was accomplished by analyzing two new variables from the CDC's school health profile survey taken at the state level and with a sample age of 9^{th} through 12^{th} graders. The first variable is the percentage of schools that require of physical education on grade levels ranging from sixth to twelfth. The second variable is the percentage of schools that have in place funding for intramural clubs or activities. Both of these variables were also based on state level data acquired from the CDC's School Health Profile report taken in 2008. Although these variables have negative coefficients in relation to obesity, school funded intramurals -4.487 and averaged 6^{th}-12^{th} grade required physical education -.0001, neither was significant at the 10% level when incorporated into the full model. This again supports what was found when using SHHPS data in the main regression model, for which physical education requirements across school levels is not a significant predictor of obesity. From this 2008 survey report, taken more recently than the SHHPS survey, an increase in significance to the 1% level was seen in the Hispanic variable. Additionally the % of black population variable was not found to be significant at the 10% level. These results may be less accurate because of how close the survey report was taken and used to explained three year averaged 2010 childhood obesity percentages. Though, the lagged variable correcting for some

of the omitted variable bias was significant at the 5% level with a positive coefficient of .484. In conclusion, there was no significant evidence revealing physical education to have negative effect on obesity.

Conclusion

The regressions revealed some valid results and ones that were unexpected. The expected result of nutritional standards for foods offered within schools proved to have a significant and positive impact in fighting obesity in the overall model. The three variables measuring the physical activity a child receives within the school environment proved not to be significant and opposed the original hypothesis. These results agree with other research also done at the state level finding that physical education has no significant impact on youth body mass indexes (Cawley 2007). Though these results were taken on the state level, it has been found on the individual level using panel data that the amount of minutes spent in physically active sports funded by schools is significant in reducing obesity (Stallone 2011).

The research and findings reported in this paper emphasize the need for further investigation into other factors contributing to this national epidemic. Looking forward, areas that have potential impact on childhood obesity include the prices for food which schools decide to provide in their cafeterias. Furthermore, increases in maternal full time employment rates which preliminary research has shown to be significant in predicting obesity (Cawley 2010). There were data limitations with regards to the amount of actual physical exertion completed in the physical education variables. Other areas of data restrictions are seen in the lack of historical data as obesity has been a major health concern for state policy makers in past thirty years.

Nutritional standards in this analysis were found to be the most beneficial school implemented policy in reducing the prevalence of childhood obesity. Nutritional standards for foods offered by schools should be considered as a tool for policy makers to exert when constructing an anti-obesity initiative on the state level.

References

Anderson, Patricia. “Economic Perspectives on Childhood Obesity”. Economics Perspectives. p.30-48. 2003.

BCBSA. “Childhood Obesity and Diabetes Statistics”. Blue Cross Blue Shield Association. p.1-2. 2007.

Boehmer, Tegan. “Preventing Childhood Obesity through State Policy Predictors of Bill Enhancement”. American Journal of Preventive Medicine. p.333-340. 2008.

Cawley, John and Feng, Liu. “Obesity - Correlates of State Legislative Action to Prevent Childhood Obesity”. Science Journals, Jobs, and Information. p.162-167. 2009.

CDC. “Obesity and Overweight: Data and Statistics”. Center for Disease Control and Prevention. 2010.

CDC. “Obesity and Overweight: Health Consequences”. Center for Disease Control and Prevention. 2009.

CDC. “Obesity and Overweight: Trends in Childhood Obesity”. Center for Disease Control and Prevention. 2010.

CDC. “School Health Policies and Practices Study 2006 Report: Nutritional Services Table 5.4”. Center for Disease Control and Prevention. 2007.

CDC. “School Health Policies and Practices Study 2006 Report: Nutritional Services Table 5.6”. Center for Disease Control and Prevention. 2007.

CDC. “School Health Policies and Practices Study 2006 Report: Physical Education Table 2.4”. Center for Disease Control and Prevention. 2007.

CDC. “School Health Profile 2008 Report: Tables 24-25”. Center for Disease Control and Prevention. 2009

Dodson, Elizabeth. “Preventing Childhood Obesity through State Policy: Qualitative Assessment of Enablers and Barriers”. Journal of Public Health Policy. p.161-172. 2009.

Hill, James PhD. “Why Is Colorado So Lean?”. WebMD. p.1-2. 2008.

Leviton, Laura. “Children's Healthy Weight and the School Environment”. Sage Journals Online. p.38-55. 2008.

NAPSE. “Physical Education is an Academic Subject”. The National Association for Physical Education. p.1-4. 2010.

NCAAHPERD. “Health Education in Schools – The Importance of Establishing Healthy Behaviors in our Nation’s Youth”. North Carolina Alliance for Athletics, Health, Physical Education, Recreation, and Dance. p.1-7. 2008.

NCES. “National Center for Educational Statistics”. U.S. Department of Education Institute of Education Sciences. p.1. 2009.

NSLP. “National School Lunch Program: Program Fact Sheet”. United States Department of Agriculture. p.1-3. 2010.

Stallone, Michael. “The Effects of Television Viewership and Sports Participation on Adolescent Obesity: Evidence from the Panel Study of Income Dynamics”. TCNJ. 2011

Thomson West Health Policy Tracking Service. “State actions to promote nutrition, increase physical activity and prevent obesity: A legislative overview”. Thomson West Services. 2005.

US Census Bureau. “Census Regions and Divisions of the United States”. Geography Division. p.1. 2011.

US Census Bureau. “Median Household Income (In 2006 Inflation-Adjusted Dollars)”. 2006 American Community Survey. p.1. 2006.

US Census Bureau. “People Quick Facts”. State and Country Quick Facts. p.1. 2010.

US Census Bureau. “Percent of People in Poverty in 2006”. 2006 American Community Survey. p.1. 2006.

Wang, Guijing. “Economic Burden of Obesity in Youths Aged 6 to 17 Years: 1979–1999”. Journal of the American Academy of Pediatrics. p.1-8. 2002.

Wang, Youfa. “The Obesity Epidemic in the United States—Gender, Age, Socioeconomic, Racial/Ethnic, and Geographic Characteristics: A Systematic Review and Meta-Regression Analysis”. Johns Hopkins Bloomberg School of Public Health. p.6-28. 2007.

Whitaker, Robert. “Predicting Obesity in Young Adulthood from Childhood and Parental Obesity”. The New England Journal of Medicine. p.869-873. 1997.

Appendix

Figure 1: Descriptive Statistics

Variable	Mean	s.d.	Minimum	Maximum
2010 Child Obesity Prevalence	15.23%	3.37%	9.60%	21.90%
Required P.E. Teaching Score (required for all grades = 3)	2.44	0.99	0	3
Averaged 6th-12th Grade Required P.E. (states excluded in the data set GA, NM, & LA)	72.34%	14.41%	26.51%	99.82%
School Funded Intramurals (states excluded in the data set GA, NM, & LA)	66.15%	12.68%	40.1%	85.1%
Nutritional Standards for School Provided Food Score (standards for all fruit, vegetable, and milk categories=4)	1.63	0.98	0	4
Prohibited Junk Food at School Events and Locations Score (prohibited junk food at all school events and locations=6)	2.45	1.69	0	6
% of Black Population	10.60%	9.49%	.70%	37.20%
% of Hispanic Population	10.18%	9.91%	1.20%	45.60%
% of Other Population	6.66%	9.01%	1.80%	62.70%
North Eastern States	.18	.38	0	1
Mid Western States	.26	.44	0	1
Western States	.26	.44	0	1
US Median Household Income	$52,186.33	$7,868.13	$37,757	$67,916
US High School Dropout Rates	4.03%	1.78%	2.00%	7.60%
2007 Child Obesity Prevalence	14.12%	3.00%	8.50%	20.90%

Figure 2: Main Regression Results using SHPPS data

Variables	Model 1	Model 2	Model 3	Model 4
Required P.E. Teaching (dummy variable)	-.001 (.10)	-.006 (-.80)	-.003 (-.39)	-.006 (-.84)
Nutritional Standards for School Provided Food	-.003 (-.63)	-.003 (-.82)	-.007 (-2.06)**	-.006 (-1.95)*
Prohibited Junk Food at School Events and Locations	.006 (2.19)**	.004 (1.89)*	.002 (1.06)	.002 (1.08)
Black		.116 (2.14)**	.119 (2.25)**	.109 (2.27)**
Hispanic		.105 (2.60)**	.119 (3.32)***	.089 (2.46)**
Others		-.029 (-.66)	.009 (.23)	-.017 (-.42)
North East		-.022 (-1.77)	-.004 (-.32)	.005 (.46)
Mid West		-.010 (-.88)	-.009 (-.86)	.002 (.18)
West		-.039 (2.72)***	-.032 (-2.40)**	-.010 (-.67)
Median House Hold Income			-1.883 (-3.62)***	-1.145 (-1.96)*
High School Drop Out Rate			.001 (.73)	.117 (.51)
2007 Child Obesity Prevalence				.420 (2.34)**

Footnote: School variables aggregated from the School Health Policies and Programs Study conducted in 2006. Statistical significance denoted using asterisks: *$P < 0.10$, **$P < 0.05$, ***$P < 0.01$.

Figure 3: Regression using School Health Profile Report

Variables	Model 3
School Funded Intramural Activities	-4.487 (-.10)
Averaged 6th-12th Grade Required P.E.	-.0001 (-.52)
Nutritional Standards for School Provided Food	-.005 (-1.42)
Prohibited Junk Food at School Events and Locations	.001 (.86)
Black	.083 (1.65)
Hispanic	.117 (2.86)***
Others	-.021 (-.51)
North East	.010 (.65)
Mid West	.005 (.44)
West	-.005 (-.28)
Median House Hold Income	-1.145 (-1.70)*
High School Drop Out Rate	.001 (.43)
2007 Child Obesity Prevalence	.484 (2.51)**

Footnote: School variables aggregated from the School Health Profiles conducted in 2008. States excluded in the data set for school variables GA, NM, & LA. Statistical significance denoted using asterisks: *P < 0.10, **P < 0.05, ***P < 0.01.

Figure 4: Pair-Wise Correlations of SHPPS Data

	Nutritional Standards	*Prohibited Junk Food*	*Required P.E.*	*Black*	*Hispanic*	*Other*	*North East*	*Mid West*	*West*	*Median H.H. Income*	*High School Drop Out*	*2007 Child Obesity*
Nutritional Standards	1.000											
Prohibited Junk Food	0.142	1.000										
Required P.E.	0.152	0.059	1.000									
Black	-0.014	0.100	0.184	1.000								
Hispanic	0.115	0.250	-0.130	-0.125	1.000							
Others	-0.201	0.055	-0.045	-0.223	0.132	1.000						
North East	0.071	0.021	0.292	-0.140	-0.075	-0.129	1.000					
Mid West	-0.149	-0.346	0.065	-0.161	-0.270	-0.134	-0.278	1.000				
West	0.038	0.089	-0.341	-0.452	0.460	0.445	-0.278	-0.351	1.000			
Median H.H. Income	-0.270	-0.202	0.069	-0.226	0.123	0.354	0.368	-0.130	0.205	1.000		
High School Drop Out %	0.045	0.112	-0.274	0.090	0.318	0.245	-0.166	-0.235	0.404	-0.031	1.000	
2007 Child Obesity %	0.088	0.247	0.177	0.558	-0.022	-0.175	-0.177	-0.081	-0.482	-0.573	0.010	1.000

Footnote: Any percentage of correlation greater than .50 indicates the possibility for traces of multicollinearity between two independent variables.

Figure 5: Pair-Wise Correlations of School Health Profile Report

	Funded Intramural Activities	*6th-12th Grade Required P.E.*	*Nutritional Standards*	*Prohibited Junk Food*	*Black*	*Hispanic*	*Other*	*North East*	*Mid West*	*West*	*Median H.H. Income*	*High School Drop Out*	*2007 Child Obesity*
Funded Intramural Activities	1.000												
6th-12th Grade Required P.E.	0.341	1.000											
Nutritional Standards	-0.042	0.231	1.000										
Prohibited Junk Food	0.017	-0.032	0.059	1.000									
Black	-0.070	-0.103	0.011	0.028	1.000								
Hispanic	0.226	0.083	-0.074	0.204	-0.043	1.000							
Other	0.256	-0.144	-0.234	0.064	-0.208	0.113	1.000						
North East	0.538	0.464	0.105	0.061	-0.119	-0.056	-0.134	1.000					
Mid West	-0.552	0.059	-0.125	-0.323	-0.132	-0.280	-0.140	-0.301	1.000				
West	0.295	-0.095	-0.046	0.069	-0.437	0.398	0.440	-0.285	-0.362	1.000			
Median H.H. Income	0.605	0.289	-0.231	-0.129	-0.199	0.214	0.362	0.357	-0.168	0.237	1.000		
High School Drop Out	0.241	-0.174	-0.041	-0.012	-0.007	0.315	0.275	-0.134	-0.207	0.433	0.064	1.000	
2007 Child Obesity	-0.252	-0.156	0.039	0.190	0.565	-0.089	-0.174	-0.155	-0.049	-0.524	-0.554	-0.074	1.000

Footnote: States excluded in the data set for school related variables are GA, NM, & LA. Any percentage of correlation greater than .50 indicates the possibility for traces of multicollinearity between two independent variables.