An Analysis of the Use of Food Outside of the National School Lunch Program in Schools and its Effects on Childhood Obesity, Overall Health and Academic Achievement of Students

by

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Abstract

Approximately one-third of the children in the United States (US) are overweight or obese. Because of this, these children have an increased risk for a variety of medical conditions that have lifelong consequences such as heart diseases, high blood pressure, lipid disorders, and diabetes. Elementary children spend half of their waking hours in school and often consume most of their days’ calories while at school. Therefore, schools, especially elementary schools, play an important role in combatting obesity in the US. With the primary cause of obesity being an energy imbalance (too many calories consumed and too few calories burned), elementary schools have the opportunity to take a population-wide prevention approach by promoting healthy lifestyles for children of all weights regardless of overweight or obesity status. The objective of this study was to evaluate recent literature regarding the use of and effects of competitive foods in the elementary classroom and its effects on the overall health and behavior of students. Research was conducted using information from primary sources of literature that were retrieved from electronic databases and by conducting expanded searches of the references used that revealed other primary and secondary literature sources. These sources were supported by both scientific and social theories. This study provides a comprehensive review of the literature and revealed adverse health and behavior effects on students in classrooms (and whole schools) that utilize food as a reward.
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Chapter 1: Introduction

Childhood Overweight and Obesity: Why It’s a Concern

Overweight and obesity rates have been on the rise for more than three decades. According to the Centers for Disease Control and Prevention (CDC), the percentage of children aged 6–11 years in the US who were obese increased from 7% in 1980 to nearly 18% in 2012. Similarly, the percentage of adolescents aged 12–19 years who were obese increased from 5% to nearly 21% over the same period making overweight and obesity in children a significant public health concern (2014). Thus overweight and obesity is causing problems for children that previously were not seen until adulthood such as: high cholesterol, hypertension, respiratory issues, orthopedic problems, and type 2 diabetes. Furthermore, being overweight or obese can cause mental health issues in children such as depression, anxiety, low self-esteem and poor body image.

The American Heart Association defines what it means to be overweight or obese as, “Overweight and obese are screening labels used for ranges of weight that are above what is generally considered healthy for a given height and may increase the risks for certain diseases or health problems. Overweight and obese are defined differently in children and adults because the amount of body fat changes with age. Body mass index in children is age- and sex-specific because body fat differs based on growth rates and development differences in boys and girls” (2011, p. 3).

There are multiple causes of obesity including, but not limited to: lifestyle habits, genetics, and the environment. Regardless, the bottom line is that American children (and adults) are taking in more calories than they are burning. Some common issues leading to
these calorie imbalances include: increased portion sizes, poor nutrition, eating out more, and moving less (American Heart Association & American Stroke Association, 2011, 4). In order to combat this epidemic, people need to understand how to live a healthy lifestyle. In particular, children need to be exposed to healthy environments at both home and school. Furthermore, what they learn about healthy lifestyles should be modeled at school and in the home.

**School Environment**

The school environment potentially consists of multiple opportunities to learn about proper food and nutrition as well as health. Most public schools in the US participate in the National School Lunch Program (NSLP), which provides meals for both breakfast, and lunch. In fiscal year 2013, federal school nutrition programs underwrote more than five billion lunches served to nearly 31 million students (New American Foundation, 2014). The schools that choose to take part in the NSLP get cash subsidies and USDA foods from the US Department of Agriculture (USDA) for each meal they serve. In return, they must serve lunches that meet Federal requirements, and they must offer free or reduced price lunches to eligible children. School food authorities can also be reimbursed for snacks served to children through age 18 in afterschool educational or enrichment programs (Food and Nutrition Service, 2014).

Schools also offer foods through “competitive foods” sold a la carte in cafeterias, vending machines, rewards for positive behavior and performance, fundraisers and snack bars. These “competitive foods” not only “compete” with the regulated, healthy breakfasts and lunches being served, they compete with the lessons being taught about
making healthy choices (e.g. choosing fruits and vegetables versus packaged and processed sweet treats or candy). Therefore, other opportunities for health and nutrition services can include developing obesity-prevention strategies by providing more nutritious food, offering greater opportunities for physical activity, and providing obesity-related health services. According to Kaphingst, French, & Story, more than 95 percent of American youth aged five to seventeen are enrolled in school. Therefore, schools play an important part in a national effort to prevent childhood obesity (2006).

**Why Poor Nutrition Modeling is a Threat to Public Health**

Poor nutrition education and modeling in schools is both confusing to the student as well as detrimental to their personal health. While public funding is mostly to blame for lack of good, consistent nutrition education in schools because of cuts to physical education and recess time, society is mostly to blame for the common use of food as a reward for positive behavior or performance. Using rewards is a very common, and usually effective method of motivating people. However, when food is used as the reward, the message being sent is both confusing and complicated.

The use of food as a reward essentially teaches a child to eat even if or when they are not hungry which counteracts a child’s ability to self-regulate their hunger. Food’s use as a reward can also teach a child to eat when they feel good because they are given a reward when they act or do something good. Moreover, food can also become something the child turns to when they feel upset or angry because they have been trained to “feel good” when eating a desired food. This type of eating is often referred to as emotional eating. Emotional eating is driven by emotional cues like depression, anxiety, happiness,
sadness, and boredom rather than hunger (GB HealthWatch, 2013). Over time, this habit of eating in order to feel good rather than because one is hungry is likely to add additional unnecessary calories to one’s diet which leads to overweight and obesity. Schools can prevent these unnecessary calories by changing their policies on “competitive foods” in their buildings such as by prohibiting birthday and holiday snacks that do not meet the same guidelines as the NSLP follows, ceasing fundraisers that sell unhealthy foods, only allowing “healthy” foods to be sold in their vending machines and not allowing food as rewards or incentives in their classrooms.

Analysis of Competitive Foods in the Classroom

In this research project, I will conduct a qualitative analysis of the use of competitive foods in the classroom and their effects, or potential effects, on childhood overweight and obesity. I will also consider and report on the emotional and behavioral effects competitive foods may present for children. This analysis will utilize peer-reviewed articles as well as secondary sources such as internet articles, websites and school districts’ wellness policies and policies on food use and consumption within the district.

Thesis Statement

Because obesity is currently affecting approximately one-third of all US students, educators should enforce food-related policies that benefit the overall health and behavior of their students.
Purpose of the Study

The purpose of this study is to review available literature about the types and use of food in school classrooms and its effect on the health and well-being of students. Food and eating play a vital role in education. As Arne Duncan, Secretary of the Department of Education, said, “When students are hungry and distracted, they’re not learning. To set kids up for academic success, we must make sure they’re getting the healthy food they need at breakfast and lunch so they can concentrate in the classroom throughout the day,” (NEA Health Information Network, 2010). When food is used as a reward in the classroom for good behavior or good academic performance or when food (candy or treat) is withheld due to negative behavior or achievement, the wrong message is being delivered by the school personnel and district. Not only is this practice “condemned” by experts, it can undermine efforts to promote healthy habits and put students at risk for obesity, Type 2 diabetes, and other serious health problems (Fedewa, Courtney and Hinds, 2014). It is my belief that schools should “do no harm” and therefore, can and should enforce policies that only benefit their students’ health and well-being now and for the future.

Research Questions and Hypotheses

Research Question 1

How does the current food environment in many schools affect the consumption of healthy foods by students?

Null Hypothesis: The current food environment in many schools does not affect the consumption of healthy foods by students.
**Hypothesis:** The current food environment in many schools has a negative effect on the consumption of healthy foods by students.

**Research Question 2**

Does the use of competitive foods in the classroom have a negative effect on the overall health (i.e. physical health, mental health) of the students exposed to the competitive foods?

**Null Hypothesis:** The use of competitive foods in the classroom does not affect the overall health of the students exposed to the competitive foods.

**Hypothesis:** The use of competitive foods in the classroom does have a negative effect on the overall health of the students exposed to the competitive foods.

**Research Question 3**

Do stronger policies regarding the use of competitive foods at the federal, state, district and school level positively affect the school food environment?

**Null Hypothesis:** The adoption and application of stronger policies at the federal, state, district and school level regarding the use of competitive foods does not positively affect the school food environment.

**Hypothesis:** The adoption and application of stronger policies at the federal, state, district and school level regarding the use of competitive foods does positively affect the school food environment.

**Theoretical Base**

Most of the literature used for this research project was qualitative in nature. The qualitative studies were analyzed for information pertaining to how and why food was
used in the classroom. Furthermore, the literature was examined for information on the effects of competitive foods in the classroom on overall health of the students (e.g. consequences of overweight and obesity) as well as how implementation and enforcement of policies regarding the use of competitive foods affected the school food environment. Quantitative studies were used to provide data supporting the incidence of overweight and obesity in US children.

**Definition of Terms**

*National School Lunch Program (NSLP):* NSLP supports students’ nutrition by providing free and reduced priced meals to low-income children before school, during school, after school, and over the summer. For those who do not qualify for free or reduced prices, the lunch may be purchased (New American Foundation, 2014).

*Public Health Informatics (PHI):* The systematic application of information and computer science and technology to public health practice, research, and learning (CDC, 2013).

**Assumptions**

The information obtained from the literature reviewed for this project is assumed to be true. However, there are some who believe that the use and consumption of food in the classroom is a personal right and that the school district cannot limit that right. Because of this, some of the literature may not fully reveal the true consequences of competitive foods in the classroom.
Limitations

Possible limitations of this study include lack of a large number of research articles specifically looking at the use of competitive foods in the classroom as well as the validity of continued long term effects on those who are overweight or obese due to the continuance of life for those who are currently overweight or obese due to the use of food in the classroom. Moreover, much of the information utilized for this study was obtained from previous research that utilized surveys and/or self-report of body measurements such as height and weight.

Delimitations

Delimitations of the study include selecting information such as journals, articles and other information that addressed common school food practices, common consequences of school food practices, and differing effects of overweight and obesity. Both quantitative and qualitative data were used to assess information gathered for this project and were used to analyze how competitive foods may have an initial positive effect on both the student and classroom behaviors in general, but the long-term effects can and do have a negative effect on the overall health of the student.

Significance of the Study

The significance of this study is to bring to the forefront the effects of food consumed in schools outside of the NSLP. Specifically, this study intends to show that the use of competitive foods in the classroom is a detriment to the student due to the health effects on the student. The overall public health of students is impacted by the use of competitive foods in the classroom, which ultimately affects the public health of the
community. This study intends to show that by removing foods consumed outside of the NSLP, the overall health and achievement of students will be positively affected. Further, this study intends to reveal that implementation and enforcement of policies regarding the use of competitive foods in the classroom can positively affect the school food environment.

**Summary and Transition**

Food in the classroom (outside of the NSLP) is a public health concern. With 1 out of 3 US students classified as overweight or obese, schools have the ability, as well as responsibility, of ensuring proper nutrition of its students both in and out of the NSLP. Overweight and obesity are caused by the imbalance that results when there is an ingestion of more calories than calories expended. By implementing and enforcing more specific, consistent policies regarding the use of competitive food and beverages in schools as well as removing foods as rewards or incentives in the classroom, the school supports the overall health of the student as well as models what it teaches about health and nutrition in the classroom. The intent of this study is to reveal that states and school districts need to take a harsher stance against competitive foods utilized in their schools because the overall health of their students depends on it.
Chapter 2: Literature Review

**Introduction**

Childhood overweight and obesity are a serious US public health concern. Since 1980, the percentage of children aged 2-5 who are overweight or obese has more than doubled, those aged 6-11 who are overweight or obese has nearly tripled and the percentage of adolescents aged 12-19 who are overweight or obese has more than quadrupled. One-third of today’s youth are overweight or obese. Preventing obesity during childhood is critical as habits formed during youth are often continued into adulthood.

The food kids encounter at school matters. There are new regulations for foods served at lunch, in a la carte lines and school vending machines, but more needs to be done to regulate the other competitive foods from parties, rewards and fundraisers. The kinds of foods served at schools matters on a nutritional level, but it also matters on an educational level. “Whatever nutritional education a child is receiving at school is irrevocably undercut when a teacher passes out candy or fast food restaurant coupons for good performance, or when the school turns a blind eye (or in some cases encourages) fundraising tables heaped with donuts or other junk food,” (Siegel, 2013).

**Literature Review**

The literature review addresses three areas of research regarding competitive foods in the classroom and childhood overweight and obesity. The first section will address research studies related to current health issues due to childhood overweight and obesity and the role schools play in combatting childhood overweight and obesity. The
second section will focus on research studies related to the current food environment in schools and its effect on consumption of healthy foods. Finally, the third section will discuss research studies related to obesity intervention in schools and its effect(s) on the health, academic performance, and behavior of students.

Literature Search

The literature search was performed through the CUNE Library Link using the Academic Search Premier database along with searches using Google Scholar. Expanded searches were conducted using references from useful articles as a means to provide additional resources. Some information was gathered from secondary sources such as government websites (e.g. Centers for Disease Control, US Department of Agriculture Food and Nutrition Center), research organizations (e.g. Robert Wood Johnson Foundation, National Collaborative on Childhood Obesity Research, Center for Science in the Public Interest), and other health-related websites (e.g. Yale Rudd Center, Connecticut State Department of Education Bureau of Health and Nutrition Services). The main terms used in the search were competitive foods, food rewards, classroom, elementary and childhood overweight and obesity. Large database searches utilized key terms such as: use of food(s) in the classroom; effects of foods in the classroom; and effects of overweight and obesity in the classroom.
Body of the Review

Health Issues Due to Childhood Overweight and Obesity and the Role Schools Play in Combatting These Issues

According to the CDC, both overweight and obesity are a result of a “caloric imbalance” meaning there are too few calories expended for the amount of calories consumed. Additionally, both are affected by various genetic, behavioral and environmental factors. Overweight is defined as having excess body weight for a particular height from fat, muscle, bone, water or a combination of these factors. Obesity is defined as having excess body fat (2014).

Obesity has become one of the more complex and challenging public health issues of this decade, affecting two thirds of adults and almost one-third (30%) of children, and recent data indicate no decline in prevalence of obesity in either adults or children (Kubik, Lytle, & Story, 2005). In order to halt the obesity epidemic, most agree important lifestyle behaviors and dietary practices must start in childhood. Recently, there has been increasing awareness on the influence of different environments and environmental factors on overweight and obesity. One of the main environments targeted has been schools because of the amount of time spent there by children. The purpose of this study was to examine the association between selected schoolwide food practices and body mass index (BMI) in young adolescents (Kubik, Lytle, & Story, 2005).

Data for this study were collected in 2000 as part of the Teens Eating for Energy and Nutrition at School study (TEENS), a school-based dietary intervention trial that sought to promote healthful dietary practices among young adolescents to reduce future
cancer risk (Kubik, Lytle, & Story, 2005). In order to participate, school districts had to be within a 30-mile radius of the Minneapolis-St. Paul metropolitan area and have a minimum of 20% of students approved for the free or reduced-cost lunch program. Fourteen districts were eligible and nine districts agreed to participate. Of the nine districts, 16 schools formed the sample for the study. A cross-sectional design was used to collect the student-level data from 3088 eighth grade students (86% of those eligible) in participating schools.

According to Kubik, Lytle, and Story, data from key informant interviews with school administrators were used to develop a schoolwide food practices scale. The questions addressed food-related school policies, schoolwide food use guidelines, and school-based health promotion activities (2005). With this data, a 7-item schoolwide food practices scale (Cronbach α = 0.83) was created (see Table 1 below from Kubik, Lytle & Story, 2005) (see Table 1, Appendix A). Items were scored on a dichotomous scale, with a “yes” response indicating that the practice was allowed (higher scores indicated more food practices were allowed) (Kubik, Lytle, & Story, 2005). The dependent variable, BMI, was calculated from the self-reported height and weight data. Students with a BMI between the 85th and 95th percentile were classified as at risk for overweight while those with BMI greater than the 95th percentile were classified as overweight.

Most of the 3088 eighth grade students were white (70%), 51% were boys, 20% participated in the free or reduced-cost lunch program, 15% were classified as at risk for overweight and 8% were classified as overweight. Two types of analysis were used to evaluate association between student BMI and schoolwide food practices. Mixed-model
analysis of variance techniques were used to evaluate the association between student BMI and the schoolwide food practices scale in order to account for variance anticipated when a cluster-sampling design is used and observations obtained from students in the same school are likely to be correlated. The mixed-model analysis of variance also allowed school-level predictors to be accurately modeled as group-level covariates (Kubik, Lytle, & Story, 2005). General linear mixed modeling was also used. The models used included: a crude model to assess the bivariate association between the independent (schoolwide food practices scale) and dependent (student-level BMI) variables; a model containing simultaneous adjustments for potential confounders (age, sex, race/ethnicity, socioeconomic status as measured by participation in the free or reduced-cost lunch program, number of parents living in the home, highest level of education for mother and father, and number of parents working full time) and a model that included adjustments for potential confounders and all 2-way interactions between gender, race/ethnicity, and socioeconomic status was used.

The results of this study showed that schoolwide food practices were positively associated with students’ BMI. Specifically, for every food practice a student was exposed to, their BMI increased 0.10 points (p = 0.03). As shown in the schoolwide food practices table, food choice at school includes more than foods and beverages that are part of the school meal programs, a la carte, and in vending machines which means that students have multiple opportunities to consume food outside of the school breakfast and lunch program. Regardless of the fact that the majority of the students were categorized
as “normal” weight, continued exposure to these common food practices places all students at risk for weight gain.

Because this study relied on self-reported data and was cross-sectional in design, there are limitations such as response bias and causality cannot be established. However, an ecological approach provides a “snapshot” of the school food environment and its potential influence on the day-to-day dietary practices of students (Kubik et al., 2005). Furthermore, the convenience sample of schools and students may not be representative of other schools and students, thus limiting the generalizability of the study findings (Kubik et al., 2012).

The most prevalent schoolwide food practice was to use food as a reward or incentive. Doing this not only adds additional (often unnecessary) calories to a student’s diet, but it also undermines the nutrition education being conducted at school and often at home. This practice encourages eating by students whenever they want (not necessarily when they are hungry) and this consumption of foods and beverages high in calories and low in nutrients has an adverse effect on students’ BMI. Because schools are influential environments, it is argued that food practices outside of the school breakfast and lunch programs should be restricted.

Turner, Chriqui, and Chaloupka reported that in recent years, the school food environment has been a focal point in efforts to reverse the childhood obesity epidemic. Recent estimates showed that one-third of children ages 6–11 years old in the US were overweight or obese during the 2009-2010 school year (2012). Foods and beverages sold in schools are typically considered to be either part of the school meal program or a
competitive food. A competitive food includes all foods and beverages sold or offered to students outside of the meals programs meaning they typically include items sold in vending machines, school stores and snack bars, or à la carte in the cafeteria, through in-school fundraisers, and offered to students during classroom parties and as rewards in the classroom. Nationwide data from the 2009–10 school year indicated that 65% of U.S. public elementary-school students could purchase foods or beverages from competitive venues (vending machines, school stores/snack bars, and or à la carte lines). Further, the third School Nutrition and Dietary Assessment Study (SNDA-III), conducted during the 2004–05 school year, indicated that 73% of public elementary schools offered at least one source of competitive foods and beverages, including the traditional sales venues (vending machines, school stores/snack bars, and à la carte lines) as well as fundraisers, parties, and given as rewards in the classroom. Moreover, it revealed that 29% of elementary school students consumed competitive items during the average school day (Turner, Chriqui, & Chaloupka, 2012).

Research (such as that revealed by Kubik, Lytle, and Story, 2005) is accumulating and starting to demonstrate that policies regarding competitive food and beverages in schools has an effect on children’s diets and weight status. The purpose of this study was to examine whether state laws and district policies pertaining to nutritional restrictions on school fundraisers (a type of competitive food like those used for rewards in the classroom) were associated with school policies as reported by administrators in a nationally-representative sample of United States public elementary schools (Turner et al., 2012).
The data for this study was collected in multiple ways. School data was collected via mail-back survey from a nationally representative sample of US public elementary schools. For each year, a different sample of schools was used, and each of the samples were developed at the Institute for Survey Research at the University of Michigan and were designed to be nationally-representative of U.S. public elementary schools (containing a 3rd grade) from the contiguous states (excluding Alaska and Hawaii). School weights were developed and adjusted for non-response bias (Turner et al., 2012). District level policy data (i.e. formal policy documents such as: wellness policies, associated rules/regulations, and other policies embedded by reference into the wellness policy/rules) were collected from the corresponding school district by trained research assistants for each elementary school in the sample. Lastly, Turner et al. (2012) collected data on state laws effective as of the beginning of September of each school year by compiling information gained through natural language and Boolean keyword searches of the full-text, tables of contents, and indices of codified state statutory and administrative (regulatory) laws commercially available from subscription-based legal research providers, Westlaw and Lexis-Nexis.

The focus of this study was on foods used in school fundraising. Information on school fundraising restrictions was gathered with the following three survey items (Turner et al., 2012):

- 1) “Does your school have any school-wide policies regarding the nutritional quality of items sold for PTA fundraisers or other fundraisers?”
• Responses were coded as follows: “Yes” (coded = 1), “No” (coded = 0) or “N/A, no fundraising.”

• Two additional items asked which of the following types of restrictions were present:
  2) No foods of minimal nutritional value (FMNVs; carbonated soft drinks and certain candies)
  3) No soda/soft drinks

  • These items were coded 1 = “Yes” versus 0 = “No” or “No restrictions.”

  • For the current analyses, the 5.1% of schools (n = 65) that did not allow any fundraising were re-coded as 1 = yes for each of the fundraising items (i.e., complete ban).

Turner et al., conducted analyses using complex survey commands in STATA/SE 12.0 and accounted for the clustering of schools within districts and states. Analyses were conducted with the data treated as a stacked cross-sectional dataset, controlling for year. Data were weighted to provide inference to all public elementary schools in the US (2012). Even though the samples were selected as separate cross-sectional samples for each year, there was a small overlap that occurred between the two years. There were nine schools that responded in both years, along with 1198 unique schools (n = 649 in 2009–10 and n = 548 in 2010–11) (Turner et al., 2012).

After controlling for school characteristics, results of this study revealed that school policies were consistently associated with state laws and district policies, both
those pertaining to fundraising generally, as well as specific restrictions on the sale of candy and soda in fundraisers (all Odds Ratios >2.0 and Ps<.05) (Turner, et al., 2012). Nevertheless, school policies were not uniformly present even in schools where district policies and state laws required fundraising restrictions. Of these schools, only 55.8% had policies in place. School policies were more common at schools in the West (77.1%) and at majority-Latino schools (71.4%), indicating uneven school-level implementation of district policy and state law (Turner et al., 2012).

According to Turner et al., elementary schools located within districts and states where both had a strong policy/law were more than twice as likely to impose nutritional restrictions on fundraisers, to prohibit FMNVs in fundraising, and to prohibit soda in fundraising activities. However, like the Kubik et al. study, this study relied on self-reported (not observed) data, which can be affected by reporting biases such as desirability or response bias. Further, there is no guarantee that the schools that responded had an enforced policy. Nevertheless, if these types of policy restrictions are effective for foods used in fundraising activities, policy restrictions are likely to be effective in decreasing and/or eliminating the use of food as a reward in the classroom.

Policy restrictions regarding food in schools may be ethically required by schools because children consume a substantial portion of their daily food there. In a special topic report in *Preventing Chronic Disease*, Crawford, Gosliner, and Kayman argue that school is a logical focus for efforts to encourage healthy dietary behaviors to prevent obesity and its consequent individual and collective costs (2011). They go on to suggest that beyond strategic considerations, the concept of the common good justifies
actions (promoting nutritional health) that may appear to conflict with freedom of choice of children, parents, and school staff, or with the interests of food and beverage companies.

The purpose of this article was to present a bioethics framework for justifying stricter regulation of school food and whether schools have a moral obligation to do so. According to Crawford et al., focusing on nutritional health promotion in schools can support the common good by reducing the impact, including substantial financial costs, of future diet-related disease associated with the childhood obesity epidemic (2011). With the number of children who are obese tripling since 1980, schools face new challenges such as 1 in 3 children born in 2000 developing diabetes in his or her lifetime and 39% of obese children aged 5 to 17 years having 2 or more risk factors for cardiovascular disease (Crawford et al., 2011). Policy makers are being advised of the benefits of putting money into healthy school foods in order to reduce future health care costs and to optimize learning and future productivity.

Although children today are consuming sufficient or even excessive food calories, they are not meeting the nutritional requirements described in the federal government’s Dietary Guidelines for Americans (Crawford et al., 2011). A recent Institute of Medicine report commissioned by USDA showed that, on average, American children between the ages of 5 and 18 consume about 720 to 950 empty, discretionary calories per day (USDA, Office of Communications, 2009). Children are not getting the right calories from nutrient-rich foods needed for growth and health. Moreover, children may consume as much as one-third to one-half of their daily calories while at school either through the
National School Lunch Program or the competitive foods marketplace. During a typical day in the first 5 years of the 21st century, 55% of high school students and 44% of middle school students consumed competitive foods at school, frequently instead of school meals (Crawford et al., 2011).

Crawford, Gosliner and Kayman argue that public schools have an obligation to question and refute policies that do not benefit their students and their communities and a corresponding responsibility to protect students, for whom school attendance is mandated, from harm. They propose that this includes protecting students’ nutritional health because schools have long accepted responsibility for supporting the health of their students, for example, by requiring immunizations, providing health screenings, and by offering meal programs (e.g. the National School Lunch Program was established in 1946 in response to claims that many American men had been rejected for World War II military service because of diet-related health problems. The federally assisted meal program was established as “a measure of national security, to safeguard the health and well-being of the Nation’s children and to encourage the domestic consumption of nutritious agricultural commodities,” ("Program History & Data," n.d.)).

While there are some who argue that school food regulation violates the right of the child to choose the foods he or she eats, schools already structure and regulate many student activities in the school setting that are not considered an abridgement of children’s rights. According to Crawford et al., the argument that a child has the right to choose foods of poor nutritional quality at school conflicts with the societal value of child

Crawford et al. used Beauchamp and Childress’s 4 foundational principles of biomedical ethics — autonomy, beneficence, nonmaleficence, and justice — to help address the question of whether a mandate to provide nutritious foods to children at school meets bioethics standards that justify regulatory action (2011). Specifically, they determined the following:

- **Autonomy** - Because children do not have the knowledge and experience needed to choose foods on the basis of nutritional quality, responsible parents provide foods in the home from which the child can reasonably select. Similarly, school authorities are responsible for offering foods from which the child can select while limiting choices to those that provide nutritional benefit rather than harm (Crawford et al., 2011).

- **Beneficence** – Efforts to encourage children to eat nutritionally sound school meals are undermined by provision of snacks and beverages that compete with healthier meals. Offering nutritious, appealing foods at school meals without competition from less healthy snack foods optimizes students’ opportunity to consume a health-promoting diet and serves as a model for educating children and parents alike (Crawford et al., 2011).

- **Nonmaleficence** – An intervention should not inflict harm. Providing nutritional foods does not cause harm. However, providing easy access to
foods of poor nutritional quality should be construed as causing harm (Crawford et al., 2011).

- Justice - The principle of social justice demands that humans be treated fairly, with an equitable distribution of benefits and burdens. Frequent exposure to marketing of competitive (less healthful) foods in schools in low-income areas where children are at greater nutritional risk is at odds with fairness and social justice. Children from low-income families often experience more psychosocial stresses; having access to healthful foods may modify the effects of these stresses on children’s growth and development. Although access to healthful food in schools will be of the greatest benefit to those with the fewest resources, all children benefit from improved nutrition. Doing harm, especially to the most vulnerable children, can never be justified. Selling foods of poor nutritional quality for profit, even if for support of desirable sports or music programs, is an example of such harm (Crawford et al., 2011).

Maximizing cognitive function and academic performance as well as protecting against obesity can be accomplished by promoting optimal nutrition. As revealed by Crawford et al., nutritional health is associated with academic performance such as: well-nourished students are better able to learn and less likely to miss school for health reasons; children from low-income families who participate in school breakfast programs score higher on standardized tests and have better school attendance than similar students who do not participate; and breakfast programs also improve classroom behavior and
attentiveness (for all students) (2011). Schools can and should model an environment that promotes learning and health. This can be done by only offering foods that support children’s health at all schools.

There are many factors that directly and indirectly contribute to childhood overweight and obesity. The main factors are related to behavior, environment and genetics. While genetics cannot necessarily be controlled, behavior and environment can be controlled. The research literature indicates that schools play a large role in maintaining a healthy environment that encourages and enhances healthy nutritional behavior. These articles provide support for the need to do more in our schools to create healthier environments for our children, which will help curb the obesity epidemic. However, the fact that these studies utilized self-reporting does allow for potential bias in the results. Moreover, the schools that said they had policies regarding competitive foods (specifically foods used in fund raisers) may not have been actively enforcing their policies, which would affect the results revealed. Nevertheless, the results reveal that society can do more to prevent childhood obesity by better controlling the nutritional environment(s), and therefore behaviors, to which children are exposed (e.g. schools).

**School Food Environment in the US**

Schools offer a setting where a large number of children can be provided with opportunities to regularly consume healthful meals, be physically active in recess and physical education (PE), and receive instruction in healthy living. Even so, many studies have shown disappointing results when it comes to the impact schools have on healthy eating, physical activity and obesity in children. Coleman, Shordon, Caparosa,
Pomichowski, and Dzewaltowski propose that one main reason for the lack of success in school-based interventions may be that they fail to target system-wide policy and environmental factors influencing a child’s/family’s/school’s ability to change behavior (2012).

The authors of this paper asserted that an evidence-based public health approach (EBPH) may be more effective in achieving positive outcomes when trying to change school environments and policies. This purpose of this paper was to describe an application of the EBPH approach to changing public school nutrition policies and environments: the Healthy Options for Nutrition Environments in Schools (Healthy ONES) study. The Healthy ONES study was designed to address some of the limitations of previous school environment and policy interventions by adapting the EBPH Institute for Healthcare Improvement’s (IHI) rapid improvement process model for school nutrition policy and environmental change (Coleman et al., 2012).

Data for this study was voluntarily collected from the Lemon Grove School District in Lemon Grove, CA. Lemon Grove was a targeted low income school district with six elementary and two middle schools having a total of 4,033 students, 42% Hispanic/Latino, 26% African American, 21% non-Hispanic white, and 11% other or mixed race. All children in the district were eligible for free and reduced school meals. The students involved in the study were second, third and sixth graders.

The steps for the implementation protocol included using the Veteran’s Administration Quality and Enhancement Research Initiative (VA QUERI) model’s approach of having the research team provide guidance in EBPH approaches to the
stakeholders. For the first step in the implementation protocol, the stakeholders were presented with a tentative plan for targeted policies, environments and behaviors. After a baseline environmental audit year, the six elementary schools and two middle schools were randomly assigned as an intervention or control school. The goals of the intervention (which had specific goals/hypotheses (i.e. eliminating unhealthy foods/beverages from school campuses) and was grounded in behavior and systems change theories) were to 1) eliminate unhealthy foods and beverages on campus, 2) develop nutrition services as the main source on campus for healthful eating (HE), and 3) promote school staff modeling of HE (Coleman et al., 2012).

Longitudinal assessment of height and weight were completed for each involved student by measuring their weight to the nearest 0.25-pound on a standard balance scale and height to the nearest 0.25 inch using a stadiometer. Collected data were converted to BMI z scores and percentile BMI values because z scores have been recommended for assessing parametric changes in children’s classification as overweight or obese instead of simply using BMI or body weight (Coleman et al., 2012). Definitions for overweight and obese as defined by the CDC growth charts for age and gender were used (e.g. overweight as ≥ 85th percentile BMI and obesity as ≥ 95th percentile). Observations were made monthly in each targeted school environment and findings were presented as items per child per week (Coleman et al., 2012).

According to Coleman et al., behavioral observation of the nutrition environment was used to index the amount of outside foods and beverages on school campuses and serve as an objective indicator of the changes in policies and organizational behaviors
required of the Healthy ONES intervention (2012). The items consumed by children during the observation period in both the lunch/cafeteria and morning snack/recess environments were observed and recorded. However, because the researchers were not allowed into the classrooms to observe and because it was too difficult to reliably quantify items during school-wide events, this data was collected by a systematic observation of school trash.

Coleman et al., states the EBPH approach relies heavily on program-planning and evaluation frameworks such as Green and Krueter’s Precede-Proceed model to address the organizational level variables (e.g. financial concerns, labor issues, staff behavior, parental reactions) that may determine intervention effectiveness. The EBPH approach utilizes stakeholder engagement as parts of all phases of intervention design, implementation, and evaluation in order to tailor the interventions to existing organizational conditions (2012). The fixed factors in this model were: intervention (control, intervention), gender (boy, girl), and year (baseline, year 1, year 2) (Table 2, Appendix B).

Analysis of the height and weight data utilized a mixed model of analysis of covariance (ANCOVA), which allowed for adjustment of the clustered data structure and to determine the impact of the primary outcome measures. Mixed model ANCOVA included main effects and interactions of the fixed factors. Variables that were considered random effects included: school, student, time nested within school, and the error associated with repeated measures. Baseline data were treated as a covariate in the model. Data were analyzed with all participants in the model regardless of whether or not they
had follow-up measures and again using only the participants for whom we had all three measurement points (Coleman et al., 2012).

Behavioral observation outcomes were analyzed using a mixed ANOVA with one repeated measure of time and two between subject’s measures of intervention and environment (recess, lunch, classroom) (Coleman et al., 2012). Because data was collected across school, it wasn’t necessary to control for the nesting effect of students across time. However, according to Coleman et al., in order to compare schools and to examine changes over time, total items across environments were corrected for the size of each school (i.e. larger schools had more students and staff and therefore had greater amounts of items). Using this adjustment, outcome variables used for the observational analyses were items per child per week (2012).

When children who had measures for all time points (424) were compared to those who did not (155) at baseline, there were no differences noted in rates of obesity, age and gender. However, the children who had measures for all time points had significantly higher BMI Z scores [t (577) = 3.73; p = .05] and rates of overweight or obesity [X2(1) = 4.08; p = .04] at baseline when compared to children who did not have measures for all time points (Coleman et al., 2012). Overall total outside food and beverage items per child per week decreased for those in intervention schools and increased over time in control schools. This effect varied due to school environment especially those with a morning snack recess/playground environment.

Coleman et al., reported there were no differences between groups in outside unhealthy foods/beverages for the classroom/school-wide events or school lunch/cafeteria
environments. However, outside foods/beverages in the lunch/cafeteria environment increased and then decreased over time for both groups (p < .01) (2012). It is interesting to note that outside healthy food items at intervention school campuses decreased over time while control school items did not change. Specifically, outside healthy food items at the morning snack/recess playground environment in control schools did not change while intervention schools decreased (p = 0.02). The lunch/cafeteria environment revealed an opposite effect with outside healthy food items increasing in intervention (p = .02) and decreasing in control schools (p = .02). There was no difference between groups for the classroom/school-wide event environment (Coleman et al., 2012). Over time, outside healthy drink items increased in all environments and schools.

As hypothesized using an implementation-focused EBPH approach to change nutrition environments and policies significantly decreased outside foods and beverages on campuses (Coleman et al., 2012). Most of the change was seen in the use of unhealthy foods and beverages. However, even healthy foods decreased during the morning snack recess/playground environment. In intervention schools, the consumption of healthy food items increased during lunch. These changes may be due to changes in the organizational practices and policies (e.g. substituting food/beverage rewards for nonfood/beverage rewards in the classroom, nutrition services catering healthy school-wide events and classroom celebrations, fundraising with healthy foods and beverages and nonfood activities such as “Jog-A-Thons”, adding a nutrition services prepared fruit snack at recess and not allowing outside foods and beverages in this environment, notifications sent home to parents about allowed healthy foods and beverages on campuses, school
staff not consuming unhealthy foods and beverages in their classrooms, principals working to support teachers in turning parent unhealthy foods and beverages away when brought to campuses, and adding fruits and vegetables to school lunch entrees (Coleman et al., 2012).

The authors also hypothesized that the nutrition environment and policy changes would result in significant differences in rates of obesity. This change was not seen in either of the schools. The lack of change in obesity rates may have been because the implementation protocol took an entire year to conduct, which only left a year to utilize implementation activities in all the intervention schools. Therefore, future studies using an EBPH approach should allow for a longer intervention period (at least three years) to assess the maximal impact of the change strategies on child obesity rates (Coleman et al., 2012).

The limitations in this study included time and lack of control outside of the school environment. As stated previously, the intervention only lasted one year. This is not likely enough time to see true results. As for lack of control outside of the school environment, schools cannot mandate what foods are served at home. Even though parents were targeted through policy changes to prevent their sending unhealthy foods and beverages to school, this may have had little impact on nutrition practices at home (Coleman et al., 2012). Future studies should focus on improving wellness policies and incorporating families in the wellness policies as well as implementing good nutrition and physical activity outside of the school environment.
Habits formed during youth are often continued into adulthood. Therefore, preventing obesity during childhood is critical. For example, an obese 4-year-old has a 20% greater chance of becoming obese as an adult and an obese teenager has up to an 80% chance of becoming an obese adult (NCCOR, n.d.). Because of this obesity epidemic, the US (and other countries around the world) are in danger of raising the first generation of children who will live sicker and die younger than the generation that preceded them.

American children spend one-third or more of their day at school where education occurs both in and out of the classroom. Therefore, the foods and beverages available in schools affect students’ diets and their weight. While schools play a major role in educating youth on healthy habits (e.g. eating, physical activity, mental health, etc.), parents and families also spend time teaching their children healthy habits at home. Hence, the messages being sent during a classroom lesson, while passing through the halls or while eating a school lunch must correspond to what is actually being taught about health in the classroom. Using foods or beverages that are not considered healthy as a reward for accomplishment or positive behavior are not only contradictory to what is being taught but also harm the health of students.

According to Turner, Sandoval, Chriqui, and Chaloupka, many studies show that schools offer a variety of unhealthy snacks and drinks in traditional sales venues. However, there has been less research about other competitive food and beverage practices, which also expose students to unhealthy fare at school. In 2004-05, 29 percent of U.S. elementary students consumed competitive items on a typical school day, and the
most commonly reported sources of competitive items in elementary schools were fundraisers, parties, and rewards or other classroom activities (2013, p. 1). Data drawn from surveys of nationally representative samples of US public elementary schools in 2009–10, 2010–11, and 2011–12 revealed that over 50% of these schools allowed the following competitive food and beverage practices: no limits on sugary items at birthday parties, no nutritional restrictions for fundraisers, sugary items allowed to be used as reward, food coupons used as incentives and candy allowed to be used in lessons (Turner et al., 2013, p. 2).

This applied research project provides evidence of the negative effects of competitive foods in the classroom. The excess calories from these low nutrient dense foods can lead to childhood overweight and obesity, which can lead to overweight and obesity in adulthood. The effects of overweight and obesity in children include, but are not limited to: increased risk for asthma; higher risk for psychosocial problems, fatty liver, orthopedic-related problems, and sleep apnea; increased proportion of youths with type 2 diabetes; and increased incidence of risk factors for cardiovascular disease (CVD) including high cholesterol levels, high blood pressure and abnormal glucose tolerance (NCCOR, n.d.). Freedman, Mei, Srinivasan, Berenson, and. Dietz reported in 2007 that of children with a BMI ≥95th percentile (P) of the Centers for Disease Control (CDC) growth charts, 39% had at least two risk factors, 65% had excess adiposity, and 65% had an adult BMI of ≥35 kg/m2. Of those with a BMI ≥99th P, 59% had at least two risk factors, 94% had excess adiposity, and 88% had an adult BMI of ≥35 kg/m2. About 4% of children in the US now have a BMI ≥99th P (2007). Furthermore, NCCOR also states
that students who are obese are absent from school significantly more often than average weight children (n.d.). All of these issues are preventable if and when overweight and obesity are prevented. Therefore, preventing food from being used as a reward in the classroom is one step towards preventing overweight and obesity in the next generation.

Because one-third of US children are overweight or obese, improving the nutritional quality of foods and beverages in schools is a key aspect of obesity prevention efforts. Lawmakers have recently recognized the potential for state and district policies regarding healthy nutrition and activity to promote healthy school food environments and combat obesity. Since 2006–2007, district policies addressing competitive foods and beverages have become more prevalent, but party restrictions are rare; as of 2008–2009, only 2% of public elementary school students nationwide were enrolled in a district with strong nutritional restrictions on items served during school parties (Turner, Chriqui, and Chaloupka, 2013). Foods offered at a classroom party are considered a competitive food in the school environment. Turner et al., chose to research competitive foods served at classroom parties because little research has been done in this area. Nevertheless, the research that has been done has shown that the foods served at classroom parties are unhealthy.

The purpose of this study was to examine associations among school, district, and state policies regarding classroom birthday and holiday parties (Turner, Chriqui, & Chaloupka, 2013). This study used nationally representative cross-sectional data from US public elementary schools during 2009–2010 and 2010–2011. All public elementary schools containing a third-grade class with at least 20 students, from the contiguous US,
were eligible for sampling. According to Turner et al., in each year, 1,070 schools were sampled. The response rate was 64.5% in 2009–2010 and 57.4% in 2010–2011 (2013).

Principals of each school received surveys in the mail each January of participating years. If a survey wasn’t returned, follow-up was conducted via mail, email and telephone until the end of June. The principals were asked questions regarding a variety of food and nutrition practices (i.e. timing and duration of meals, participation in NSLP, availability of competitive foods), physical activity (i.e. physical education and recess) and other wellness practices (policy development).

Data for this study were gathered by researchers from *Bridging the Gap*, a research program supported by the Robert Wood Johnson Foundation. Researchers developed the surveys to be consistent with surveys from an existing parallel practice of studies in the middle and high school (Turner et al., 2014). The variables in this study were the prevalence of school-wide restrictions on sugary items served during parties and they type, if any, policy in place by each school district and/or state. If schools had policies on wellness, health and nutrition and physical activity, it was collected by trained researchers. If there were state laws or regulations in effect in September of each school year pertaining to classroom parties, researchers gathered this data and coded it using the same methods and rubric as district policies.

According to Turner et al., each school was classified into 1 of 4 mutually exclusive and exhaustive categories: (1) no district policy and no state law, (2) district policy only, (3) state law only, and (4) both district policy and state law. Multivariate logistic regressions were used to examine associations between school-level restrictions
(outcome) and district policies and state laws, controlling for demographics and school year (Turner et al., 2013). They did this by comparing the schools in the second, third and fourth categories to those in the first category (no policy schools). The researchers also examined how, or if, schools abided by district policies and state law.

Overall, results showed that school limits on unhealthy, sugary foods were more likely in states and districts where policy and law addressed specific nutritional aspects of foods and beverages served in classroom parties. Specifically, less than 10% of schools that responded reported prohibiting sugary items during classroom parties, about one-third discouraged sugary items and about half either had no restrictions or left the decision up to the teacher. Schools located in districts and states with regulations were 2.5 times more likely to restrict sugary (unhealthy) items at parties than were schools with no corresponding policy or law. Even so, of schools in districts and states with regulations, covariate-adjusted prevalence revealed that only 63.1% of schools had restrictions on birthday parties and 58.2% had restrictions on holiday parties. Further analysis revealed that school-level policies were not necessarily concordant with state law and district policy (Turner et al., 2013).

The research by Turner et al. revealed that elementary school-level restrictions on classroom parties were related to relevant state law and district policy, although schools did not consistently follow such laws and policies. Many schools only have regulations on sugary foods and not restrictions. There are political challenges of enacting such laws as well as controversies and media debate due to some who believe schools do not have a right to regulate competitive foods. Nevertheless, policy and law were positively
associated with increased school-level restrictions, which demonstrate the value of having policies. If more states, districts and individual schools implement policies on competitive foods, fewer unnecessary and unhealthy calories will be able to make it into children’s diets.

Limitations in this study were mainly related to the research being conducted by survey. Because this study was completed by surveys, the researchers were limited in their ability to evaluate party practices in detail and it only inquired about school policies so researchers did not know if they were actually enforced. Further, because principals (and not teachers) replied to the surveys, there was variability in party frequency and foods allowed within schools. For example, some teachers may allow parties with food every week whereas some teachers may only have quarterly parties and never allow food. Moreover, the surveys didn’t collect information about student dietary intake or student weight and the authors recommend this for future studies.

Recent data indicates that 32.6% of elementary students (ages 6-11) are overweight or obese. Schools play a key role in shaping kids’ dietary intake habits but a student’s dietary intake at school is not always healthy. Unhealthy foods typically come from the competitive market such as foods sold a la carte, in the vending machine, brought from home for parties, foods used for fundraising or foods used for rewards. Even though many national organizations recommend against it, using food as a reward in the classroom is a common practice in US schools.

The purpose of this study was to examine the prevalence of using food as a reward in the classroom in public elementary schools and to examine the association
between school practices and corresponding district policies (Turner, Chriqui, & Chaloupka, 2012b). Data were gathered during the 2007-2008, 2008-2009 and 2009-2010 school years via mail-back surveys sent to elementary school principals (or other respondent with knowledge of school nutrition and physical activity policies) from a nationally representative sample of US public elementary schools. Each school selected was required to have a third grade. Turner et al., reported that data were weighted to provide inference to all public elementary schools in the US. Further, to control for confounding, data were obtained on the total number of students in the school, the number of students receiving free or reduced priced lunch, student race/ethnicity, US census report and locale (2012b).

The 2,069 returned surveys were collected between January and June of each school year. Each survey had approximately 200 items to be answered. These items remained identical over the course of the three years. According to Turner et al., the lead-in asked respondents to “indicate whether the following practices occur at your school.” Items were “food (e.g. candy) is used as a reward for good academic performance” and “food (e.g. candy) is used as a reward for good behavior.” Options were “No;” “Yes, but it is up to the teacher;” or “Yes, but it is discouraged” (2012b). District level policy data (e.g. policy manuals and wellness policies as mandated by the Child Nutrition and WIC Reauthorization Act of 2004) were collected by researchers following an established protocol using Internet searches, telephone calls, and mailings (to find policies not available online) (Turner et al., 2012b). There were two provisions for coding policy.
Policies that explicitly prohibited the use of food as a reward were coded with a “1” while those that only discouraged or had no policy in place were coded with a “0.”

Surveys received were double-entered for quality assurance and district policies were double-coded and analyzed by two trained researchers. Response rates for surveys were calculated using the American Association for Public Opinion Research Method Two and counted partial responses as complete (Turner et al., 2012b). The data for policy was entered into an Excel spreadsheet. Two multivariate logistic regression models were calculated. The outcome of the first model was food as a reward for good academic performance and the outcome of the second model was food as a reward for good behavior.

There were two dependent variables in this study, which were collected by survey response. They were: food as a reward for good academic performance and food as a reward for good behavior. Each of these depended on: (1) whether or not there was a policy in place that explicitly prohibited the use of food as a reward, (2) if the practice was just discouraged and/or up to the teacher or (3) there was no policy. The independent variables in this study included: the school year, type of policy, percentage of students eligible for free or reduced-price lunch, race/ethnicity, location in US and school size. According to Turner et al., the data for these were obtained from the National Center for Education Statistics Common Core of data for each survey year (2012b).

Results showed that the percentage of districts with strong policies prohibiting the use of food as a reward in the classroom did not differ significantly over the course of the three years. The school-level survey data revealed that even though there are national
recommendations against the practice of using food as a reward in the classroom, many elementary schools still continue this practice. However, even though there were only approximately 10% of school districts with policies that strictly prohibited the use of food as a reward in the classroom, these policies were significantly associated with school practices (Turner et al., 2012b). Specifically, Turner et al. reported that multivariate analysis revealed when school contextual factors and year were controlled in schools where district policy prohibited the use of food as a reward, school respondents were significantly more likely to report that food was not used as a reward for academic performance (odds ratio 1.71, 95% CI 1.09 to 2.67 $P<0.05$) nor for good student behavior (odds ratio 1.66, 95% CI 1.03 to 2.51 $P<0.05$) (2012b). Further, logistic regression analyses revealed significant differences between schools depending on the school location (e.g. respondents from the West and Midwest were less likely to respond that food was used as a reward for either academic performance or good behavior than respondents from the South or Northeast) (Turner et al., 2012b).

This was the first study to examine associations between district policies and school practices pertaining to the use of food as a reward in the classroom (Turner et al., 2012b). While the results showed that districts with strong, formal policies in place had schools that used fewer food rewards, it didn’t account for any informal policies at the district, school or even teacher level. Nevertheless, this does suggest that having policies in place does have a positive effect on the school food environment. Therefore, making policy changes is an effective method of battling the obesity epidemic at the school level.
There were a few limitations in this study. The first is due to it being a survey (like previous studies reviewed). Further, as stated previously, the study didn’t account for any informal policies that may have been in place which may skew the results simply because a specific school in a district or teacher in a school may have a “no food” rule in their classroom(s) but be in a district that does not have a strong policy or any policy at all. Moreover, the results were coded as either a “yes” or “no” for policy so those districts that had recommendations against using food were actually coded as “no” in the results even though they may not have had any schools or teachers using food as a reward in their classroom(s).

School food environments entail much more than just the school breakfast and lunch programs. Vending machines, a la carte items, food from home, school fundraisers and classroom rewards are all potential food sources in schools. These competitive foods are not regulated like the NSLP and are therefore often high calorie/nutrient dense food with low nutritional value. The research presented thus far has revealed that having policies in place to regulate the use and consumption of these foods on school campuses is likely the have a positive health effect on the students. In the 2013 study by Turner et al., the authors shared information about a direct observation of 6 classroom parties in one urban elementary school that found, on average, students consumed an estimated 444 kilocalories from items served at each party, and were also given take-home goody bags with an estimated total of 638 kilocalories. These calories are unnecessary and unhealthy. Moreover, foods served as a reward for academic performance or behaviors are likely to teach children to associate eating with feeling good or performing well rather than to
associate food with hunger. While many people feel it is a right to be able to eat when and what one wants, there are many people who also feel that teaching children to eat when they are not actually hungry will have a potentially lifelong negative effect on their eating habits and overall health. Therefore, because schools have the opportunity to provide a healthy food environment, which can teach lifelong lessons about nutritional health, they should.

**Obesity Interventions in Schools**

Childhood overweight and obesity has been on the rise for the past three decades. The urgency for effective childhood obesity intervention programs is apparent from the growing health, social, and economical costs associated with the rising rates of obesity (Greening, Harrell, Low & Fielder, 2011). Children spend approximately one-third of their day (one-half of their non-sleeping day) in schools. Therefore, it’s argued that school-based interventions designed to instill healthy lifestyle behaviors by promoting, encouraging and engaging children in nutritional and physical activities might be a viable solution for preventing childhood obesity.

The purpose of the present study was to apply the Social Learning Theory to a school-based childhood obesity intervention program in a state where the rate of obesity is the highest in the nation—Mississippi (Greening et al., 2011). The intervention in this study took place in rural Mississippi and involved the only two schools in their respective communities with a total of 450 students ranging in age from 6-10 years of age. The community populations and median incomes were comparable with a range of 3,500 to 4,500 residents and income of $30,713 for the intervention community and $29,904 for
the control community. According to Greening et al., approximately two thirds were African American (63% control; 58% intervention) and the remaining students were white (37% control; 42% intervention). Approximately half were male (52%) and 48% were female. The ethnic/racial composition of the sample allowed for statistical comparisons for treatment effects between African-American and white youth (2011).

Schools were randomly assigned as a control or intervention school after obtaining institutional review and school board approval. In order for students to participate, parents had to provide written informed consent. Students were excluded if they had a disability that precluded comprehending the questionnaires or performing the fitness tests. Ultimately, 450 students had complete data that could be analyzed at the end of the study.

Baseline data, including height, weight, waist circumference, percentage body fat, performance on three fitness tests, nutrition knowledge, self-report physical and dietary habit activity, and were collected at both schools during a weeklong assessment (Greening et al., 2011). Following these baseline assessments, an 8-month intervention was completed while the control school followed the state’s standard health curriculum. As reported by Greening et al., the state’s standard health curriculum included didactic nutrition education, health information incorporated into academic lessons, and weekly physical education classes. The intervention program included monthly family events that alternated between nutrition and physical activities/contests (2011). (Please see the table below for specifics on both the intervention and control school activities.) Following the
8-month intervention, a posttest was conducted where the students were again measured and questioned.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Curriculum</th>
<th>Intervention Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition</td>
<td>45-min nutritional information session presented once during the school year by a nutritionist</td>
<td>Family- and school-based nutritional events on alternating months including: (i) healthy tailgating recipe contest, (ii) supermarket sweep requiring parent and student to locate healthy, low-nonfat food ingredients for recipes, (iii) healthy snack selection contest, and (iv) parent–child healthy holiday eating and activity log</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>45-min physical education class twice a week</td>
<td>Family- and school-based physical activity events on alternating months including: (i) parent–child football toss contest, (ii) parent–child holiday activity log, (iii) parent–child softball throw contest, and (iv) field day of various activities including rope jumping, hula hoops, baseball throws, foot races</td>
</tr>
<tr>
<td>Health Education</td>
<td>Teachers incorporated health information in weekly class lectures e.g., health risks for diseases including smoking, lack of exercise, etc.</td>
<td>Nutritional content of foods addressed in monthly nutritional events. Portion sizes and eating in moderation addressed. Health benefits of the monthly physical activity events were provided during the activity</td>
</tr>
<tr>
<td>Institutional</td>
<td>None</td>
<td>Replaced deep frying equipment with baking ovens</td>
</tr>
</tbody>
</table>

Teachers and mothers participated in recipe selections, food preparations, and in the activities with the students. Health providers (e.g., dietitians) and educators from the Department of Education organized and facilitated participation in the nutritional and physical activity events in collaboration with the elementary school and the school’s faculty.

*(Greening et al., 2011)*
Measurements of adiposity were taken on each child and BMI was calculated using the most recent Centers for Disease Control’s BMI for age- and sex-specific growth charts (obesity is defined as BMI ≥95th percentile for age and sex). Bioelectrical impedance analysis was performed on each child to estimate percentage body fat using a BF-350A body composition analyzer which has been found to correlate significantly with dual energy X-ray estimates of fatness (0.86), skinfold thickness (0.83), and BMI (0.82) (Greening et al., 2011). Nutrition knowledge was assessed by students completing the Know Your Body Questionnaire, which consisted of twelve multiple-choice items for children. It was written at a first-grade reading level and each response included two possible choices about healthy food that were presented pictorially. Fitness was measured using three fitness tests from the President’s Challenge Physical Activity and Fitness Awards Program. The three tests were: the shuttle run, curl-ups and the V-sit. Variables for these tests included the number of seconds it took for the child to complete the shuttle run, the number of curl-ups completed in one minute and the distance in centimeters stretched for the V-sit (Greening et al., 2011). Physical activity was measured by children checking off each of 21 activities they engaged in during the previous day for a minimum of 15 minutes. Lastly, dietary habits were measured using a 17-item Child Dietary Fat Questionnaire about the child’s dietary habits that was filled out by the primary caregiver.

Greening et al. regressed the post-test scores for the various adiposity measures on the respective pretest scores. The results of those regressions represent change in adiposity measure adjusted for baseline variances. These residualized change scores
revealed that the intervention school showed statistically significant improvement in percentage body fat, physical activity, performance on fitness tests, and dietary habits compared to the control school (Greening et al., 2011). Moreover, there was no evidence of differences in outcomes based on gender or ethnicity/race.

Implications from this study include early intervention in development may offer the best outcome because of the difficulties with changing lifestyle behaviors later in adulthood and that both boys and girls, and African-American and white children can benefit equally from such interventions (Greening et al., 2011). This study also suggests that similar programs may be one option for other schools/communities as it can be administered easily by school health champions (e.g., school nurse, counselor) and is relatively inexpensive.

A few methodological limitations existed in this study. For instance, there was potential for bias with the use of self- and/or parent-report measures for physical activity and dietary fat intake. In order to possibly overcome these biases, objective adiposity and fitness measures were included. Another limitation in this study was the use of adiposity measures interchangeably (e.g. BMI is criticized for not being a precise indicator of underlying proportion of fat and lean tissue). Lastly, developmental factors such as physical growth and the nature of the fitness tests may have presented limitations to this study.

While this study didn’t address the use of competitive foods in the classroom directly, it did address how schools can create a positive food environment, which can help combat obesity. Greening et al. suggest that obesity may be a problem that needs to
be addressed with community action and not just individuals. Further, the earlier this action is undertaken in children’s development, the greater the likelihood of sustaining treatment (and prevention) gains (Greening et al., 2011).

Again, childhood overweight and obesity has become a prominent public health concern. Childhood obesity has been shown to be associated with several immediate health risk factors such as orthopedic, neurological, pulmonary, gastroenterological, and endocrine conditions (Datar, Sturm and Magnabosco, 2004). Maybe even more importantly, according to Datar et al., obesity also affects children’s psychosocial outcomes, such as low self-esteem and depression, resulting from overweight concerns. Because of these potential outcomes, other aspects of childrens’ lives may be affected such as academic performance and more serious social outcomes.

While it is well known that lower educational achievement is associated with adults who are obese, it has not been well-studied in children. Some recent research has reported that obese adolescents have self-reported themselves as poorer performing students, but prior to this study, there were only two known studies evaluating related issues of overweight/obesity and academic performance in young, early elementary-aged children. The purpose of this study was to examine the association between children’s overweight status in kindergarten and their academic achievement in kindergarten and first grade (Datar et al., 2004).

This study used a national probability sample of kindergartners in the U.S. to examine whether overweight status in kindergarten was associated with poor academic performance during the first 2 years in school (kindergarten and first grade). Specifically,
the students were part of the Early Childhood Longitudinal Study-Kindergarten Class (ECLS-K). According to Datar et al., the ECLS-K surveyed a nationally representative cohort of kindergarteners in the US during the 1998-1999 school year by using a multistage cluster sampling design. Further, this study controlled for socioeconomic characteristics and other potential confounders such as birth weight, mother’s educational level, race/ethnicity, annual family income and urbanicity.

At the beginning of each data collection period, the children’s height and weight were measured by researchers rather than self-reported in order to reduce self-reporting error and bias. This data was used to calculate BMI according to the CDC’s recommended definition of overweight (BMI > 95% was considered overweight). The surveyed students were individually given math and reading assessments at each data collection point. For both reading and math, assessments consisted of a two-stage assessment. According to Datar et al., in the first stage, children received a 12- to 20-item routing test. Performance on the routing items guided the selection of one of the several alternative second stage tests. The second stage test contained items of appropriate difficulty for the level of ability indicated by the routing test (2004). Item response theory (IRT) scale scores were computed for all students because the students did not take the exact same test. These scores are comparable across students within a wave and also across waves enabling comparison of children’s performance over time (Datar et al., 2004).

The dependent variables in this study were the students’ math and reading scores during the first, second and fourth data collection points. The standardized IRT scale
scores in reading and math were used to measure children’s cognitive skills and were an indicator of the child’s performance relative to their peers. The independent variable was an indicator variable for the child’s overweight status at baseline (Datar et al., 2004). According to Datar et al., the ECLS collected children's height and weight measurements in each wave, and these were used to compute the BMI. The height and weight measurements were recorded by the assessor using the Shorr Board and a digital bathroom scale, respectively. All children were measured twice to minimize measurement error (2004). Other independent variables included: race/ethnicity, mother's education, annual family income, and urbanicity.

When analyzing the data, multivariate regression was used to control for socioeconomic factors as well as other potentially confounding factors that could have been correlated with childhood overweight and academic performance. Separate analyses were conducted for boys and girls. Cross-sectional estimates of the effect of overweight status were initially obtained from just the fall kindergarten data. A longitudinal regression analysis where the effect of overweight status on test scores was estimated was conducted on test scores in the later waves. This model was identical to one where change scores are regressed on baseline test scores. Controlling for baseline test scores removed the influence of effects of other factors that determine school readiness and allowed us to examine the independent effect of obesity on academic achievement as a result of being in school (Datar et al., 2004). Furthermore, according to Datar et al., because of the clustered sample design, the SEs of the regression were adjusted using the
Huber/White correction as implemented in the cluster option in Stata 7.0 (Stata Corporation, College Station, TX)(2004).

The results of this study did show that overweight children had significantly lower math and reading test scores compared with non-overweight children in kindergarten. Because both groups gained similarly on math and reading test scores, significantly lower test scores were also seen among overweight children at the end of first grade. However, these differences, except for boys’ math scores at baseline (difference = 1.22 points, p = 0.001), became insignificant after including socioeconomic and behavioral variables, indicating that overweight is a marker but not a causal factor (Datar et al., 2004). Additionally, this study by Datar et al. revealed that race/ethnicity and mother's education were stronger predictors of test score gains or levels than overweight status.

With the exception of math scores for boys at baseline, there was not a significant difference between overweight and non-overweight kids’ test scores when socioeconomic and behavioral variables were controlled. Therefore, the results of this study indicate the following: 1) that overweight is not a causal factor affecting academic performance and 2) race/ethnicity and mother’s education are stronger predictors of test scores than overweight status. Nevertheless, Datar et al. (2004) states,

“Even though the significant differences in test scores by overweight status can be explained with other individual characteristics, especially parental education and the home environment, overweight is more easily observable by students compared with other socioeconomic characteristics, and its significant (unadjusted) association with worse
academic performance can contribute to the stigma of overweight as early as the first years of elementary school.”

There are limitations in this study that the current study addressed. First, by controlling for socioeconomic differences and other potential confounding factors, the association between overweight and test scores was weakened. These controls were more comprehensive than in previous studies and may have actually been too comprehensive. Datar et al. admit that this study may have over controlled for some factors such as physical activity and television watching. They say it’s possible that obesity may be as much a cause as a consequence of these factors. Second, because lifestyle and quality of the home environment are difficult to observe and measure, conducting a cross-sectional analysis does not help in determining the direction of the effect (e.g. lower test scores may cause overweight among children just as overweight status may lead to lower test scores (Datar et al., 2004)). Lastly, even though the association between overweight status and academic performance in this study was statistically insignificant (with the exception of boys’ math scores at baseline), it doesn’t mean that weight status is not important for academic performance (i.e. the study was only two years long which may not have been long enough to show statistical significance).

The current obesity epidemic has had an effect on policies in the US. National medical organizations, policymakers, and the federal government have called for bold policy initiatives to reduce obesity because the long-term effects of obesity on morbidity and premature mortality during adulthood are well documented (Taber, Chriqui, Perna, Powell, and Chaloupka, 2014). Many interventions have attempted to halt the obesity
epidemic without considerable success. Taber et al. argue that education-based interventions are not adequate as they (alone) do not change the obesogenic (high calorie, low nutrient dense food) environment in which children and adolescents are often emerged. Because schools have become another source of sugar-sweetened beverages, candy and other unhealthy foods and beverages, the purpose of this study was to determine if state laws regarding nutrition content of foods and beverages sold outside of the federal school meal program were associated with lower adolescent weight gain (Taber et al., 2012).

The data for this study were obtained from the Early Childhood Longitudinal Study – Kindergarten Class (ECLS-) which was a cohort that began as a nationally representative sample of kindergarten students in 1998 and was followed through seven rounds of data collection (Taber et al., 2012). For this particular study, public school student data was taken from measurements in round 6 (fifth grade, spring 2004) and round 7 (eighth grade, spring 2007). Forty states (6300 students) were represented by the study sample used. Those states not represented tended to have weaker laws but they did not differ from the sample with respect to state median income, poverty rate, adult education or obesity prevalence.

School food environments, especially middle and high school food environments, often have competitive foods easily available. In the past, these foods have been exempt from federal nutrition regulations. (Currently, one of the things the Healthy, Hunger-Free Kids Act of 2010 requires is that competitive foods be subject to standards set by the US Department of Agriculture (USDA) in schools that participate in federal meal programs.)
Because there was a lack of evidence regarding an association between school nutrition policies and student weight status, this study was designed to estimate the association between independently coded state laws governing competitive foods and change in BMI and weight status of adolescent students.

In each survey round, student weight was taken using a digital scale and height was measured with a Shorr board. ECSL-K researchers took each measurement and calculated BMI according to the 2000 CDC growth charts. Students were then categorized as overweight if their BMI was greater than or equal to the age and gender-specific 85th percentile and obese if it was greater than or equal to the 95th percentile. BMI was used in lieu of BMI percentile or z score because the variability of changes in BMI percentile and z score are associated with baseline values of these measures (Taber et al., 2012).

State laws regarding the availability of high-caloric-density, low-nutrient-density foods and beverages in schools were obtained from the National Cancer Institute’s Classification of Laws Associated with School Students school nutrition scoring system. Statutory and administrative laws were compiled by conducting searches of Westlaw (a subscription-based legal research database). The categories of laws included were: 1) competitive foods sold in vending machines 2) beverages sold in vending machines 3) competitive foods sold in cafeterias (a la carte) 4) beverages sold in cafeterias (a la carte) 5) competitive foods sold in other venues (e.g. stores) and 6) beverages sold in other venues (e.g. stores). States were then rated on scale of 0 to 6 for each category of laws beginning in 2003. According to Taber et al., for the purpose of this study, states were
categorized as having “strong” competitive food laws if their average rating was > 2.0 (this cut point was chosen because ratings >2 represent laws with specific, required standards, as opposed to laws that contained weak language (e.g. “recommended” standards)). States with an average rating of 1 to 2 were categorized as having “weak” competitive food laws (2012).

The independent variables in this study were the 2003 state law category and the changes in state laws from 2003-2006 as these years preceded the spring seasons when student data were collected (Taber et al., 2012). The dependent variables in this study were the changes in BMI of each individual student (if any change) and the obesity and overweight status of each student. General linear models were used to estimate differences across 2003 middle school law categories (strong, weak, none) in each dependent variable. In both fifth and eighth grade, those identified as overweight or obese were separated from those who were not identified in order to estimate incidence and maintenance of obesity. According to Taber et al., models were adjusted for gender, age, race/ethnicity, socioeconomic status (measured by using an index that combined data on parental education, occupation, and income), school locale (city, suburb, township/rural), Census region, physical activity and 2003 state adult obesity prevalence (2012). Physical activity was measured by asking the eighth grade students how many days they engaged in an activity that made them sweat or breathe hard for at least 20 minutes in the previous week. For fifth graders, physical activity was measured by parent report of activity in the previous week.
Law changes between 2003 and 2006 were categorized using 2 criteria: 1) the state’s average rating for 2006 middle school laws (e.g. was their rating equal to, higher than or lower than) compared to their average rating for 2003 elementary laws (“no change,” “new law,” or “weaker laws” respectively) and 2) the “new laws” category was subdivided into 2 categories (strong or weak) and the “no change” category was subdivided into 3 categories (strong, weak, none). An individual-level fixed-effect model was used to estimate differences between categories in within-student changes in BMI, overweight, or obesity, adjusted for SES and locale (Taber et al., 2012).

Overall, this study revealed that state competitive food laws were associated with lower BMI change and lower risk of remaining overweight or obese over time. The two key factors that influenced the association were law strength and consistency of the law(s). Specifically, students exposed to strong laws at baseline gained, on average, 0.25 fewer BMI units (95% CI: -0.54, 0.03) and were less likely to remain overweight or obese over time than students in states with no laws (Taber et al., 2012). Students also gained fewer BMI units if exposed to consistently strong laws throughout follow-up ($\beta = -0.44$, 95% CI: -0.71, -0.18) (Taber et al., 2012). Taber et al. also reported that students exposed to weaker laws in 2006 had approximately the same BMI change as those who were no exposed to any relevant laws throughout follow-up ($\beta = -0.04$, 95% CI: -0.24, 0.15) (2012).

The stringency of school nutrition standards has long been a controversial and contentious topic because there are many who believe it is a “right” to eat what one chooses. However, there are many who believe that allowing unhealthy foods in the
schools conflicts with what schools are expected to teach about health and nutrition. Regardless, this study reveals that attempts to improve nutrition in schools can be positively influenced by federal, state, district and school level policy. Further, law strength, language, comprehensiveness and consistency are imperative to improving nutritional content of foods.

This study, like others, had limitations. The first limitation is that because the analyses incorporated six different laws targeting competitive foods and beverages in different settings, it is impossible to know which law, if any, was most effective or whether it was truly a collective effect. A second limitation to consider was that during the 2006-2007 school year, the Child Nutrition and WIC Reauthorization Act of 2004 and the Alliance for a Healthier Generation School Beverage Guidelines were implemented. Because of this, it’s not known if the states with stronger laws were implementing federal or local policies more aggressively. The third limitation regards the number of students who were “lost” during follow-up between fifth and eighth grade. Many of these students were racial/ethnic minorities or of low SES. This factor, along with changes in activity measures across grades (which affects physical activity) and other time-varying confounding factors cannot be ruled out. Lastly, this study did not analyze adherence to the laws just whether or not there was a law. Because this was not accounted for, there were likely some schools in states with laws that didn’t adhere to the law and vice-versa. Therefore, the results may not reflect the true effect of stringent and specific laws on nutritional foods in schools.
Chapter 3: Research Method

**Introduction**

This study has reviewed research pertaining to childhood overweight and obesity and the role of schools in combatting the obesity epidemic. School food environments have a direct impact on student health and nutrition, which means they have an effect on childhood overweight and obesity. Foods in the NSLP are now better regulated for healthy nutrition content but other foods (e.g. competitive foods such as a la carte items, vending machine items, fundraising items and food used as a reward) have little or no regulation in most areas. Specifically, competitive foods that are served at classroom parties, during lunch because they are brought from home or given as a reward for academic performance or good behavior have a detrimental effect on both the health and behavior of students. The results of this study have suggested that more and better policy at the state, district and school level is likely to have a positive effect on the numbers and types of competitive foods served in US public schools

**Research Design and Approach**

This study was non-experimental with most of the literature used for this study being qualitative in nature. A review of literature revealed statistics on childhood overweight and obesity, school food environments and common uses of food in the classroom, potential efforts that could create change in change in schools and effects of food in the classroom. The qualitative studies were analyzed for information pertaining to how and why food was used in the classroom. Some information that was used to provide data supporting the incidence of overweight and obesity in children was quantitative in
nature as it provided numeric analysis and statistical results making it possible to assert generalizations about childhood overweight and obesity as well as effects of food in the classroom. The study design was both retrospective and correlational. The study used a retrospective design because the information utilized was gathered from previous studies. The study design was correlational because it revealed how the use of foods in the classroom affects the learning and behavior of the student.

**Setting and Sample**

Qualitative studies were reviewed and selected based on type of reward used (e.g. competitive food), age of the population studied (e.g. elementary or middle school-age children) and specific setting of the study (e.g. elementary or middle schools). Competitive foods were selected because of the potential negative health consequences to children such as becoming overweight or obese (and related consequences). The researcher chose to study elementary-age children because of their impressionability at that age when it comes to creating and maintaining a healthy food environment (e.g. healthy habits are learned so when they are learned at an early age, they are more likely to be kept). Lastly, the researcher chose studies pertaining to elementary and middle schools as little research had previously been conducted in these settings even though the competitive food market is active.

Both the qualitative and quantitative studies were obtained through the use of literature obtained through CUNE Library Search Engines, interlibrary loans and with searches utilizing Google Scholar. All of the studies reviewed were peer-reviewed. Most of the studies were limited to research published after 2007, but due to difficulty in
retrieving relevant information, some information utilized is from years prior to 2007. The majority of the samples in the studies used were nationally representative of US schools.

**Data Collection and Analysis**

Data collected in the research project consisted of mixed data that comprised both categorical and continuous data (i.e. mixed). Several studies reported information that was either learned via mail-back surveys or by direct observation. Most of the responses in these studies were coded for categorical purposes. Data obtained from the surveys and observations were used to explain research questions and the data were compared and contrasted to see if validation existed.

When examining the literature for this study, both descriptive and inferential statistics were used. Descriptive statistics were utilized in studies pertaining to current childhood obesity information as well as school food environments (e.g. the foods that are readily available in schools). Inferential statistics were used when interpreting results and implications of the studies comparing school practices to state, district and school policies.

**Research Measures and Statistics**

**Research Question 1**

How does the current food environment in many schools affect the consumption of healthy foods by students?

_*Null Hypothesis:*_ The current food environment in many schools does not affect the consumption of healthy foods by students.
**Hypothesis:** The current food environment in many schools has a negative effect on the consumption of healthy foods by students.

**Research Measures.** As already stated, school food environments entail much more than just the school breakfast and lunch programs. Vending machines, a la carte items, food from home, school fundraisers and classroom rewards are all potential food sources in schools. These competitive foods are not regulated like the NSLP and are therefore often high calorie/nutrient dense food with low nutritional value.

In the study by Greening et al., the Mississippi schools that agreed to participate were located in a county where the rate of obesity ranks the highest. Baseline data, including height, weight, waist circumference, percentage body fat, performance on three fitness tests, nutrition knowledge, and self-report physical activity, were collected at both schools during a weeklong assessment. According to Greening et al., the physical measurements and fitness tests were completed for each student by trained professionals from the Department of Education and from local academic institutions (universities). The nutrition knowledge and physical activity checklists were competed with groups of 15-20 children during class time with the help of research assistants. The dietary habit questionnaires were completed at home by the primary caregiver and returned to school. The intervention itself lasted eight months while the control school followed the state’s standard health curriculum consisting of: didactic nutrition education, health information incorporated into academic lessons, and weekly physical education classes (2011).

The statistics from the Greening et al. study were: (1) The intervention school showed a statistically significant decline in percentage body fat compared to the control
school whose children’s percentage body fat remained fairly stable, \( F(1,449) = 5.56, P = 0.02 \). (2) The intervention school reported engaging in significantly more physical activities from baseline to post-intervention whereas the control school reported a decline in physical activities, \( F(1,449) = 4.56, P = 0.04 \). (3) The intervention school also showed improvement in their dietary fat intake compared to the control school, \( F(1,449) = 12.30, P < 0.0005 \). (4) Lastly, the children from the intervention school also showed statistically significant improvement in their performance on two of the three fitness tests from the President’s Challenge, including curl-ups, \( F(1,449) = 30.69, P < 0.0001 \), and the shuttle run, \( F(1,449) = 52.24, P < 0.0001 \).

In the Healthy ONES study by Coleman et al., foods consumed by students (both foods as part of the NSLP and those outside of the NSLP) were observed and recorded by researchers. However, because the researchers were not allowed into the classrooms to observe and because it was too difficult to reliably quantify items during school-wide events, this data was collected by a systematic observation of school trash. This behavioral observation of the nutrition environment was used to index the amount of outside foods and beverages on school campuses and serve as an objective indicator of the changes in policies and organizational behaviors required of the Healthy ONES intervention (Coleman et al., 2012).

The Healthy ONES study found that when unhealthy foods and beverages were combined, an average of 0.86 (SD 0.34) unhealthy items per child per week were consumed at school. It also found that playground/recess and classroom environments generally had more food items from outside sources than the lunch environment. The
observations of trash also supported other research findings that the most common areas for outside foods in elementary schools were school activities, classroom parties, fundraisers and treats from teachers and school staff.

Research Question 2

Does the use of competitive foods in the classroom have a negative effect on the overall health (i.e. physical health, mental health) of the students exposed to the competitive foods?

Null Hypothesis: The use of competitive foods in the classroom does not affect the overall health of the students exposed to the competitive foods.

Hypothesis: The use of competitive foods in the classroom does have a negative effect on the overall health of the students exposed to the competitive foods.

Research Measures. Most of the studies used by this researcher utilized surveys to analyze food environments in US public schools and compared the strength of food/nutrition/wellness policies at the school, district, state and federal levels to the type of food environment in schools. In the studies by Turner et al., surveys were sent to school principals asking about food environments and policies within the school. District and state-level policies were researched by trained researchers using Boolean searches on the Internet or calling individual districts or state departments and asking for policies. Overall, results revealed that stricter district and state policies were more likely to be associated with stricter school-level policies. Specifically regarding food rewards during the 2009-2010 school year, 42.1% of schools reported not using food as a reward for academic performance and 40.7% reported not using food as a reward for good behavior.
Specifically regarding classroom and holiday parties, data from the 2009-2011 school years showed that only 63.1% of schools had restrictions on classroom parties and only 58.2% has restrictions on holiday parties. However, analyses revealed school-level policies were not necessarily concordant with district and state-level policies.

Furthermore, the added calories from competitive foods (i.e. food rewards, classroom parties, fundraisers, etc.) have a negative effect on the weight status (i.e. BMI) of students. Nevertheless, research does not support that competitive foods cause overweight or obesity. However, students who are overweight and/or obese have shown to have lower test scores. For example, in the study done by Datar et al., a statistically significant association was shown between childhood overweight and test scores—overweight kindergartners scored lower than their non-overweight peers on standardized tests (2004). This association was weakened when socioeconomic differences and other confounding factors were controlled (except the difference in boys’ math scores remained statistically significant).

**Instrumentation and Materials**

Instruments used in this study were the CUNE Library Search Engines and Google Scholar. Expanded searches were conducted by using resources/references from articles previously researched and websites such as the Centers for Disease Control, USDA Food and Nutrition and the Robert Wood Johnson Foundation.

**Protection of Human Participants**

There were no human subjects or private health information used in this study. All information was obtained through literary reviews of established studies.
Chapter 3 Summary

In summary, food that is not part of the NSLP presents potential health problems to students in US schools. To understand the effects of foods in the classrooms and overall effects of childhood overweight and obesity, a combination of both a qualitative and quantitative study design was employed. Utilizing both study designs proved helpful in exploring how the information gathered could be used to encourage schools, communities and legislators to create more stringent policy that regulates both the type and amount of food utilized in schools outside the NSLP. The researcher utilized qualitative research to help gain an understanding how foods are used in the classroom (e.g. how much, what type of food and reason for use). The researcher used quantitative research to help quantify data and generalize results from the studies. By using a qualitative approach, the researcher was able to gain insight into the problems associated with competitive foods in the school setting; specifically the classroom. The researcher was also able to better understand how policy changes (e.g. strong policy) affect the use of food in the school setting. Quantitative studies provided numeric data and statistical results making it possible to make generalizations about competitive foods in schools and the overall health of children in these schools.

The obesity epidemic is a public health crisis in the US. Identifying means of preventing children from becoming overweight and/or obese is likely the best course of action along with community-wide/school-wide efforts to address nutritional and physical health among children and adolescents. Because children spend a significant amount of time in the school setting (e.g. half of their waking day or one-third of the
overall day), it makes sense that schools should incorporate better health and nutrition standards and activities in order to teach lifelong habits and lessons on overall health.
Chapter 4: Results

**Introduction**

With one-third of today’s children being overweight or obese and because children attend school for a majority part of their waking day and consume one if not two meals while at school, the school plays a vital role in protecting student’s health while at school. Currently, the food environment in many schools allows for foods and beverages to be consumed outside of the NSLP with little or no regulation. Furthermore, many schools more or less encourage the consumption of unhealthy foods outside of the NSLP by providing foods and beverages for class parties and as rewards for performance and behavior in the classroom.

In this chapter, research will reveal the poor quality of the current school food environment and how the use of food outside of the NSLP, both in and out of the classroom, can have adverse effects on children’s health. Additionally, this chapter will reveal how the use of unhealthy competitive foods may correlate with a child’s academic performance. The author tried to limit research to children who were in elementary school. Many of the studies used for this research used nationally representative samples of US schools. A few of the studies conducted smaller-scale research in specific areas of the US (e.g. Minneapolis-St. Paul) using samples that were representative of their populations but possibly not generalizable to all US schools. Regardless, the author analyzed the results by searching for central and emerging themes. These themes were categorized and summarized for this chapter.
Data Analysis

Most of the studies researched for this project used cross-sectional study designs. Data collected during the studies utilized by this researcher was completed by surveys, self-reported measurements, database searches, internet searches (for school policies), telephone calls (for school policies) and measurements taken by professional researchers. Regression analyses were conducted on the majority of the data while some used analysis of variance. Essentially, regression analyses and analysis of variance (ANOVA) do the same things. However, ANOVA is more for experimental designs while regression is more for non-experimental research. Regardless, when conducted, variables such as age, weight, height, race/ethnicity, income, education level, SES, urbanicity, school locale, Census region and physical activity were compared.

Research Question 1

How does the current food environment in many schools affect the consumption of healthy foods by students?

*Null Hypothesis:* The current food environment in many schools does not affect the consumption of healthy foods by students.

*Hypothesis:* The current food environment in many schools has a negative effect on the consumption of healthy foods by students.

*Analysis and Results.* Certain environments can be powerful influences of choices that children and adolescents make. One of these environments is the school environment – specifically the school *food* environment (a food environment is essentially the physical and social surroundings that influence what people eat).
Competitive foods and beverages are widely available in schools. The pervasiveness of school a la carte and vending programs that sell foods and beverages that are high in calories and low in nutrients is well-documented (Kubik et al., 2005). Nationwide data from the 2009-2010 school year indicate that 65% of US public elementary-school students could purchase foods or beverages from competitive venues such as vending machines, school stores/snack bars and/or a la carte lines (Turner et al., 2012).

In 2000, there was a school-based dietary intervention trial (Teens Eating for Energy and Nutrition at School (TEENS)) that sought to promote healthful dietary practices among young adolescents in order to reduce future cancer risk. Participating school districts had to be within 30 miles of the Minneapolis-St. Paul metropolitan area and have a minimum of 20% of students approved for the free or reduced-cost lunch program. A cross-sectional design was used to collect the student-level data from 3088 eighth grade students (86% of those eligible) in participating schools.

A 7-item schoolwide food practices scale was developed with the assistance of school administrators. The questions addressed food-related school policies, schoolwide food use guidelines, and school-based health promotion activities (Kubik et al., 2005). Items on the scale were scored on a dichotomous scale, with a “yes” response indicating that the practice was allowed (higher scores indicated more food practices were allowed) (Kubik et al., 2005).

Two types of analysis were used to evaluate association between student BMI (the dependent variable) and schoolwide food practices (an independent variable). Mixed-model analysis of variance techniques were used to evaluate the association between
student BMI and the schoolwide food practices scale in order to account for variance anticipated when a cluster-sampling design is used and observations obtained from students in the same school are likely to be correlated. The mixed-model analysis of variance also allowed school-level predictors to be accurately modeled as group-level covariates (Kubik et al., 2005). General linear mixed modeling was also used. The models used included: a crude model to assess the bivariate association between the independent (schoolwide food practices scale) and dependent (student-level BMI) variables; a model containing simultaneous adjustments for potential confounders (age, sex, race/ethnicity, socioeconomic status as measured by participation in the free or reduced-cost lunch program, number of parents living in the home, highest level of education for mother and father, and number of parents working full time) and a model that included adjustments for potential confounders and all 2-way interactions between gender, race/ethnicity, and socioeconomic status was used.

In this study, the most prevalent school food practice was the use of food as a reward or incentive for students. The mean number of food and beverage practices (according to the 7-item scale) allowed by a school was 3. Of the 7 practices on the scale, most represented opportunities to eat and drink (in the hallway, classroom or both). More opportunities to eat and drink at school can promote consumption of more foods and beverages high in calories and low in nutrients (Kubik et al., 2005). The results of this study showed that schoolwide food practices were positively associated with students’ BMI. Specifically, for every food practice a student was exposed to, their BMI increased 0.10 points (p = 0.03).
Coleman et al. conducted a group randomized trial using implementation models to change nutrition policies and environments in low income schools using an evidence-based public health approach (EBPH). Eight schools in the Lemon Grove School District agreed to participate in the trial. Four schools were assigned to a control group while the other four were assigned to the intervention group. Intervention goals were to 1) eliminate unhealthy foods and beverages on campus, 2) develop nutrition services as the main source on campus for healthful eating (HE) and 3) promote school staff modeling of HE (Coleman et al., 2012). The four broad categories for foods and beverages brought to campus were: unhealthy foods, healthy foods, unhealthy beverages and healthy beverages. Coleman et al. reported no differences in rates of obesity, rates of overweight, age, or gender between control and intervention group children at baseline. However, intervention group children had higher BMI Z scores (0.86 ± 1.03) at baseline than control group children [0.68 ± 1.10; t (577) = 2.06; p = .04] (2012).

For the height and weight data, intent to treat multilevel models were used to determine main effects and interactions among different settings (i.e. schools) and individual characteristics (Coleman et al., 2012). A mixed model analysis of covariance (ANCOVA) was conducted for the impact of the intervention on the rates of obesity over time in order to adjust for the clustered data structure and determine the impact of the primary outcome measures. Baseline data were treated as a covariate in the model. All participants’ data were analyzed regardless of whether they had follow-up. However, the data was also analyzed using only those participants for whom there were complete data (all three measurements). There was no difference found between the two data analyses.
Behavioral observation outcomes were analyzed using a mixed ANOVA with one repeated measure of time and two between subject’s measures of intervention and environment (recess, lunch, classroom) (Coleman et al., 2012). Because these data were aggregated across schools, it was not necessary to control for the nesting effect of students in schools across time. According to Coleman et al., larger schools had greater amounts of items simply because they had more students and staff. This was calculated by either counting the number of students in the environment during observation (school lunch/cafeteria and morning snack recess/playgrounds observations) or obtaining the student attendance for the day of observation (classroom/school-wide events). Using this adjustment, outcome variables used for the observational analyses were items per child per week (2012).

While the study by Coleman et al. did not support the hypothesis for research question 1 as there were no significant differences in rates of overweight, obesity or BMI z scores between the intervention and control schools, it does reveal that the current school food environment is not necessarily a healthy food environment. Results of the Healthy ONES study revealed no baseline differences between control and intervention schools for total outside food and beverages per child per week. Over time, the intervention school outside food and beverage items per child per week decreased (p = .005) while these items in control schools increased over time (p = .04). This effect varied by school environment primarily due to the morning snack recess/playground environment where outside foods/beverages in control schools increased (p < .001) and intervention schools decreased (p = .02). There were no differences between groups in
outside foods/beverages for the classroom/school-wide events or school lunch/cafeteria environments (Coleman et al., 2012). Moreover, outside foods/beverages in the lunch/cafeteria environment actually increased initially and then decreased over time for both groups (p < .01).

Specifically regarding unhealthy food and beverages on school campuses, unhealthy food items on intervention school campuses decreased over time (p < .001) while these items increased over time in control schools (p = .02). Outside unhealthy drink items on intervention school campuses decreased over time (p = .015) and control schools did not change. Furthermore, overall, outside healthy food items on intervention school campuses decreased (p = .03) and control school items did not change over time. However, in the lunch/cafeteria environment, outside healthy foods increased in intervention schools (p = .02) but decreased in control schools (p = .02). Lastly, over time, outside healthy drink items increased in all environments and schools until the last semester where there was a decrease (p = .002) (Coleman et al., 2012).

During the 2004-05 school year, 29% of US elementary students consumed competitive food and beverage items on a typical school day (Turner et al., 2013). Additionally, Turner et al. reported the following key findings in a research brief from April 2013:

- The majority of survey respondents indicated that their school had no school-wide restrictions on teachers using candy in classroom lessons, offering sugary items (e.g., candy) as reward for good student behavior or
academics, or offering coupons or incentive programs (e.g., pizza parties for reading).

- Few schools had school-level policies to limit students from bringing in sugary items to be served during holiday parties or birthday parties, or to be eaten during regular snack time.
- There were no statistically significant changes over time in any of these competitive food and beverage practices such as: allowing candy in lessons, using food coupons as incentives, using sugary items as a reward, having no nutritional restrictions on fundraisers, no limits on sugary items for birthday parties, no limits on sugary items for holiday parties, no limits on sugary items for snack time, foods allowed in class outside of parties/snack and non-water beverages allowed in class (see Table in Appendix).

In another study, Turner et al. reported that during the 2004-05 school year, 73% of public elementary schools offered at least 1 source of competitive foods and beverages, including sales venues as well as fundraisers, parties and rewards in the classroom (2013b). Because there was little evidence available regarding competitive foods used for classroom parties, Turner et al. studied 1,204 schools in regards to school, district and state policies regarding classroom parties. What they found was: fewer than 10% of respondents reported prohibition of sugary items in the schools for classroom parties (birthday or holiday); only one-third of schools discouraged sugary items; and
about one-half either had no restrictions or left the decision up to the teacher (Turner et al., 2013b).

Furthermore, Turner et al. also reported on research by Isoldi and Dalton that documented what children ate and drank in 6 separate classroom parties. The results were attained by direct observation in pre-kindergarten, kindergarten and first grade classrooms at 1 urban elementary school. Sugary foods and beverages were offered at all 6 parties. On average, students consumed an estimated 444 kilocalories from items served at each party and were given take-home goody bags with an estimated 638 kilocalories (Turner et al., 2013b). These are unnecessary, nutrient-lacking calories that support poor nutrition in children.

In the final study analyzed for this research question, Greening et al. presented information on a healthy lifestyle, school-based obesity intervention program implemented in a rural southern community in Mississippi. Measurements taken for this study included: adiposity measures (height, weight, and BMI percentile), tests of nutrition knowledge, fitness, physical activity and dietary habits. The statistics from the Greening et al. study revealed: (1) The intervention school showed a statistically significant decline in percentage body fat compared to the control school whose children’s percentage body fat remained fairly stable, [F(1,449) = 5.56, p =0.02]. (2) The intervention school reported engaging in significantly more physical activities from baseline to post-intervention whereas the control school reported a decline in physical activities, [F(1,449) = 4.56, p = 0.04]. (3) The intervention school also showed improvement in their dietary fat intake compared to the control school, [F (1,449) = 12.30, p < 0.0005]. (4) Lastly, the
children from the intervention school also showed statistically significant improvement in their performance on two of the three fitness tests from the President’s Challenge, including curl-ups, \( F(1,449) = 30.69, p < 0.0001 \), and the shuttle run, \( F(1,449) = 52.24, p < 0.0001 \).

Based on these specific studies, I would reject the null hypothesis and accept the hypothesis that the current food environment is unhealthy and has a negative effect on the consumption of healthy foods. Competitive foods have a negative impact on students’ dietary needs and weight (e.g. related to increase in BMI, can lead to overweight that leads to physical inactivity). In addition, the widespread availability of unhealthy competitive foods conveys a contradictory message to students about the importance of nutrition and health.

**Research Question 2**

Does the use of competitive foods in the classroom have a negative effect on the overall health (i.e. physical health, mental health, academic health) of the students exposed to the competitive foods?

**Null Hypothesis:** The use of competitive foods in the classroom does not affect the overall health of the students exposed to the competitive foods.

**Hypothesis:** The use of competitive foods in the classroom does have a negative effect on the overall health of the students exposed to the competitive foods.

**Analysis and Results.** Focusing on nutritional health in schools can support overall health by reducing the impact of the childhood obesity epidemic. Furthermore, optimizing nutrition in childhood is critical to learning and future productivity (Crawford
et al., 2011). According to Crawford et al., nutritional health is associated with academic performance and well-nourished students are better able to learn and less likely to miss school for health reasons (2011). Crawford et al. (2005) also report that: children from low-income families who participate in school breakfast programs score higher on standardized tests and have better school attendance than students who do not participate and that breakfast programs also improve classroom behavior and attentiveness.

Ethically, Crawford et al. argue that providing foods of poor nutritional quality to finance school programs and profit commercial entities fails to meet society’s ethical obligation to minimize harm, provide benefit and protect vulnerable children who are a captive audience. Fostering optimal nutrition not only protects against obesity but is also essential for maximizing cognitive function and academic performance (2011).

Childhood obesity has been shown to be associated with several immediate health risk factors such as orthopedic, neurological, pulmonary, gastroenterological and endocrine conditions. Possibly more importantly, obesity also affects children’s psychosocial outcomes, such as low self-esteem and depression, resulting from overweight concerns. These mechanisms may affect other aspects of children’s lives, such as academic performance with potentially even more serious adverse social outcomes in the long term (Datar et al., 2004). Datar et al. used data from the ECLS-K, which surveyed a nationally representative cohort of kindergartners in the US during the 1998-99 school year. The ECLS-K data were one of the first to collect information on school performance and childhood overweight status (2004).
The dependent variables in this study were the reading and math test scores from waves 1, 2, and 4 of each child. Tests were given individually to each student and each subject area consisted of a two-stage assessment. Item response theory (IRT) scale scores were computed for all children because all students didn’t all take the exact same test. These scores were comparable across students within a wave and also across waves, which enabled comparison of children’s performance over time (Datar et al., 2004). The child’s overweight status was the main independent variable (other independent variables included in the study were: race/ethnicity, mother’s education, annual family income and urbanicity) all children were measured twice by trained professionals. These measurements were used to calculate BMI. Children with a BMI > 95th percentile for their age and gender were classified as overweight.

Datar et al. reported using multivariate regression to control for socioeconomic factors and other potentially confounding factors that may be correlated with both childhood overweight and academic performance. These regressions also included parent-reported time spent watching TV and physical activity of the child measured by the number of days in a week the child got exercise that caused rapid breathing, perspiration and a rapid heartbeat for 20 minutes or more (2004). Lastly, parent-child interaction and child’s birth weight were also included in the regressions.

Separate analyses were conducted for boys and girls. Using fall kindergarten data, cross-sectional estimates of the effect of overweight status were concluded. Next, a longitudinal regression analysis was conducted in order to estimate the effect of overweight status on test scores in later waves (all the while controlling for baseline test
scores on entry into kindergarten, sociodemographic factors and other potential confounders) (Datar et al., 2004). By controlling for baseline test scores, effects from other factors are, in essence, cancelled-out allowing for examination of the independent effect of obesity on academic achievement. Interaction models were also conducted in order to examine whether the association between overweight status and test scores varied by race/ethnicity.

The data from ECLS-K revealed that about 11.1% of kindergartners were overweight when they entered kindergarten in 1998 (12% of boys and 10.1% of girls ($p = 0.03$)) (Datar et al., 2004). According to the results from Datar et al., simple bivariate estimates show that overweight boys scored 1.42 points lower and girls 1.66 lower ($p < 0.05$) in reading than nonoverweight boys and girls at the beginning of kindergarten. In math, the test score difference between overweight and nonoverweight boys was greater among boys (1.99 points) but lower among girls (1.21 points) ($p < 0.05$). When sociodemographics and other potential confounders were controlled for, overweight status among boys at the beginning of kindergarten was not significantly associated with reading test scores ($p = 0.088$), but overweight boys scored 1.22 points lower than nonoverweight boys ($p = 0.001$) in math (2004). Test scores among girls, regardless of overweight status, did not differ significantly for either reading ($p = 0.064$) or math ($p = 0.355$).

At the end of kindergarten (after controlling for baseline test scores), longitudinal regression estimates showed that overweight boys scored 0.61 points lower than nonoverweight boys ($p = 0.017$) in reading (there was no significant difference in math),
but this difference was no longer significant at the end of first grade \((p = 0.142)\). Among girls, overweight status did not have a statistically significant effect on either math or reading scores after controlling for baseline test scores at the end of kindergarten or first grade (Datar et al., 2004). Overall, the results reveal that when controls were in place for sociodemographic and other confounding factors, overweight status did not have an effect on test scores for girls in reading or math and in boys, was only significant for their math scores at baseline (not reading). Other variables such as race/ethnicity, mother’s education level, and number of hours of television or video had much stronger effects on children’s academic performance than overweight status (Datar et al., 2004).

Findings of this study by Datar et al. indicate that overweight status is not a causal factor affecting academic performance but is correlational to academic performance. The researchers did note, however, that even though other characteristics/factors may have a stronger effect on test scores, being overweight is more easily observable by students. Because of this, its significant (unadjusted) association with worse academic performance can contribute to the stigma of overweight as early as the first years of elementary school (Datar et al., 2004).

Lastly, as reported in the section regarding research question 1, Kubik et al. (2005) conducted a study on school food practices and their effect on BMI. The results of the study showed that schoolwide food practices were positively associated with students’ BMI. Specifically, for every food practice a student was exposed to, their BMI increased 0.10 points \((p = 0.03)\).
The results of these studies neither clearly support nor clearly refute the hypothesis. This researcher believes more research is needed in order to refute or support the hypothesis. Evidence (e.g. test scores, BMI results) appears to show some support that having access to competitive foods does have a negative effect on health and academic performance, but this is less apparent when other confounding factors are controlled.

**Research Question 3**

Do stronger policies regarding the use of competitive foods at the federal, state, district and school level positively affect the school food environment?

**Null Hypothesis:** The adoption and application of stronger policies at the federal, state, district and school level regarding the use of competitive foods does not positively affect the school food environment.

**Hypothesis:** The adoption and application of stronger policies at the federal, state, district and school level regarding the use of competitive foods does positively affect the school food environment.

**Analysis and Results:** Recently, the school food environment has been a focal point in efforts to reverse the childhood obesity epidemic because children spend approximately half of their waking day at school. Schools can (and do) have a powerful influence on the choices children make. One of the choices most children make on a given day at school is the choice of food and beverage to consume or purchase. While the meals provided through the NSLP are regulated for nutrition, most competitive foods have not been stringently regulated for nutritional quality.
Accumulated research demonstrated that policies regarding competitive food and beverages—including those sold as well as those offered in the classroom and in other ways on campus—were significantly associated with children's diets and weight status (Turner et al., 2012). In a study by Turner et al. (2012), school fundraisers were specifically examined because they had been identified as a potential factor in student weight outcomes. The data for this study was collected in multiple ways. School data was collected via mail-back survey from a nationally representative sample of US public elementary schools. District level policy data (i.e. formal policy documents such as: wellness policies, associated rules/regulations, and other policies embedded by reference into the wellness policy/rules) were collected from the corresponding school district by trained research assistants for each elementary school in the sample. Lastly, Turner et al. (2012) collected data on state laws effective as of the beginning of September of each school year by compiling information gained through natural language and Boolean keyword searches of the full-text, tables of contents, and indices of codified state statutory and administrative (regulatory) laws commercially available from subscription-based legal research providers, Westlaw and Lexis-Nexis.

Turner et al., conducted analyses using complex survey commands in STATA/SE 12.0 and accounted for the clustering of schools within districts and states. Analyses were conducted with the data treated as a stacked cross-sectional dataset, controlling for year. Data were weighted to provide inference to all public elementary schools in the US (2012). According to Turner et al., the prevalence of school policy status was tabulated and each school was classified into one of four mutually exclusive and exhaustive
categories for each fundraising policy category of interest (i.e., overall fundraising restrictions, no sodas in fundraisers, no candy in fundraisers): 1) no district policy and no state law; 2) district policy only; 3) state law only; and 4) both state law and district policy. Then, the relationships between state law and school policies and between district and school policies were examined with a series of multivariate logistic regressions that included a set of three variables to account for district policy and state law (2012).

As reported by survey respondents at 1,215 US public elementary schools, during the 2009–11 school years, 39.2% of schools had some sort of school-wide restriction regarding the nutritional quality of items sold for fundraisers (Turner et al., 2012). During the same time frame, 25.1% of schools reported bans on FMNVs and 21.7% of schools reported bans on soda and/or soft drinks. Of the schools that participated in this study, 30.2% were identified as having strong fundraising policies. Of the states represented in this study, 21.3% had strong law. When examined in combination, most schools were located in districts and states with no policy at either level; however, approximately one-fourth of schools were subject to policies at both levels (Turner et al., 2012). Using multivariate logistic regression models, this study revealed that schools located in both districts and states with policy pertaining to nutritional value of competitive foods were more than two times as likely to have nutritional limitations on fundraisers.

Turner et al. revealed that elementary school-level fundraising restrictions are related to state law and district policy, but relevant policies and laws at the state and district level are not consistently implemented in schools. Across the board, the combination of policy at both the state and district level was significantly associated with
a doubled likelihood of having a school policy, suggesting that district policies are helping to reinforce the state laws in this area, and that policy at both jurisdictions increases the likelihood of school-level restrictions (2012). Regardless, an effective strategy for positively impacting the elementary school food environment would involve a revision of formal district policies and state laws to strengthen existing provisions that are currently written as “recommendations” and writing them as actual restrictions.

Turner et al. conducted similar studies regarding policies at the school, district, state and federal levels and classroom parties and the use of food as a reward in the classroom (for both academic achievement and positive behavior). The methods of the study, as well as analysis of the results, were very similar. In both studies, multivariate logistic regressions were used to examine associations between school-level restrictions and district policies and state laws while controlling for demographics and school year.

Results regarding the study of food rewards showed that the percentage of districts with strong policies prohibiting the use of food as a reward in the classroom did not differ significantly over the course of the three years (average of 10% of districts). Of these 10% of districts with specific policy regarding food as a reward in the classroom, a significant association was found with school practices. Specifically, multivariate analysis, which controlled for school contextual factors and year, indicated that where district policy prohibited the use of food as a reward, school respondents were significantly more likely to report that food was not used as a reward for academic performance (OR 1.71, 95% CI, 1.09 to 2.67; \( p < 0.05 \)) nor for good student behavior (OR 1.66, 95% CI, 1.03 to 2.51; \( p < 0.05 \)) (Turner et al., 2012B). Turner et al. also
reported that logistic regression analyses also revealed significant regional differences in school practices (e.g. school-level respondents were less likely to report that food was not used as a reward for good academic performance in the West (37.6%) than in the South (45.6%)).

Results of the study regarding classroom parties (birthday and holiday-related) revealed that school limits on unhealthy, sugary foods were more likely in states and districts where policy and law addressed specific nutritional aspects of foods and beverages served in classroom parties. Specifically, less than 10% of schools that responded reported prohibiting sugary items during classroom parties, about one-third discouraged sugary items and about one-half either had no restrictions or left the decision up to the teacher. According to Turner et al., schools located in districts and states with regulations were 2.5 times more likely to restrict sugary (unhealthy) items at parties than were schools with no corresponding policy or law. Even so, of schools in districts and states with regulations, covariate-adjusted prevalence revealed that only 63.1% of schools had restrictions on birthday parties and 58.2% had restrictions on holiday parties (2013). Further analysis revealed that school-level policies were not necessarily concordant with state law and district policy (Turner et al., 2013).

The studies by Turner et al. support the hypothesis that the adoption and application of stronger policies at the federal, state, district and school level regarding the use of competitive foods does positively affect the school food environment. Turner et al. consistently indicated that elementary school-level restrictions on classroom parties, the use of food as a reward and fundraisers were related to relevant state law and district
policy even though schools did not consistently follow such laws and policies. It is possible that the significant effect of the combination of both district policy and state law may be the result of a reinforcing relationship (Turner et al, 2013).

**Chapter 4 Summary**

In summary, the US obesity epidemic affects people of all ages, including children. Childhood obesity is often preventable which means its consequences (high cholesterol, high blood pressure, Type II diabetes, social discrimination, low self-esteem, lower academic achievement), is also often preventable. This research indicates the importance of having a healthy school food environment as well as having policy that clearly supports a healthy school food environment. Correspondingly, this research provides some evidence revealing a correlation between a healthy school food environment and positive overall health.

The school environment, including the school food environment, is an influential setting for children. Schoolwide food and beverage practices such as using food and/or beverages as a reward in the classroom, allowing competitive foods as snacks or in class parties, and using competitive food and/or beverages as part of fundraising supports frequent snacking and consumption of foods and beverages high in calories and low in nutrients. Over time, these practices are adversely associated with students’ body mass index. Moreover, some evidence points to lower academic achievement on math and reading assessments. Prevention of overweight and obesity in childhood must include attention to the nutrition integrity of schools (Kubik et al., 2005).
Providing healthy options at school is often uneasy to do. Due to lack of understanding, many people feel that food and beverages consumed at school should be a free choice of the students. However, there are some who believe schools are ethically responsible to provide healthy, nutritious meals and snacks to all students. The ethical obligation argument rests on the precautionary principle that implies “society has a responsibility to intervene and protect the public (children) from exposure to harm (obesity) where scientific investigation identifies a plausible risk” (Crawford et al, 2011).

Recently, national medical associations, policy makers and the federal government called for bold policy initiatives to reduce childhood obesity in the US (Taber et al., 2012). These initiatives included stronger and more consistent laws and policy regarding nutritional requirements of foods in the NSLP as well as competitive food and beverages offered in schools. While most of these initiatives did not directly address food and beverage practices in the classroom, many states, districts and individual schools have initiated their own policies regarding the use of competitive food and beverages in the classroom and school fundraisers. Research clearly indicated that strength of language, comprehensiveness and consistency of food and beverage standards (at the federal, state, district and school level) that support and promote healthy dietary practices among children and adolescents are imperative for successful implementation and utilization in schools. By doing so, research reveals that students’ exposure to healthier food and beverages decreases their risk of obesity and positively impacts their BMI, which can positively impact their academic achievement.
Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This study was conducted in order to reveal the effects, if any, of the use of foods from outside of the NSLP on the overall health of students. Specifically, the author wanted to address the effects, if any, on the overall health and potential academic success of elementary-aged students. Because the number of children and adolescents who are overweight or obese has tripled since 1980, childhood overweight and obesity is one of public health’s most challenging issues of the 21st century.

Most children spend the majority of their weekdays at school and obtain up to one-half of their daily calories from foods consumed at school. Therefore, schools are a natural place to implement policies that promote healthy eating habits. While many different environments have an effect on each child’s growth and development, the school environment may be one of the most influential due to the time spent at school. In the school environment, students are expected to learn how to read, compute math problems, write stories, spell etc. They are also required to take physical education (PE) and health classes, which teaches children about being physically active and consuming healthy foods. Because schools teach health and because children are impressionable, it is argued that it is important for schools to both offer choices for healthy lifestyles as well as model healthy lifestyles. One way to do this is to offer healthy school lunches as well as healthy foods (or other health activities) for use in other aspects of the school day.

Foods and beverages available in schools come from many sources such as the lunch (or breakfast program), vending machines, classroom rewards, classroom parties
and a la carte menus. These competitive foods are sources of additional, often unnecessary, calories for the students. Further, these foods and beverages are often high-calorie, low nutrient-dense foods. This research analyzed various school environments regarding the use of competitive foods, the effects competitive foods had, if any, on the overall health and academic achievement of students, and whether the implementation and enforcement of policies concerning the use of competitive foods in school environments could have a positive effect on the school food environment.

**Interpretation of Findings**

Whether at home or school, it is important to educate children about how to make healthy choices and about why those choices matter. Health-related issues often play a major role in whether or not students are able and motivated to learn. Interventions that address health issues can likely improve both educational and health outcomes. Many professionals argue that healthier students are better learners (e.g. health-related factors such as hunger, physical and emotional abuse, and chronic illness can lead to poor school performance (CDC, 2014)).

According to Basch, recent research in fields ranging from neurosciences and child development to epidemiology and public health provide compelling evidence for the causal role that educationally relevant health disparities play in the educational achievement gap that plagues urban minority youth (2010). The research presented in this project presented evidence that supports the hypothesis that the school food environment is negatively affected by unhealthy, competitive foods and that these foods are causal
factors in childhood overweight and obesity. Therefore, the consumption of these foods is also found to be a causal factor in lower academic achievement and poorer overall health.

Important lifestyle behaviors, such as behaviors related to nutrition, need to be taught and learned in childhood. Factors that influence the adoption of healthy nutrition practices include individual as well as environmental influences. One of the major environmental influences is the school food environment. Kubik et al. showed that schoolwide food practices that supported frequent snacking and the consumption of foods and beverages high in calories and low in nutrients by students throughout the school day were common and adversely associated with body mass index of the students (2005).

Most of the students in the study conducted by Kubik et al. were exposed to more than 1 type of school food practice outside of the NSLP. In this particular study, the mean number of food practices to which students were exposed was 3. Most practices represented opportunities to eat and drink (e.g. food and beverages allowed in hallway and classrooms, food rewards, classroom parties, school fundraisers) (Kubik et al., 2005). Regardless, the most important finding of this study was the positive association between school food practices and student BMI. Kubik et al. revealed that student BMI increased 0.1 units for every food practice allowed (2005).

In the study by Coleman et al. regarding healthy options for nutrition environments in schools, an evidence-based public health (EBPH) approach was used to promote a model for implementing nutrition policy and environmental changes in various school settings. Coleman et al. found that using an implementation-focused EBPH approach to change nutrition environments and policies significantly decreased outside
foods and beverages on campuses. The change was primarily seen for unhealthy foods and beverages, although healthy foods were also reduced in the morning snack recess/playground environment (2012).

Coleman et al. also hypothesized that making these nutrition environment and policy changes would result in significant differences between control and intervention school rates of obesity. This hypothesis was not supported as there were no changes in obesity rates across time in either control and intervention schools and BMI Z scores increased significantly over time for both intervention and control schools (Coleman et al., 2005). This may have been due to the fact that the full intervention effect was only after one year of implementation. If the intervention had been continued for multiple years, the researchers stated they may have seen more significant effects (e.g. obesity rates) between intervention and control schools due to poor school food environments.

The hypothesis that competitive foods in schools affect the consumption of healthy foods by children was further supported in studies by Turner et al. In one study, Turner et al. reported that during the 2004-05 school year, 73% of public elementary schools offered at least 1 source of competitive foods and beverages, including sales venues as well as fundraisers, parties and rewards in the classroom. They also reported that during the 2004-05 school year, 29% of US elementary students consumed competitive items on a typical school day (2013b). Moreover, they reported that direct observation of 6 separate classroom parties in pre-kindergarten, kindergarten and first-grade classrooms revealed the use of unhealthy, competitive food in all classrooms. These foods and beverages averaged to an additional 444 kilocalories consumed at each
party. Additionally, students were given goody bags with an estimated 638 kilocalories to take home (Turner et al., 2013b).

Research has shown that children who are not healthy are not as successful in school. Regardless of the preparation and readiness of teachers, regardless of accountability measures put in place and regardless of the governing structures established for schools, the educational progress will be profoundly limited if students are not motivated and able to learn (Basch, n.d.). Furthermore, health-related problems play a major role in limiting the motivation and ability to learn of youth (specifically urban, minority), and interventions to address those problems can improve educational as well as health outcomes (Basch, n.d.).

The research conducted by Taber et al. supported the hypothesis that competitive foods had a negative effect on overall health. In this study, students who were exposed to strong laws at baseline gained about 0.25 BMI units fewer than students in states with no laws. Further, students in states with strict laws regarding competitive foods were less likely to remain overweight or obese over time.

The hypothesis that competitive foods have a negative effect on academic achievement was not fully supported by research conducted by Datar et al. but it did reveal correlation. Significant differences in test scores were seen between overweight and obese kindergartners and first graders when compared to their normal weight peers. However, this study controlled for other confounding factors such as mother’s education level, race/ethnicity and other socioeconomic and sociodemographic factors. After doing so, the only significant test score gap was for boys’ math scores at baseline. Nevertheless,
Datar et al. reminded the researcher that it was important to bear in mind that small or insignificant associations between overweight status and academic performance do not necessarily imply that overweight is not important where academics are concerned (2004). It may take more time (i.e. more than 2 years) for the effects of overweight to be seen.

The presence of competitive foods affects the school food environment in general as well as has a potential effect on the overall health and academic achievement of students. As seen in the studies by Turner et al., students are surrounded by foods and beverages that are not considered healthy. While the research specifically utilized for this project didn’t indisputably show a causal effect of competitive foods in schools on obesity or overweight and obesity having a causal effect on academic achievement, it left enough unanswered questions so that the research couldn’t undeniably say that competitive foods had no effect on obesity and/or academic achievement.

Competitive foods and beverages in schools are present because there have been few efforts to limit them in schools. There are many who believe that utilizing competitive foods in schools is a right and, at times, necessary in order to provide financial support to the school. To the contrary, Crawford et al. argued that there is no justification for the promotion of diets (i.e. competitive foods) that increase the risk of obesity and therefore the potential consequences related to obesity (2011). Specifically, Crawford et al. suggested that “beyond strategic considerations, the concepts of the common good justify actions that may appear to conflict with freedom of choice of
children, parents, and school staff, or with the interests of food and beverage companies” (2011).

Regarding the financial aspect that competitive foods are often believed to contribute to schools, research shows that a la carte menus and vending machines do not truly offer a substantial amount of funding for schools. For example, the National Center for Chronic Disease Prevention and Health Promotion recently published information such as (Implementing Strong Nutrition, n.d.):

- Over 80% of principals surveyed in a West Virginia survey reported “little or no change” in revenues after new vending machine policies were implemented.

- An urban middle school reported that within 2 months of implementing nutrition standards, the school generated more revenue from food sales than a larger middle school in the same district that continued to sell soda and fast food. The increase in revenue was due to higher participation in the school lunch program.

Both Taber et al. and Turner et al. presented research that revealed how policy affects the use of these competitive foods. For example, research by Turner et al. revealed that if districts and/or schools had strong, formal policies regarding the use of competitive foods and were in states with specific and comprehensive policies regarding competitive foods in schools, it was much more likely that the use competitive foods was limited and/or better regulated. However, if districts and/or schools had weak policies and were in states with weak policies, the use of competitive foods in schools was much more
prevalent. Additionally, research by Taber et al. strengthened evidence that having competitive food laws/policies could improve weight status in children and adolescents. Moreover, the strength of policy/law language, policy/law comprehensiveness and consistency of new competitive food policies is necessary for success in reducing childhood obesity (2012).

**Recommendations for Action**

Because schools play a critical role in promoting the health and safety of children and adolescents and in helping children and adolescents establish lifelong healthy behaviors, the use of competitive foods in schools requires more thought and oversight. The findings from this research indicate that more research is needed regarding competitive foods in schools. While it is relatively easy to find information regarding competitive foods in schools when researching questions such as types of competitive foods, costs of competitive foods, where competitive foods are found in schools and why competitive foods are used in schools, it is not easy to find information regarding the effects competitive foods have on and/or in schools.

Competitive foods are often energy-dense, nutrient-poor items, and their availability at school undermines efforts to promote healthy diets, prevent obesity and support academic achievement. The bulk of the information researched, evaluated and analyzed for this applied research project found that schools located in districts located in states with specific policy regarding the use of competitive foods in schools were considerably more likely to have schoolwide policies that regulated the use of competitive foods. Nonetheless, a school can choose to create, implement and enforce
their own local policy regarding competitive foods in spite of what the district or state do in regards to competitive foods. Therefore, regardless of policy “ownership,” this author recommends more and better development, implementation and enforcement of policies regarding the use of competitive foods in schools. Any policy that is enacted should be specific, comprehensive and implemented and enforced consistently.

**Recommendations for Further Study**

Childhood obesity and overweight is a relatively recent public health issue. Because of this, there is not a lot of research with conclusive evidence pertaining to the causes of childhood obesity. The research that has been completed has often focused on issues related to home life and personal choice as causes of obesity. It has only been in the past 10-15 years that school environments have even been considered as a cause of childhood obesity. Unfortunately, because our youth are affected and influenced by so many different environments, it is difficult to conclude that the school environment has a significant effect on overall childhood health (e.g. overweight, obesity, consequences of both overweight and obesity, and/or academic achievement). For now, most research concludes that the school environment, specifically the school food environment, in only correlational to obesity and overweight. Moreover, most research concludes that being overweight or obese is only correlational to lower academic achievement and not causal.

The first recommendation of this author is to lengthen the amount of time allotted for studies regarding progression of students through their school career. One of the most significant limitations in the studies researched for this project regarding student performance and weight status was that the length of time the students were followed
(studied) was too short. Overweight and/or obesity do not necessarily progress quickly. Rather, they usually take time, which means that the effects of actually being overweight or obese will not be seen until after time spent being overweight or obese. For example, instead of assessing the academic performance of students from the beginning of kindergarten through the end of first grade, this author recommends assessing students based on overweight status starting in kindergarten and continuing through eighth or twelfth grade.

The second recommendation of this author is to better assess the enforcement of policies regarding competitive foods. With better assessment of enforcement, results of studies, such as those conducted in the research used for this project, will likely give a better representation of actual findings. Furthermore, because there are many opinions and beliefs regarding causes of overweight and obesity, as well as of the methods to prevent childhood overweight and obesity, many individuals tend to ignore or disregard policies pertaining to prevention or care of overweight and obesity. Doing so has the potential to skew results because a state, district or school may have a very specific and comprehensive policy, but if it is not being enforced and/or those responsible for following the policy are not doing so, result may appear favorable to having policies, but he policies will likely not appear to be effective.

Summary

Childhood overweight and obesity is a worldwide public health challenge. The youth of today may be the first generation to not live as long as their parents. This is more than just cause for concern, it is cause for action. Children are influenced by various
factors on any given day throughout their childhood and adolescence. By teaching them how to make healthy choices while they are young, they are more likely to make healthy choices for a lifetime. In order to even attempt this, the school environment must be a healthy environment.

Children spend approximately one-third of their day in school where they often consume up to one-third to one-half of their daily calories. If these calories are not of high nutritional value, the child is put at risk for health problems due to nutrition. Furthermore, the one-third to one-half amounts referenced only refers to calories consumed during breakfast and/or lunch at school. Any additional calories provided at school (i.e. competitive foods) can potentially increase this caloric number considerably.

Combatting and preventing childhood overweight and obesity will have a profound effect on our society. If society makes the choice to do so, one main environment that needs to be targeted is the school food environment. Schools need to provide a healthy school food environment. In order to do this, schools need to cease utilizing food as: rewards in the classroom, foundations for fundraising and staples in classroom parties. Moreover, school, district and state leaders need to choose to provide a healthy school food environment. In order to do this, specific, comprehensive policies need to be created, implemented and enforced. These policies can and will enhance the overall health of the student as well as potentially ensure higher academic achievement.
References


Crawford, Patricia B. Gosliner, Wendi Kayman, Harvey (n.d.). *The Ethical Basis for Promoting Nutritional Health in Public Schools in the United States*. Retrieved from Centers for Disease Control and Prevention website:

http://www.cdc.gov/pcd/issues/2011/sep/10_0283.htm


Table 1. Schoolwide Food Practices Scale: Scale Items and Prevalence of Practice, by School*

<table>
<thead>
<tr>
<th>Scale Items ᵃ**</th>
<th>Prevalence of Practice by School, No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are students allowed to have food in the classroom?**</td>
<td>5 (31)</td>
</tr>
<tr>
<td>2. Are students allowed to have beverages in the classroom?**</td>
<td>6 (38)</td>
</tr>
<tr>
<td>3. Are students allowed to have snacks in the hallway? **</td>
<td>5 (31)</td>
</tr>
<tr>
<td>4. Are students allowed to have beverages in the hallway?**</td>
<td>3 (19)</td>
</tr>
<tr>
<td>5. Are food or food coupons used as reward or incentive for students?</td>
<td>11 (69)</td>
</tr>
<tr>
<td>6. Do you have classroom fundraising that includes food sales?</td>
<td>9 (56)</td>
</tr>
<tr>
<td>7. Do you have schoolwide fundraising that includes food sales?</td>
<td>5 (31)</td>
</tr>
</tbody>
</table>

*Items are summed to create the score with an increasing score indicating more school food practices allowed. Cronbach α for Scale equals 0.83. Mean score 3 (range 0-7). Sixteen schools participated in this study.

† Scored on a dichotomous 1 or 0 scale.

** The wording “allowed to have” indicates that students are allowed to consume food and beverages in this setting.
Appendix B
## Table 3. Percentage of U.S. Public Elementary Schools Allowing Competitive Food and Beverage Practices By School Year (between 2009-2012)

<table>
<thead>
<tr>
<th>Type of Food and Beverage Practice</th>
<th>Average % of elementary schools across all years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candy allowed to be used in lessons</td>
<td>69.1</td>
</tr>
<tr>
<td>Food coupons used as incentives</td>
<td>67.9</td>
</tr>
<tr>
<td>Sugary items allowed to be used as reward</td>
<td>64.6</td>
</tr>
<tr>
<td>No nutritional restrictions for fundraisers</td>
<td>60.6</td>
</tr>
<tr>
<td>No limits on sugary items at birthday parties</td>
<td>57.6</td>
</tr>
<tr>
<td>No limits on sugary items at holiday parties</td>
<td>57.3</td>
</tr>
<tr>
<td>No limits on sugary items at snack time</td>
<td>38.2</td>
</tr>
<tr>
<td>Food allowed in class outside of parties/snack</td>
<td>21.0</td>
</tr>
<tr>
<td>Non-water beverages allowed in class</td>
<td>9.5</td>
</tr>
</tbody>
</table>
Appendix D
Table 3. Descriptive statistics by gender and overweight status

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not</td>
<td>Overweight</td>
<td>Difference</td>
<td>Not</td>
<td>Overweight</td>
<td>Difference</td>
</tr>
<tr>
<td></td>
<td>overweight</td>
<td></td>
<td></td>
<td>overweight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall kindergarten reading scores</td>
<td>50.55</td>
<td>49.12</td>
<td>1.42*(0.41)</td>
<td>52.28</td>
<td>50.62</td>
<td>1.66*(0.43)</td>
</tr>
<tr>
<td>Spring kindergarten reading scores</td>
<td>50.88</td>
<td>49.2</td>
<td>1.67*(0.40)</td>
<td>52.57</td>
<td>51.55</td>
<td>1.01*(0.40)</td>
</tr>
<tr>
<td>Spring grade 1 reading scores</td>
<td>51.14</td>
<td>49.85</td>
<td>1.30*(0.38)</td>
<td>52.65</td>
<td>51.84</td>
<td>0.81*(0.38)</td>
</tr>
<tr>
<td>Fall kindergarten math scores</td>
<td>52.28</td>
<td>50.29</td>
<td>1.99*(0.41)</td>
<td>52.07</td>
<td>50.86</td>
<td>1.21*(0.40)</td>
</tr>
<tr>
<td>Spring kindergarten math scores</td>
<td>52.47</td>
<td>50.84</td>
<td>1.63*(0.40)</td>
<td>52.06</td>
<td>50.81</td>
<td>1.24*(0.39)</td>
</tr>
<tr>
<td>Spring grade 1 math scores</td>
<td>52.34</td>
<td>50.87</td>
<td>1.46*(0.38)</td>
<td>51.57</td>
<td>50.32</td>
<td>1.26*(0.37)</td>
</tr>
<tr>
<td>White§</td>
<td>0.66</td>
<td>0.59</td>
<td>0.07*(0.02)</td>
<td>0.65</td>
<td>0.57</td>
<td>0.08*(0.02)</td>
</tr>
<tr>
<td>Black§</td>
<td>0.13</td>
<td>0.13</td>
<td>−0.00 (0.01)</td>
<td>0.14</td>
<td>0.18</td>
<td>−0.04*(0.01)</td>
</tr>
<tr>
<td>Hispanic§</td>
<td>0.12</td>
<td>0.16</td>
<td>−0.05*(0.01)</td>
<td>0.11</td>
<td>0.16</td>
<td>−0.05*(0.01)</td>
</tr>
<tr>
<td>Asian§</td>
<td>0.03</td>
<td>0.05</td>
<td>−0.02*(0.01)</td>
<td>0.04</td>
<td>0.03</td>
<td>−0.01 (0.01)</td>
</tr>
<tr>
<td>Mother's education§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school diploma</td>
<td>0.09</td>
<td>0.11</td>
<td>−0.02*(0.01)</td>
<td>0.08</td>
<td>0.09</td>
<td>−0.01 (0.01)</td>
</tr>
<tr>
<td>High school diploma</td>
<td>0.29</td>
<td>0.31</td>
<td>−0.01 (0.02)</td>
<td>0.29</td>
<td>0.37</td>
<td>−0.08*(0.02)</td>
</tr>
<tr>
<td>Some college</td>
<td>0.34</td>
<td>0.35</td>
<td>−0.01 (0.02)</td>
<td>0.34</td>
<td>0.34</td>
<td>−0.00 (0.02)</td>
</tr>
<tr>
<td>Bachelor's</td>
<td>0.18</td>
<td>0.16</td>
<td>0.02 (0.02)</td>
<td>0.19</td>
<td>0.14</td>
<td>0.05*(0.02)</td>
</tr>
<tr>
<td>More than bachelor's</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family income ($)§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;15, 000</td>
<td>0.11</td>
<td>0.12</td>
<td>−0.01 (0.01)</td>
<td>0.12</td>
<td>0.15</td>
<td>−0.03*(0.01)</td>
</tr>
<tr>
<td>Income Category</td>
<td>Number of activities parent does with child at least once a week</td>
<td>Number of days per week child exercises for 20 minutes or more</td>
<td>Birth weight (pounds)</td>
<td>Number of hours per day child watches TV or videos on weekdays</td>
<td>Number of observations</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------</td>
<td>---------------------------------------------------------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>&gt;15,000 and &lt;25,000</td>
<td>0.11</td>
<td>0.15</td>
<td>-0.04*(0.01)</td>
<td>0.11</td>
<td>0.14</td>
<td>-0.03*(0.01)</td>
</tr>
<tr>
<td>&gt;25,000 and &lt;35,000</td>
<td>0.12</td>
<td>0.15</td>
<td>-0.03*(0.01)</td>
<td>0.11</td>
<td>0.14</td>
<td>-0.03*(0.01)</td>
</tr>
<tr>
<td>&gt;35,000 and &lt;50,000</td>
<td>0.17</td>
<td>0.17</td>
<td>-0.01 (0.02)</td>
<td>0.16</td>
<td>0.16</td>
<td>-0.00 (0.02)</td>
</tr>
<tr>
<td>&gt;50,000 and &lt;75,000</td>
<td>0.23</td>
<td>0.22</td>
<td>0.01 (0.02)</td>
<td>0.24</td>
<td>0.23</td>
<td>0.01 (0.02)</td>
</tr>
<tr>
<td>&gt;75,000</td>
<td>0.27</td>
<td>0.19</td>
<td>0.08*(0.02)</td>
<td>0.26</td>
<td>0.18</td>
<td>0.08*(0.02)</td>
</tr>
<tr>
<td>Central city§</td>
<td>0.37</td>
<td>0.36</td>
<td>0.01 (0.02)</td>
<td>0.38</td>
<td>0.38</td>
<td>0.00 (0.02)</td>
</tr>
<tr>
<td>Urban fringe and large town§</td>
<td>0.21</td>
<td>0.17</td>
<td>0.04*(0.02)</td>
<td>0.2</td>
<td>0.19</td>
<td>0.01 (0.02)</td>
</tr>
<tr>
<td>Small town and rural§</td>
<td>0.23</td>
<td>0.26</td>
<td>-0.03*(0.02)</td>
<td>0.22</td>
<td>0.24</td>
<td>-0.01 (0.02)</td>
</tr>
</tbody>
</table>

* *p < 0.05; figures in parentheses are SEs of difference in means.
§ Figures reported are proportions in the population.
¶ The total sample size for the t tests.