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# A Description of Snack Foods in Select Ohio Schools: A Baseline Prior to USDA New Competitive Food Guidelines

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A description of snack foods in select Ohio schools: A baseline prior to USDA  
new competitive food guidelines

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**Table of Contents**

Abstract.....	4
Introduction.....	5
Purpose Statement.....	6
Literature Review.....	6
Rate of Obesity in America.....	6
Demographic factors.....	6
National School Lunch Program.....	7
Healthy Hunger-Free Kids Act.....	12
Chef Initiative.....	21
Research Questions.....	24
Methods.....	25
Setting and Sample.....	25
Design.....	25
Study Measures.....	26
Data Collection.....	28
Results.....	31
Discussion.....	35
Recommendation.....	38
Study Limitations.....	38
Public Health Implications.....	39
Conclusion.....	40
References.....	41
Appendix.....	45

### **Abstract**

**Background:** The proliferation of snack foods in school lunch programs has necessitated the USDA to regulate its consumption by implementing policies regarding its use. The competitive food guidelines were enacted in June 2013 through the Healthy, Hunger-Free Kids Act. This required development of federal nutritional guidelines snack foods had to meet in order to be considered a competitive food and thus sold in school lunchrooms.

**Objectives:** The purpose of this study is to describe the current snack food offerings in select Ohio high schools, and to determine how these snack foods affect the consumption of healthier free and reduced meal options. We also describe factors that influence decision making in lunchrooms and to explore effective ways to encourage healthier food decision making.

**Methods:** This is a descriptive study that uses plate waste data from select Ohio schools to determine food choice among students from three High schools. Model used for this study was from Cornell University's Smarter Lunch Rooms Movement.

**Results:** The major factors that affected the consumption of snack foods was the variety, availability, and district poverty level. Schools in the less affluent neighborhoods were more likely to consume more of the reimbursable meals. The more affluent schools had more consumption of snack foods. Fifteen of the 19 snack foods met the new competitive food guideline.

**Conclusion:** To encourage greater consumption of healthier meal options, a multifaceted approach needs to be adopted. This approach should include efforts from the government, school's Food Service Directors, parents and students.

*Keywords:* reimbursable, competitive, lunchroom, school district, obesity

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competitive food guidelines**

Childhood obesity in the United States is no longer news as almost everyone knows how problematic it has been over the past decade. The WHO and UNESCO has made obesity one of its priorities for countries with high rates of childhood obesity. The issue of childhood obesity began to pose serious health concerns over 30 years ago. For decades, the scourge of childhood obesity has been on the rise with insignificant declines in a few years. Worldwide, over 2.6 million people die annually as a result of the risks associated with obesity or being overweight. Currently, one out of every three children in the United States is either overweight or obese. Quality of life and life expectancy is reduced with obesity, which leads to an increased expenditure in the health budget of many countries. In 2006 alone, 146 million dollars was spent on obesity related health complications in the United States and has been on the rise since then. The difficulty in the treatment of adult obesity as a result of childhood obesity has made it a priority in many countries. The difficulty in the treatment of adult obesity has necessitated the need for an urgent intervention to reduce the rate especially among teenagers who are the most susceptible to being overweight. The severe health and psychological effects obese children experience early in life include type II diabetes mellitus, heart disease, mood disorders, pediatric hypertension and low self-esteem.

**Purpose Statement**

The purpose of this study is to describe the current snack food offerings in select Ohio high schools, and to determine how these snack foods affect the consumption of healthier free and reduced meal options. We also describe factors that influence decision making in lunchrooms and to explore effective ways to encourage healthier food decision making.

## **Literature Review**

### **Rate of Obesity in the United States**

The United States has witnessed a rapid increase in the number of obesity related illness within the past few decades. In 1980, the rate of childhood obesity among children 6 to 10 years was 6.5 percent while adolescents 11 to 19 were 5 percent (Lueke, 2011). In 1990, in the United States, no state had a childhood obesity level above 15 percent but in 2005, only 6 out of the 50 states had an obesity level below 20 percent. The rate worsened, by 2007 with few states still in the 20<sup>th</sup> percentiles and most of them in the 30 percentiles. By 2012 no state had an obesity level below the 20<sup>th</sup> percentile (Menifield, Doty, & Fletcher, 2008). The steady increase over the past 30 years has made various stakeholders in the health sector to term childhood obesity an epidemic in the United States.

The National Survey of Children's Health by U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau (DHHS) (2007) reveals that the trend varies by states. Most states had higher obesity levels for 10 to 13 years than for 14 to 17 years, while in a few states the obesity rate for children 14 to 17 years was higher. Singh, Kogan, and Van Dyck (2008) using data from the Behavioral Risk Factor Surveillance System found higher rates of childhood obesity in southern states. Wyoming and Utah had the lowest obesity rate for males while Washington DC had the highest. West Virginia, Texas, Tennessee, Kentucky and North Carolina have an odds ratio twice the rate of other States with similar demographic profiles.

### **Demographic Factors**

Demographic factors have been found to be major risk and protective factors of obesity among teenagers. Various studies have been conducted to evaluate which factors pose more risk

among children. Singh et al. (2008) found that African-Americans are at the highest risk of childhood obesity having an odds ratio of 80 percent compared to that of the Hispanics with an odds ratio of 34 percent. In Ohio, however, the National Survey of Children's Health (DHHS, 2007) concluded that 35.7 percent of non-Hispanic Whites were obese, followed by blacks with 30.4 percent obese children while the Hispanics were the least susceptible. This difference from the previous data may be attributed to the small sample size used for the Hispanic population compared to Non-Hispanic White, which could be a major confounder.

In a study conducted by Singh et al. (2008), low levels of education and income could lead to an increased risk towards several health risk behaviors. Children with parents who had less than 12 years of education were 50 percent more likely to be obese compared to their affluent counterparts. Families with incomes above 400 percent above the poverty level were 34 percent less likely to be obese (Singh et al., 2008). Children living in single parent households had obesity rates significantly higher than children living with both parents. Also, families in which English was the primary language the obesity rate was 50 percent less than the rate for families who speak other languages.

There has been an increase in sedentary lifestyle as well as a reduced expenditure of energy in these urban settlers. This has resulted in a shift of the diseases to the urban poor who are bearing a dual burden of obesity and under- nutrition (Singh et al., 2008).

### **National School Lunch Program**

The National School Lunch Program (NSLP) is the second largest food assistance program in the United States (Neumark-Sztainer, French, Hannan, Story, & Fulkerson, 2005). This program serves low cost and free lunches to over 31.6 million American school children daily. The National School Lunch Program (NSLP) since inception has been going through



different phases of metamorphosis in a bid to provide school children with healthy food choices (Cohen, Richardson, Austin, Economos, & Rimm, 2013). The United States Department of Agriculture (USDA) and the United States Department of Education (USDE) has been actively involved in the NSLP. The aim of NSLP is to provide school children with the best available food choices during the period children spend in school. This is being achieved by transforming the school meal programs by introducing different policies.

The National School Lunch Program has established minimum and maximum standards for the number of calories consumed. Limits have also been established for consumption of total and saturated fats. Recently, an additional requirement was added in the NSLP establishing minimum intake levels for the nutrients iron, protein, calcium, vitamin A and C (Cohen et al., 2013). Despite these regulations, the standards for these nutrients may not be met because a significant amount of food is wasted. Another major concern about the National School Lunch Program is that it has not established nutritional requirements for other nutrients like sodium, grain and fibers until recently with the competitive food guideline. It is important that efforts be made to promote serving whole grain, fruits, unsaturated fats and vegetables. Establishing minimum requirements for these food items may help decrease the risk of obesity and diabetes, and blood pressure (Cohen et al., 2012). Energy intake and expenditure are predictors of childhood obesity. Schools have a vital role to play in altering the dietary and physical activity behavior of school children. There has been a relationship between food availability and the existence of school food policy which affects the choices students make regarding school meals. In many cases children leave the serving line with a nutritionally balanced meal. The emerging paradigm called behavioral economics explains that consumers do not always make the best of

their available choices or information in a way that optimizes their well-being, which directly affects participation (Price & Riis, 2012).

### **Participation in school lunch programs.**

In 2007 alone, over 30 million school children participated in the National School Lunch Program. Briefel, Wilson, and Gleason (2009) found that in 2004 and 2005 participation in the school breakfast program was associated with lower body mass. Briefel et al. (2009) suggests that eating breakfast and energy distribution across the day may be a possible explanation to the lower BMI found among the study population. One of the nutritional benefits of school meal program is that some of the energy dense, low nutrient foods are not allowed in the school lunch program. When foods with low nutrient and high energy are served in school lunch programs (french fries and pastries) are served regularly, the aim of National School Lunch Program policies are being circumvented. In some cases, even when these participating schools serve fewer low nutrient energy dense food items, children still find a way to make up for those shortages by consuming those energy dense food items at home or places other than school. Briefel et al. (2009) suggests that to best maximize the advantages of school meal programs and identify essential ways to improve children's eating behavior is to understand the dietary patterns of children who participate in school lunch programs. Briefel et al. (2009) concludes that 95 percent of school children consume some type of low nutrient, energy dense food every day, however, where these foods are consumed differ significantly. Fifty percent of children consume sugar sweetened beverages at home, 68 percent at other locations and 25 percent at school. This suggests that the National School Lunch Program is doing a good job on their part to significantly reduce the consumption of low nutrient, energy dense food especially by altering the participation patterns across the different age groups served.

Children who participate at the school breakfast program as well as lunch programs consume 51 percent of their daily energy intake at school. High school participants in the NSLP consume significantly higher amount of sugar sweetened beverages in school than any other location. NSLP participating schools children consumed high amounts of energy from French fries, and other potato products. The concern about the consumption of sugar sweetened beverages is that people who consume sugar sweetened beverage in school are more likely to consume more of those items when they are away from school. A mean of 112 kcal is consumed from sugar sweetened beverages by elementary school children in school and a mean of 157 kcal from sugar sweetened beverages is consumed at the high school. Newman (2013) reports that other studies have found that there is no evidence linking NSLP participation to overweight or childhood obesity. Newman (2013) suggests that a single intervention will not result in changes to influence children's intake of fruits and vegetables but rather a multi-faceted approach needs to be adopted to achieve program goals.

#### **Addressing the issue.**

In 2010, the White house task force on childhood obesity indicated that serving healthy food is a major priority in addressing childhood obesity (Cullen, Watson, & Dave, 2011). Health improvement can be seen as a socio-ecological process that works to initiate other processes that could result in the intrapersonal behavior medication. Health departments in the United States and United Kingdom have put more emphasis on the school meal (Briefel et al., 2009). Elementary school children consumed an average of between 230 to 250 kcal from low nutrient, energy dense food items. A very important and vital privilege to improve dietary habits among school children is to increase the awareness about eating behaviors at home. This is because a high percentage of total energy consumed from low nutrient, energy dense food items are from

home meals. As an alternative, through nutrition education parents could always serve healthier choices like low fat milk, 100 percent fruit juice and water to replace sugar sweetened beverages. Parents also need to make a conscious effort to reduce fast food restaurant visits. They also need to educate their children of the importance of making healthy food choices and the importance of eating breakfast and lunch. Selecting small portion sizes and eating less frequently at places that serve low nutrient high energy food items should be encouraged (Briefel et al., 2009).

The Healthy Hunger Free Kids Act was adopted to help achieve the goal of teaching children to make healthier food choices. Although this policy has recorded some success, it is also at a risk of not reaching its objectives because children are not willing to consume healthier foods. The possible reason for non-compliance may be because these children have not been exposed to healthier food choices. This may be attributed to the multi-level complexity embedded within these policies (Briefel et al., 2009).

#### **Influence of state action on policy implementation.**

School nutrition policies are a string of interventions to create improved access to healthier food choices and restrict access to less healthy food choices at school as much as possible. Implementation of these different nutrition policies differs by state. Some states with strong nutrition policies tend to adopt new nutrition guidelines faster than states that have little interest on nutrition and childhood obesity (Brener, Eaton, & Kann, 2013). Brener, Eaton, and Kann (2013) reports that school children who live in states with strong nutrition programs and policies that prohibit or restrict the sale of less healthy snack foods in schools gained less weight than those living in states with weak nutrition policies and programs. Students who were categorized as overweight or obese in the states with strong nutrition policies were less likely to remain overweight or obese after a 3 year period. Brener et al. (2013) argues that the health

benefits received by children living in states with strong nutrition policies should be made available to all the school children in the United States. The Healthy, Hunger-Free Kids Act was passed by the United States congress to make the benefits of strong school nutrition programs available for all school children.

### **Healthy, Hunger-Free Kids Act**

Congress passed the Healthy, Hunger-Free Kids Act (HHFKA) in December, 2012. The HHFKA gave the United States Department of Agriculture the regulatory power to influence the access and quality of meals offered at schools. The law also allows USDA to implement changes in regards to administration of food with proper nutrition standards. The Healthy, Hunger-Free Kids Act resulted in the need for the USDA to institute many changes in the National School Lunch Program. These changes include new and more stringent standards for school meals for the 2012 and 2013 school year. These changes include serving variety of fruits and vegetables, serving whole grains, and strict compliance to the new competitive food guideline (Newman, 2013). In 2007 the USDA reported that although most schools served meals that met the key nutrition requirements, they did not meet the recommended 2005 dietary guidelines for a variety of nutrient dense foods from fruits, vegetables and whole grains. Different policies implemented in school lunch programs could help contribute in the wider public health agenda by achieving positive health related outcomes in relation to improved nutrition behavior like long term health and obesity prevention

Table 1

*Summary of Changes in Weekly Required Minimum Amounts and Types of Foods Offered in USDA School Lunches*

<b>Category</b>	<b>Pre-2012 Requirement</b>	<b>New Requirement</b>
Total fruit and vegetables	2.5–5 cups of fruit and vegetables combined per week	2.5–5 cups of fruit 3.75–5 cups of total vegetables per week
Vegetables	No specifications as to type of vegetable	Weekly requirement of half a cup for dark green, legumes, starchy and other vegetables, respectively, and three-quarters of a cup for red/ orange vegetables.
Meat/meat alternate	7.5–15 oz equivalents per week	8–12 oz equivalents per week
Grains	8–15 oz equivalents per week	9–13 oz equivalents per week
Whole grains	Encouraged, but not required.	Upon implementation, at least half of the grains to be whole grain-rich (>50 percent whole grain). After 2 years, all grains must be whole-grain rich.
Milk	5 cups	5 cups, fat content of milk to be 1 percent or less
Saturated fat	Energy from saturated fat must be no greater than 10 percent of total energy.	No greater than 10 percent of total energy.
Total fat	Energy from total fat must be no greater than 30 percent of total energy.	No standard for total fat.

### **Snack food items.**

Competitive food items also known as a la carte foods are generally those food items which are not considered reimbursable and are not paid by the government. These meals are

bought out of the pocket by school children and are usually low on nutrients. The USDA is required to set nutritional standards for competitive foods at schools that offer USDA school meals. It is proposed that competitive foods served at schools that offer USDA meals, may diminish revenue to local school services. Affluent neighborhoods usually have school food services with high competitive food revenues (Guthrie, Newman, Ralston, Prell, & Ollinger, 2013). Also in affluent neighborhoods, fewer students receive free and reduced-price lunches compared to poorer neighborhoods.

Regardless of the grade level (secondary vs. elementary), high competitive schools shared similar socioeconomic and meal program characteristics (Guthrie et al., 2013). High competitive schools were more affluent and served fewer students that received free or reduced-price meals compared to the lowest revenue quartile. Also high revenue schools were less likely to participate in the School Breakfast Program compare to the lowest revenue quartile schools. The prices for meals in the high-revenue quartile were higher than the low-revenue quartile but the revenue obtained was lower than the free meal reimbursement (Guthrie et al., 2013). Generally higher competitive-revenue schools earned less revenue from school meals.

When comparing higher and lower competitive revenue quartiles there was not much difference in the nutritional environment characteristics (Guthrie et al., 2013). School Food Authorities (SFAs)–level data was used to examine the competitive food revenues. Suburban districts were found to have SFAs with higher competitive food revenues. Also SFAs in the highest quartile had the lowest level of support from their specific state. Districts with high shares of revenues were found to serve more affluent students, served less USDA meals, meal prices were higher for full-price students and had a low breakfast participation (Guthrie et al., 2013).

The concern among stakeholders in the health sector is how low nutrient foods and energy dense food are displacing the healthy alternative choices like the fruits, vegetables and low fat milk. Consumption of fruits and vegetables can improve children diet quality and intake of essential nutrients. School food policy has a major role in children's access to food, especially when vending machines are available to the children or when a la carte items are served as alternatives to school meals. Many a la carte items are low on nutrients and very high in energy and most often the energy are not used up thus accumulating and storing excess fat leading to overweight and obesity (Briefel et al., 2009). Most items served a la carte include sugar-sweetened beverages, baked goods with high fat, salty chips, cookies, brownies, french fries and high sugar desserts (Briefel et al., 2009).

Access to healthy or unhealthy food and beverages at home and other places affects children's overall diet in school and studies show that certain dietary behaviors are risk factors to childhood obesity which is prevalent among U.S children and adolescent. Limiting access to high energy a la carte items in school meal programs reduces its consumption at home too (Briefel et al., 2009).

Although guidelines have been put in place to regulate school lunch programs very few policies have been adopted regarding alternative food options such as the a la carte items, the vending machines and the snack bar. Students gain access to these a la carte items by using the vending machines, and snack bars (Neumark-Sztainer et al., 2005). Studies have revealed that the convenience of these vending machine and snack bar lowers the purchase of fruits and vegetable and increases the consumption of high energy, low nutrient food items (Neumark-Sztainer et al., 2005). To alter student's attitude about food choices Cornell University used behavioral economics to influence student purchase. Behavioral economics studies implemented



in the Smarter Lunch Room Movement (SLM) use social and emotional factors to affect decision making. Neumark-Sztainer, French, Hannan, Story, and Fulkerson (2005) realized that very few schools in the Minnesota area had an overall policy on food and nutrition. Few schools indicated they had a policy regarding the types of beverages and soda sold in vending machines. This is an issue of importance for school lunch programs because majority of schools have at least one vending machine and often cases there are no restrictions on vending machine use.

Adolescent eating patterns can be determined by proximal and distal factors. The proximal factors can be individual food choice, family meal patterns, and role modeling by parents. Distal factors on the other hand can be social norm or the media messages (Neumark-Sztainer et al., 2005). In order to address those factors that affect eating habit, Bronfenbrenner's ecological model tries to provide some explanation. Bronfenbrenner's ecological model shows a concentric sphere of factors that influence eating habits. It ranges from the proximal factors to the distal factors while the school is in between. For example, the more access to a la carte food items, the fewer students tend to consume fruits and vegetable which defeats the goal of the HHFKA (Neumark-Sztainer et al., 2005).

### **Environmental and social cues and food choices.**

To improve the weight status of American children, it is important to have an understanding of the role of school meal programs, the eating environment, and the food consumption patterns of school children. Social interaction between lunch room staff and students promotes healthier choices among the students (Hanks, Just, Smith, & Wansink, 2012). Cornell University researchers see lunch rooms as a social setting where children make decisions about food choices based on their emotions. For convenience, students may avoid staying in long school lunch lines and may instead choose to go to faster a la carte sections and vending

machines. This behavior supports students in choosing items like the potato chips, cookies, soda and other high calorie, low nutrient food items (Hanks et al., 2012). Hanks, Just, Smith, and Wansink (2012) suggests substituting the convenience of a la carte items with more healthy choices by making the serving lines of the more healthy choices shorter and more accessible. On the other hand, making the less healthy food section less convenient will queue students toward healthier choices. Cornell researchers used this strategy-and found that students selected significantly healthier choices. However, selections of healthier choices did not translate to consumption of the healthier foods. SLM describes students as being in a “hot state” when making impulsive decisions due to a stressful and distracting environment (Hanks et al., 2012). Hanks et al. (2012) suggests that decisions at the lunch rooms are made depending on whether students are in a cold state or hot state. School lunch room normally crowded, noisy and chaotic. These conditions could nudge a student towards a hot state. On the other hand, when the environment is calmer and less chaotic, a cold state can be said to exist encouraging students make more thoughtful decisions.

To encourage healthy eating habits the SLM developed six research based principles to encourage healthy choices; cold state decision making, improving convenience, regulating portion sizes, enhance taste expectation, improve visibility, make use of suggestive selling, and set smart pricing strategy. Use of these principles has proven to produce positive results (Wansink, Just, Payne, & Klinger, 2012). Wansink, Just, Payne, and Klinger (2012) recorded a 99 percent increase in vegetable purchase by simply changing the names of the vegetable into something more creative. In the control school, however, there was a 16 percent decrease in the consumption of fruits and vegetable. Wansink et al. (2012) believe that the success of their study was as a result of giving the students a sense of self efficacy, i.e. the ability to make their own

decisions with fewer restrictions. Students were given choices of more than one vegetable this resulted in an increase in the number of vegetables consumed and overall diet quality.

A change in the lunch environment could influence children food choices. Wansink and colleagues (2012) concluded that there is a strong and positive relationship between food selection and food intake. If there is a change in the availability and amount of different food choices, there would be a proportionate change in food intake as well. In his study when children were given more food options to select from, there were more likely to select healthier choices. Food choice decision helps determine what people eat and food consumption volume decisions determine how much people eat. Wansink (2004) defined an eating environment to the ambient factors that are directly associated with eating a meal but is independent of the food. This could be atmosphere, effort towards getting the food, the social interaction that occurs as well as the distraction that occurs in the environment. Food environment on the other hand can be described as the way food is provided and presented. This may include salience, structure, and portion size. These different environments can contribute by suggesting consumption norms and inhibiting consumption monitoring. Consumption can be influenced by other norms that are present in the eating environment. Influences on consumption could be variety of food available, package, salience of the food, plate size or because eating provided them with something to keep busy with. A major determinant of how much someone eats in a distracting eating environment is whether the person deliberately monitored what he/she selects. Atmospheric influence on eating duration could be as a result of temperature, odor, lighting and noise. People consume more during a long period of cold temperatures than during hot temperatures. People also tend to eat less in a harsh and brightly lit room because comfort and disinhibition is not achievable in such environment (Wansink, 2004). Wansink (2004) also concluded that increased effort

decreases consumption. Effort is related to ease, access and/or convenience that a food can be consumed. Cafeteria studies show that people tend to consume ice cream when the lid of the container was open rather than when it was closed. A social environment also influences what is eaten and how much is eaten. Meals eaten with people are 33 percent larger than meals eaten alone (Wansink, 2004). Other strategies which help to record a decent number of success in the study by SLM was the “lunch line redesign” which involves increasing the number of fruits choices, and moving the fruits closer to the registers to facilitate sale. Applying this low budget intervention in several lunch rooms across the United States would not only reduce the increasing obesity trend but will also help children develop a habit of healthy eating which may continue into adulthood.

#### **Libertarian paternalism.**

Hanks et al. (2012) conducted a pilot study using Libertarian Paternalism which simply means influencing rather than restricting choices. These changes were accomplished by increasing convenience, attractiveness, and the normative nature of healthy option in the lunchroom which could help students make healthy choices by themselves. Libertarian Paternalism helps to preserve choices as well as can potentially nudge children into making life long habits of choosing and eating more healthy food even when less healthy options are available (Hanks, Just, Smith & Waskink, 2013). This method was adopted by Cornell University’s Smarter Lunch Room Makeover. Hanks et al. (2013) concluded after their study using the same principle that students were more likely to take more fruits and vegetables. In addition those students who choose fruits and vegetables were more likely to consume a majority of the food items chosen. This suggests that minimal and cost effective changes in the

lunchrooms can have a vital effect on influencing students towards healthy behavior (Hanks et al., 2013).

### **Possible improvements to increase consumption.**

The environment at the lunch room also has a major role to play in affecting decisions about diet quality and energy intake although very little can be done by the school to alter other environments away from school like at home. Areas where possible improvement can be made include removing beverages high in sugar in schools, limiting access to other similar food items, reducing the availability of french fries and other high baked goods, providing nutrition education, encouraging parents to pack healthy lunch for their children and developing strict school wellness policies (Briefel et al., 2009). In a recent study conducted by Hanks et al. (2013), they concluded that among the most important determinant of making healthy choices in school lunch rooms is convenience and taste. Although taste is a more difficult predictor to alter, if convenience was given a deep sense of priority, healthy choices could be promoted. Adoption of chef initiative could also significantly improve healthy decision making.

### **Chef Initiative**

A pilot study conducted on two Boston schools to examine the difference between regular lunches served at the Boston area school and those using the Chef initiative to improve the dietary content and over all lunch meal quality of the school. At the end of the study, Cohen et al. (2012) found that students who had lunch from the Chef initiative participating schools consumed 77 percent of whole grain while the control group which was the group that was not participating in the Chef initiative program. In addition the chef initiative school had a significantly large amount of milk consumption despite serving plain milk non-fat and reduced fat. The control school served chocolate and other flavored milk had similar milk consumption.

This result contradicts the fear by cafeteria staff that changing meals into healthier choices will reduce palatability and student's turn out during lunch periods. Another concern of the cafeteria staff was that they do not have enough culinary skills to prepare high quality meals in the cafeteria, however, if the Chef initiative is introduced in school cafeteria they can help improve the overall meal standard by providing cafeteria staff members some inventive recipes to help improve dietary quality and palatability.

### **Offer vs. serve.**

In order to reduce the amount of food wasted, a provision known as "offer vs. serve" was initiated. The goal was to allow students to choose from 3 or more different meal components instead of being required to take everything offered. However, this initiative has not yielded so much result as expected. In the 2002 report to congress, a total of 600 million dollars' worth of food waste was incurred by the federal government. Cohen et al. (2012) reported that in the schools studied only half of the total calories taken are consumed and the other wasted despite initiatives to meet dietary guidelines. Vitamins, iron, and calcium are also consumed below standards. When Cohen et al. (2012) compared the consumption of fruits, and vegetables in Chef initiative schools and regular school, there was a significant difference in the waste. Children from Chef initiative schools had less waste from fruits and vegetables than the comparable school. On the average, students discarded approximately, 19 percent of the entrée, 47 percent of the fruits, 25 percent of the milk and 73 percent of the vegetables (Cohen et al., 2012). Cohen et al. (2012) further concluded that most of this waste came from control schools which suggest that chef initiative schools accept healthier choices. Schools and families could save money and benefit financially by serving healthier, more appealing foods because if students consume more of the available lunch at schools, they are more likely to spend less when

they are outside the cafeteria or out of school. Hanks et al. (2012) believe it is a good way to gradually promote healthy choices among school children. Hanks et al. (2012) also promoted the use of flavored milk because they believe it is a healthier alternative when compared with having a soda. Flavored milk contains fewer calories, and more nutrients, and conversely, soda contains lots of calories and very few nutrients. A switch of convenience in favor of healthy choices will definitely yield a positive result on health. In Hank's study, diet consumption tells us that food that was healthier got a greater percentage of the total grams consumed in the high school studied.

#### **Use of creative names.**

McDowell, Gunther, and Kennel (2013) recorded an increase in the number of fruits and vegetable consumed when creative names were added to the food items and also when the cafeteria staff verbally cued the children to take them. Wansink (2004) in his study to determine the effectiveness of attractive and descriptive names in school lunches found out that name has a major role to make in decision making. Attractive names do not only improve the awareness and salience of the meal, it also raises a person's taste expectation. Wansink (2004) used the name "X-ray vision carrot" in place on carrot in the school studied and recorded a tremendous increase in consumption. When the name was changed back to carrot the rate of consumption decreased. This suggest that use of attractive names to describe a healthy food in a cafeteria could be an effective, scalable and persistent approach which needs little experience and is low cost.

#### **Recognition.**

Pittman et al. (2012) tried a different approach towards encouraging healthy eating among school children. The study identified a sustainable and cost free approach which did not involve any substantial change in the school lunch routine as well as it physical environment.

The approach required identifying the daily healthy food items and recognized students who make the healthy decisions in addition to taking white milk. Selected students were allowed to ring the bell in recognition for their healthy food choice. The goal was to invigorate the intrinsic, positive emotions associated with a short public attention from the extrinsic action of bell ringing which will in return provide an intrinsic pride and a sense of fulfillment for making a healthy decision.

### **Restrictions on vending machines and a la carte items.**

Another good way to encourage healthier eating among school children is to put restrictions on use of the vending machines and snack bar. At the same time improve the nutritional content in available a la carte items while making less healthy a la carte items unavailable. Neumark-Sztainer et al. (2005) found that elementary schools without a la carte choices consumed more fruits, juices, and vegetables. Schools that offered several a la carte choices recorded a decrease in consumption of fruits and vegetables (Neumark-Sztainer et al., 2005). In schools without a restriction on vending machines during the lunch periods recorded a high level of eating out in restaurants especially among the 11<sup>th</sup> and 12<sup>th</sup> grades. In other schools with a closed campus policy, eating out was prevented and students had to either eat their packed lunch or eat in school which encouraged them to eat healthier food options available in the school menu. Some schools put restrictions on the hours of operation for the vending machines; in most cases it is open after lunch. Although majority of student eat school lunch, it is also imperative to note that consumption is always higher for a la carte items. Since 35 to 40 percent of daily caloric consumption among school children is during the breakfast and lunch periods, changes in lunch policies in school would most likely make a significant impact in the health of



school children. Schools have a vital role to play in providing school children with opportunities that are health (Neumark-Sztainer et al., 2005).

### **Use of behavioral theories.**

Vyth et al. (2011) argues that certain behavioral theories like the transtheoretical model can be applied in making food choices. Vyth et al. (2011) researched to see how effective nutrition logos are in making healthy food decisions among school children. The study concluded that a consumer has to be motivated to change their behavior before action to change can be undertaken. After this phase, the individual is expected to move from a motivational phase to the volition phase. If a consumer has no interest on eating healthy, there is likelihood that he/she would not be motivated to use the nutrition information in the label.

Wansink, Just, Hanks, & Smith (2013) suggest that is important to address the practical reasons why people tend to avoid food even though they are aware of the fact that it is nutritious. The useful application of the convenience principle in behavioral economics helps address the issue of food waste in lunch rooms. Wansink et al. (2013) concluded that student may not eat fruits because it is too messy or too large. Providing schools with fruit slicers help to reduce waste, mess and increase consumption. In his study, Wansink et al. (2013) recorded a statistically significant increase in the consumption of fruits after the introduction of fruit slicers in the lunch rooms.

### **Research Questions**

RQ 1 - What proportion of snack food items purchased meet the competitive food guidelines by school district?

RQ 2 - Is there a relationship between the proportion of reimbursable meal purchased and the socio-economic status of school districts?

RQ 3 - Is there a relationship between the amount of snack foods purchased and the socio-economic status of school districts?

RQ 4 - Is there a relationship between the proportion of snack food purchased and the proportion of reimbursable meals purchased by school district?

### **Methods**

This study evaluates the effectiveness of the new policies by the National School Lunch Program (NSLP) in select Southwest Ohio schools. This study specifically looks into the purchase of out-of-pocket competitive food and how it affects consumption of the healthier reimbursable food options made available by NSLP.

### **Setting and Sample**

For this study, concepts from Cornell University Smarter Lunchrooms Movement were used to evaluate the food choices made by school children using information based on plate waste data collection. Schools that participated in the study include: School A, School B and School C. A total of three building belonging to the three different high schools were the site of the study. The study participants were between the ages of 13 and 19 years. To prevent introducing changes in eating habits that might create biased results, when students enquired about the study, they were told school lunch across Ohio was being studied without giving out the details of the project.

### **Design**

This is a descriptive study. Data for the study were collected from September 2013 to November 2013 in three school districts in Southwest Ohio. This project is part of a larger study, the Ohio Smarter Lunchrooms Project. The Ohio Smarter Lunchrooms Project was funded by the Ohio Department of Education during the 2013 fiscal year. Letters and e-mails

were sent to Ohio schools inviting them to participate in the project. Follow-up correspondence using phone calls and emails answered concerns regarding participation in the project. Interested schools were enrolled in the project. Participating schools are located in communities with different economic and racial background. This project collected no personal health identifiers, as a result it was exempted from review from the Institutional Review Board (IRB). Wright State University reviewed the project and issued an exemption for the research (Appendix A).

For collecting plate waste data the WSU Smarter Lunch Room Project adapted an Excel spreadsheet developed by Cornell University's Smarter Lunchroom Movement. The Cornell plate waste data collection form includes, school name, date, location, grade, and names of coders. To fit the needs of this project the spread sheet was modified to include the menu items for each day plate waste data was collected. Each page includes food items served, standard serving size and columns for the individual plates and a column for each tray for which plate waste is collected (see Appendix B for an example of the plate waste data collection form).

### **Study Measures**

Data collect to determine what students wasted was used in this project to determine what food items were purchased. These items were used to determine whether students purchased reimbursable or non-reimbursable meals and/or competitive food items. Raw data from the different coding session in the participating schools were used to develop the measures of interest for this project. Excel functions were used to numbers of food items on each student tray identified in waste collection. Menu items were grouped to different five meal categories: 1) meat and meat alternatives (entrée), 2) grain, 3) fruits, 4) vegetables, and 5) milk using the USDA food classification standards for the National School Meals Program. Food items that did not meet the USDA standards as part of a meal were classified as a competitive food, if it met

competitive food guidelines. Items that did not meet either standard were, coded separately and not used in this analysis.

Table 2 is a list of measures used in this study. Socioeconomic status of the school district is based on certain criteria used by the USDA to determine school's eligibility for free, reduced and reimbursable meal. Eligibility criteria are based on whether the families' incomes are above or below 185% of the Federal poverty level (\$43,568) to receive reduced price meals, or below 263% of the Federal poverty level (\$30,615) to receive free meals for a family of four.

Table 2

*Variables of Interest and Possible Measurement*

Variable of Interest	Definition of Variable	Source of Data
<b>School Level Variables</b>		
School District Socioeconomic Status	This depends on some criteria like family poverty level which the USDA uses to determine school's eligibility for free, reduced and/or reimbursable meal.	American Community Survey/Ohio Department of Education (ODE)
<b>Meal and Food Variables</b>		
Reimbursable meals	Meals that meet the USDA criteria (minimum of 3 qualifying items) meal	Plate waste data
A la carte items	Food item sold that are not reimbursable	Plate waste data
A la carte proportions	Portion sizes from each a la carte item served	Percentage cost or number of sales for each a la carte items
Snack foods	Food items that do not requirements to be considered a meal but meet some nutrition guideline to be served as alternative to school meals in the NSLP	USDA/ODE

Analytical categories were created based on whether students purchased a reimbursable or non-reimbursable meals and/or competitive food items. A reimbursable meal, three of the five items must include a meat and meat alternatives (entrée), grain, fruits and vegetables or milk have to be selected. If less than 3 of the 5 items were purchased the tray is considered as a non-reimbursable meal. Food items considered as a competitive food was coded separately. The

individual production records from the different school districts as well as plate waste data provided baseline information for all participating schools. This was used to assess the difference and the trend in eating behavior before our study and during the study period. The eligibility requirement for every school to be considered to take part of the reimbursable meal plan was verified from the Ohio Department of Education. For the poverty level of the different school districts studied, data was retrieved from the United States Census Bureau (see Table 3).

Table 3

*Families with Incomes Below 185% of Poverty  
by School District*

<b>Geography</b>	<b>%</b>	<b>n</b>
School A	33.6	852
School B	44.0	1,705
School C	65.1	853

To be a competitive food item as regulated by the USDA, snack food items must be considered to meet USDA Tier 1 nutrition standards. Competitive food item criteria as described in Table 3 contains nutrition regulation for saturated fat, trans fat, calories, sugar, sodium, grain, dairy etc. Tier 1 meal items are fruits, vegetables, whole grain and related combination products and nonfat/low fat dairy that are limited to 200 calories or less per portion as packaged and must follow the criteria listed in Table 4.

Table 4

*Competitive Food Item Criteria*

Item	Competitive Food Criteria
<b>Block 1</b>	
1.1	No more than 35 percent of total calories from fat
1.2	Less than 10 percent of total calories from saturated fats
1.3	Zero trans-fat (< 0.5g per serving)
1.4	35 percent or less of calories from total sugar , except for yogurt with no more than 30g of total sugar, per 8-oz portion as packaged
1.5	Sodium content of 200 mg or less portion as packaged
<b>Block 2</b>	
2	Be a grain product than contains 50 percent or more whole grain by weight or have whole grain as the first ingredient
3	Have as the first ingredient, one of the non-grain main food groups: fruits, vegetables, dairy, or protein foods (meat, beans, poultry, seafood, eggs, nuts, seeds, etc)
4	Be a combination food that contains at least ¼ cup of fruit and/or vegetable
5	Contain 10 percent of daily value (DV) of nutrient of public health concern (e. g. calcium, potassium, vitamin D, or dietary fiber).

Note: If water is the first ingredient, the second ingredient must be one of the items 2, 3, or 4 above.

Source: [http://www.fns.usda.gov/cnd/governance/legislation/allfoods\\_summarychart.pdf](http://www.fns.usda.gov/cnd/governance/legislation/allfoods_summarychart.pdf)

To be considered as a competitive food, snack food items must meet the all of the requirements in the first block and one or more of the criteria in the second block. Some items in the menu that are not considered part of a meal or a competitive food item were not coded and was not considered for this research.

### **Data Collection**

For this study, plate waste data was used as the primary source information about the foods students purchased as meals in school lunchrooms. Plate waste is the measure of the edible portion of food served disposed of by students when they have consumed what they want. To determine the amount of food students did not eat, plate waste information was collected. Plate waste was conducted several different days to ensure the results were reliable data. By

assessing the waste of items on the plate it is possible to determine what foods the student purchased.

Data was collected by teams from Wright State University. Food service directors from the school districts participating in the study provided data and assistance as requested. Data collectors evaluated individual student trays to determine the amount of food that was wasted. Coding methods used were similar to the methods used by the Cornell Smarter Lunchroom Movement. The remainder of each food item on the tray was evaluated. Food items that were uneaten were coded as four. A code of three was given for items that were three-quarters wasted, two was given to items that were one-half eaten, one was given when one-quarter of the item was wasted. An item that was completely consumed was coded as zero. Evidence such as crumbs, left over containers, ketchup packs, bones, etc. was used to determine that the items had been on the tray. Lunchroom custodians and school teachers from the different school districts ensured that the students were not aware their eating behavior was being studied to avoid biasing the study results. This was done by being consistent with one message. Students were told that school lunch was being studied across Ohio whenever any student asked. The teachers and custodians also helped direct students to the tables where they could leave their trays when they finish consuming their meals.

Prior to the plate waste collection, trash cans in the lunchroom area were either placed behind each coding station or hidden to make them inaccessible to students. This helped direct students to bring their trays to coding stations. Each coding station had a caller (a person who evaluated food items and called out the code for the amount of waste remaining for each food item) and a coder (a person who recorded the waste in the Excel spreadsheet). At the end of a

coding session from each school, data collected from the different coding stations were turned in to the project coordinator.

### **Data analysis.**

Data was analyzed using Excel. Tables were created to show the number of reimbursable meals, non-reimbursable meals, and competitive food items were purchased in each of the three schools. A list of all competitive foods offered was compiled. The criteria listed above for the competitive food item was used to check which of the food items met all the nutritional requirements as stipulated by the USDA. For the reimbursable and non-reimbursable meals excel functions helped us determine the number of food items in each plate. This helped us determine how many reimbursable meal and non-reimbursable meal sold. Trays that had at least three of the five food items required to be considered as a reimbursable meal was counted as a reimbursable tray. On the other hand, trays that had less than three of the five food items deemed reimbursable were considered as non-reimbursable.

Data analysis includes descriptive statistics of the food menu and food choices. Chi square test will also be used to determine statistical significance between the different variables. To maintain accuracy, the two tailed fisher test will be used to determine significance cell sizes were less than five. Finally, statistical significance was determined using a p-value equal to or less than 0.05. In order to maintain confidentiality, data used for analysis did not record the names of the students who had each plate recorded.

### **Results**

Table 5 shows all food items offered in the three high schools. A total of 19 different snack-food items offered by the three different high schools. For a snack item to be considered as a competitive food it has to meet the all the requirements in block one and at least one of the



requirements in the second block. The 19 snack items were analyzed to see if there met the competitive food guidelines enacted by the USDA in 2013.

Table 5

*Snack Food Items by USDA Criteria for Competitive Foods offered in Lunchrooms*

Snack-Food Item	Block 1 Criteria					Block 2 Criteria				B-1 Total	B-2 Total	Qualification
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4			
Chips	1	1	1	1	1	1				5	1	Competitive
Cookies	0	0	1	1	1	1				3	1	
Ice cream	0	0	1	1	1	0	1			3	1	
Jell-O with fruits	1	1	1	1	1	0	1			5	1	Competitive
Muffins	1	1	1	1	1	1				5	1	Competitive
Cheese sticks	0	0	1	1	0	0	1			2	1	
Pop Tarts	1	1	1	1	1	1				5	1	Competitive
Pretzel	1	1	1	1	1	1				5	1	Competitive
Water	1	1	1	1	1	0	0	0	0	5	0	
Yogurt	1	1	1	1	1	0	1			5	1	Competitive
Smoothie	1	1	1	1	1	0	1		1	5	2	Competitive
Cheez it	1	1	1	1	1	1				5	1	Competitive
Gold fish	1	1	1	1	1	1				5	1	Competitive
Nachos w cheese	1	1	1	1	1	1				5	1	Competitive
Bagel	1	1	1	1	1	1				5	1	Competitive
Nutri-grain	1	1	1	1	1	1				5	1	Competitive
Flavored water	1	1	1	1	1	0	0	0	1	5	1	Competitive
Vitamin water	1	1	1	1	1	0	0	0	1	5	1	Competitive
Tea	1	1	1	1	1	0	0	0	1	5	1	Competitive

After analysis, 78.9 percent or 15 of the 19 snack food items met the competitive food guideline.

School C offered fewer snack food items only half meet the competitive food guidelines.

Table 6 shows the number of snack food served by each school district. It also shows the proportion of snack foods that meet the competitive food guideline and the ones that do not meet the requirements. School A and School B had a higher offering for snack foods.

Table 6

*Proportion of Snack Food Items Purchased Meet the Competitive Food Guidelines by School District*

School District	Snack Foods Sold	Meets Guidelines		Does not Meet Guidelines	
		n	%	n	%
School A	11	8	73	3	17
School B	11	7	64	4	36
Northridge	4	2	50	2	50

More of the snack foods from School A meet the guidelines than any of the other school districts.

Table 7 shows that there is a relationship between poverty level and proportion of reimbursable meals purchased. School C has the highest proportion of families who have incomes below 185 percent of the poverty level (65 percent). In this school district over 72 percent of the meals sold at the high school were reimbursable meals.

Table 7

*Reimbursable Meal Purchased by Socio-economic Status of School Districts*

School District	185% of Poverty	Reimbursable Meals	
		n	%
School A	33.6	150	38.1
School B	44.0	175	70.3
School C	65.1	337	72.9
Total		662	59.9

Chi sq = 179.9, df=4, p= 0.001 (T vs LM&NR)

Chi sq = 1.6, df=4, p= 0.806 (T&LM vs NR)

School A, the school district with the lowest proportion of poverty sells significantly fewer reimbursable meals at the high school than the other two school districts. There is no difference in the number of reimbursable meals sold at the high schools in the other two school districts i.e. School B and C.

Table 8 shows the relationship between snack foods purchased and school district poverty level. School A with 34 percent of families with incomes below 185 percent of the poverty level had purchased significantly higher proportions of snack foods than School B and School C. Fifty-six percent of meals sold at School A included snack foods. School C was 65 percent below the Federal poverty level.

Table 8

*Proportion of Snack Foods Purchased by Poverty Level  
in School Districts*

School District	185% of Poverty	Competitive Foods*	
	%	n	%
School A	33.6	193	56.3
School B	44.0	121	40.9
School C	65.1	68	16.8
Total		382	36.6

Chi sq = 112.2, df=4, p= 0.001 (T vs LM&NR)  
Chi sq = 9.7, df=4, p= 0.045 (T&LM vs NR)

Students at School C purchased significantly fewer snack foods than the other school districts. The higher the poverty level, the less likely students were to purchase snack foods.

Table 9 shows the relationship between the purchase of reimbursable meals and snack foods. An increase in the in the purchase of snack foods results in in the purchase of fewer reimbursable meals. School A had the highest level of snack food purchases and experienced decrease in the demand for reimbursable meals.

Table 9

*Reimbursable and Snack Foods by School District*

High School	Reimbursable Meals		Snack Foods*	
	n	%	n	%
School A	150	38.1	193	49.0
School B	175	70.3	121	48.6
School C	337	72.9	68	14.7
Total	662	59.9	382	34.6

Chi sq = 118, d = 4, p <.001 (T vs LM&NR)

Chi sq = 85, d = 4, p <.001 (T&LM vs NR)

\*Number of competitive foods are not included as meals.

School C which had 73 percent of food sales attributed to reimbursable meals saw a decline in the snack foods to 15 percent compared to 49 percent as seen in the School A school district.

### Discussion

The purpose of this study is to describe the current snack food offerings in select Ohio high schools, and to determine how these snack foods affect the consumption of healthier free and reduced meal options. We also describe factors that influence decision making in lunchrooms and to explore effective ways to encourage healthier food decision making. The USDA has put several measures in place to promote the consumption of reimbursable meals which are healthier food options. Guidelines such as the Competitive Food Guidelines were enacted to regulate the sale and the nutritional content of the snack foods sold at school lunchrooms. This new guidelines are expected to be in full effect by Fall 2014. This study examines how effective the new Competitive Food Guideline has been and whether it has been helpful in promoting the consumption of the reimbursable, healthier meal options. This study uses data from three high schools: School A, School B, and School C.

A total of 19 snack foods were offered in the three school districts studied. The most common foods offered were Doritos Nachos Cheese, Pop Tarts, potato chips, cookies and Gold

Fish Crackers. The highest proportions of snack foods were purchased in School A and School B School districts. Despite the new competitive food guidelines enacted by the USDA in July 2013 regarding the type of snack foods permitted in school lunchrooms, some of these snack foods did not meet the new guidelines. Four of the 19 snack foods failed to meet the new guidelines. Three of the four snack foods that did not meet the guidelines were served at School A and three of the four noncompetitive food items were sold in School B. It is safe to conclude that the larger the number of snack food options offered the higher the proportion will meet the new guidelines. This is consistent with Newman's (2013) prediction that despite the strict USDA nutrition requirements for competitive food guidelines not all snack foods served in school lunchrooms under the competitive food category will meet the requirements.

The information acquired in this study suggests the question; "does the number or variety of snack foods offered by school district affect the consumption of healthier meal options?" An argument can be made that it has a significant impact in the proportions of reimbursable meals purchased. School A offered the highest quantity of snack foods offered and sold the fewest number of reimbursable meals. This was closely followed by School B, which had the same quantity of snack foods offered

From the results of this study, school's district poverty level has a relationship on the purchase of reimbursable meals. This finding is consistent with the findings of this study, which shows that students at School C, the school in the district with the highest poverty level, consumed more reimbursable meals than the other two high schools studied. On the contrary School A was the most affluent high school studied and was two times less likely to consume reimbursable meals than School C. Affluent school districts like School A and School B do not

have the luxury of enjoying free and reduced price lunches like the less affluent schools like School C. This affects student participation in the National School Lunch Program.

Another significant finding from this study is that there is a relationship between the consumption of snack foods and the socio-economic status of the school district. Students in the School C which had the largest number of families with incomes below 185 percent of the poverty level purchased the lowest proportion of snack foods. Students in the School A, the most affluent district, purchased the highest proportion of snack foods. In addition, School A and School B had larger selections of snack food offerings than School C. According to the result of our study, availability of a large selection of snack foods may explain why there was a higher demand for snack foods in the more affluent schools. School A, which had more snack food options, was three times more likely to consume snack foods compared to School C, which had less snack food offerings. The results agree with the findings of Guthrie et al. (2013), where he stated that affluent school districts usually have food services with high revenue from snack food items.

Finally, we studied the relationship between consumption of reimbursable meals and snack foods by school. These results suggest that as the purchase of reimbursable meals increases, the demand for snack food declines. Affluent schools like School A had a low consumption of reimbursable meals combined with a high demand for snack foods. School C which had a low access to snack foods experienced a high demand for reimbursable meals. This may be as a result of the socio-economic status of the school district. This result evokes the concern of the stakeholders in the health sector who continues to raise the issue of how the low nutrient foods are displacing the healthy alternatives especially in the more affluent school districts (Briefel et al., 2009).

**Recommendations**

Solutions to the high consumption of snack foods and low utilization of healthier meal options should be multi-faceted. A single intervention will most likely yield poor results. Parents, the government, schools and the students all need to make a conscious effort to encourage healthy eating behaviors.

The food service directors can contribute to reducing the consumption of snack foods by making changes policy as well as lunchroom changes. Policy changes may include restricting access to the vending machines, or selling snack items only at the end of the lunch period. Schools without snack bars and vending machines were more likely to consume healthier meal options (Wansink, 2004). Lunch room changes may include, stationing snack foods in places that would be less conspicuous (Wansink, 2004). A feasible lunchroom policy can be to allow lunchroom workers to follow a legal protocol, which allows them to mandate, regulate and limit the amount of snack items, an individual student may be allowed to purchase. This method controls and maintains the overconsumption of unhealthy snack foods by the students. The more effort that is required in order for a students to acquire a snack item, the less desirable it will be for them. Another way to increase the consumption of healthier meals may be by making the serving line for snack foods longer and doubling up the serving lines for meals which would make the meal serving line faster and easily accessible. On the other hand, students would have to wait to a longer period just to get a Dorito Nachos Cheese, or a Pop Tart which is less fulfilling than an entire meal. Increasing choices and attractiveness of healthier meal options like fruits and vegetables may encourage its demand and reduce the demand for snack foods.

### **Study Limitations**

Data used for the study were from a single lunch day for School A and School B high schools and 3 different lunch days from School C. This may affect the results we obtained so caution should be used when translating the study results. If the entrée served during the plate waste data collection day was not a high demand food item, more students would consume more snack foods. On the contrary, if the entrée was a high demand item like pizza, it would sway decision making towards more meals than snack foods. More data collection days would have helped to get a more statistically reliable data.

Another limitation to the study is that not all the trays from the high schools were analyzed. On certain days the tray waste coordinators were overwhelmed with the number of trays and we targeted about 60 to 70 percent of the trays. Thirty percent of the trays we failed to analyze could have changed the result of our study. Also during the plate waste collection, some of the trays were combined with others so we had to discard those trays because we were not sure how many trays were combined and what the contents of the individual trays were.

School C had a small variety of snack food options unlike the other two schools studied. Four snack foods for School C may not be significant enough to make relevant statistical conclusions. School A and School B had a statistically significant number of eleven snack food items each.

### **Public Health Implications**

Snack foods are very high on energy and low on nutrients and efforts should be geared towards reducing its consumption to the barest minimum. The high energy these food items possess is not always used up thus accumulating in the body and storing excess energy in the form of fat. This excess energy in turn leads children to be overweight and in some cases obese.



Obese children go through several social, emotions and health problems. Obese children are more likely to suffer from diabetes, stroke, hypertension and heart attack. The secondary effects of obesity and overweight are the major causes of morbidity and mortality in our world today. These are the reasons why obesity has been classified as a disease by the American Medical Association. Although the secondary impact of obesity may not develop in childhood, the consequences are enormous in adulthood. Efforts to curb obesity should start from childhood and a good place to direct efforts would be in the school lunch rooms and at homes.

### **Conclusion**

The USDA and the HHS should put forth more effort towards promoting healthier meal options and ensure that school lunch programs strictly adhere to the recent competitive food guidelines. The socio-economic status associated with the poverty level has a large impact on individual food selection and decision-making in lunchrooms. The major factors that affected the consumption of snack foods were the variety of snack foods, convenience, and poverty level. The competitive food guidelines have been helpful in controlling the type of snack foods sold in school lunchrooms. Although the schools did not fulfill all of the guidelines, a future follow up by the USDA can help in fostering compliance to this new policy. When comparing the amount of low nutrient foods eaten outside the lunch school environment and those served as snack food in the lunchroom, we can confidently say that the NSLP has been able to significantly reduce the amount of high energy, low nutrient food items sold in lunchrooms.

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Appendix – List of Competencies Used in CE

**Tier 1 Core Public Health Competencies**

<b>Domain #1: Analytic/Assessment</b>
Identify the health status of populations and their related determinants of health and illness (e.g., factors contributing to health promotion and disease prevention, the quality, availability and use of health services)
Describe the characteristics of a population-based health problem (e.g., equity, social determinants, environment)
Use variables that measure public health conditions
Use methods and instruments for collecting valid and reliable quantitative and qualitative data
Identify sources of public health data and information
Recognize the integrity and comparability of data
Identify gaps in data sources
Adhere to ethical principles in the collection, maintenance, use, and dissemination of data and information
Describe the public health applications of quantitative and qualitative data
Collect quantitative and qualitative community data (e.g., risks and benefits to the community, health and resource needs)
Use information technology to collect, store, and retrieve data
Describe how data are used to address scientific, political, ethical, and social public health issues
<b>Domain #2: Policy Development and Program Planning</b>
Gather information relevant to specific public health policy issues
Describe how policy options can influence public health programs
Gather information that will inform policy decisions (e.g., health, fiscal, administrative, legal, ethical, social, political)
Identify mechanisms to monitor and evaluate programs for their effectiveness and quality
<b>Domain #3: Communication</b>
Identify the health literacy of populations served
Communicate in writing and orally, in person, and through electronic means, with linguistic and cultural proficiency
Participate in the development of demographic, statistical, programmatic and scientific presentations
<b>Domain #4: Cultural Competency</b>
n/a
<b>Domain #5: Community Dimensions of Practice</b>
Recognize community linkages and relationships among multiple factors (or determinants) affecting health (e.g., The Socio-Ecological Model)
Demonstrate the capacity to work in community-based participatory research efforts
Identify stakeholders
Collaborate with community partners to promote the health of the population
Maintain partnerships with key stakeholders
Use group processes to advance community involvement
Identify community assets and resources
Gather input from the community to inform the development of public health policy and programs

<b>Domain #6:Public Health Sciences</b>	
Describe the scientific evidence related to a public health issue, concern, or, intervention	
Retrieve scientific evidence from a variety of text and electronic sources	
Discuss the limitations of research findings (e.g., limitations of data sources, importance of observations and interrelationships)	
Describe the laws, regulations, policies and procedures for the ethical conduct of research (e.g., patient confidentiality, human subject processes)	
Partner with other public health professionals in building the scientific base of public health	
<b>Domain #7: Financial Planning and Management</b>	
Demonstrate public health informatics skills to improve program and business operations (e.g., performance management and improvement)	
<b>Domain #8: Leadership and Systems Thinking</b>	
Incorporate ethical standards of practice as the basis of all interactions with organizations, communities, and individuals	
Describe how public health operates within a larger system	

**Health Promotion and Education Concentration Competencies:**

<b>Health Promotion and Education</b>	
<b>Area 1: Assess Needs, Assets and Capacity for Health Education</b>	
1.1	Identify stakeholders to participate in the assessment process
1.2	Engage stakeholders to participate in the assessment process
1.3	Analyze factors that foster or hinder the learning process
1.6	Synthesize assessment findings
<b>Area 2: Plan Health Education Programs</b>	
	n/a
<b>Area 3: Implement Health Education</b>	
	n/a
<b>Area 4: Conduct Evaluation and Research Related to Health Education</b>	
4.1	Create purpose statement
4.2	Develop evaluation/research questions
4.3	Assess the merits and limitations of qualitative and quantitative data collection for research
4.4	Critique existing data collection instruments for research
4.5	Create logic model to guide the evaluation process
4.6	Develop data analysis plan for research
4.7	Write new items to be used in data collection for research
4.8	Evaluate feasibility of implementing recommendations from evaluation
4.9	Disseminate research findings through professional conference presentations
<b>Area 5: Manage Health Education Programs</b>	
	n/a
<b>Area 6: Serve as a health education resource person</b>	
	n/a
<b>Area 7: Communicate and advocate for health and health education</b>	
	n/a