THE EFFECT OF PRICE AND AVAILABILITY OF HEALTHY FOOD ALTERNATIVES ON STUDENT CHOICES DURING SCHOOL LUNCH

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The Effect of Price and Availability of Healthy Food Alternatives on Student Choices

During School Lunch

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ABSTRACT

The purpose of this study was to determine the impact of healthy food alternatives on the food choices of secondary school students. The researcher focused on one particular lunchroom environment within a secondary school. A single subject research design was used to study purchasing behavior among students during lunch periods over several days. Results related to the impact of healthy food alternatives on lunch room choices showed four different phases used within the study. The first phase introduced healthy alternatives to the a la carte menu for students to buy at full price. The students were able to choose from traditional items and healthy alternatives. During the second phase, the prices of the healthy alternatives were reduced and then increased back to full price during the third phase. The healthy alternatives were taken out of the a la carte menu during the final phase offering only traditional food items. These phases allowed the researcher to examine if offering healthy alternatives and pricing changes of those items affects student food choices during a single lunch period. Results indicated that introducing healthy alternatives and reducing the price of these same items does not have an effect on student choices during a school lunch period.
# TABLE OF CONTENTS

Chapter

I. INTRODUCTION ................................................................. 6
   Regulating Food Choice .......................................................... 8
   Offering Attractive Alternatives .............................................. 9
   Other Influences ...................................................................... 11
   Summary and Purpose Statement ............................................ 12

II. LITERATURE REVIEW ...................................................... 14
    Childhood Obesity ................................................................. 14
    Emotional Complications ..................................................... 14
    Physical Complications ......................................................... 16
    Into Adulthood ...................................................................... 18
    Causes of Childhood/Adolescent Obesity .............................. 19
    School Environment .............................................................. 21
    National School Lunch Program .......................................... 22
    Competitive Foods ............................................................... 23
    Factors Influencing Eating Behavior ..................................... 24
    Food Preferences of Students .............................................. 26
    Food Preference Interventions ............................................. 28
    Conclusion ............................................................................ 34

III. METHODS ........................................................................ 36
    Population ........................................................................... 36
    Sample ................................................................................ 36
    Instrumentation .................................................................. 36
    Pricing ................................................................................ 37
    Procedures .......................................................................... 37
    Research Design and Data Analysis ....................................... 39
    Internal Validity ................................................................... 39
    Summary ............................................................................. 41

IV. RESULTS........................................................................... 43
    Interpretation of Line Graphs .............................................. 43
    Descriptive Statistics .......................................................... 45
    Hypothesis Tests .................................................................. 47

V. DISCUSSION ....................................................................... 48
    Limitations .......................................................................... 52
    Recommendations for Research .......................................... 54
    Recommendations for Practice ........................................... 56
    Conclusion ........................................................................... 58
CHAPTER I
INTRODUCTION

Obesity has become a major problem for children in America. The Centers for Disease Control and Prevention (2008) has found that “the prevalence of overweight among children aged 6-11 years has more than doubled in the past 20 years and among adolescents aged 12-19 has more than tripled” (p. 1). Obesity that is developed in childhood has a tendency to carry on into adulthood (Friedlander, Larking, Rosen, Palermo, & Redline, 2003). Research has found that within children, “approximately 16.5% are overweight and 31.5% are considered at risk for overweight” (Nollen et al., 2007, p. 2). Obesity can increase the chance of children developing diabetes, heart disease and high blood pressure as they become adults (Ebbeling, Pawlak, & Ludwig, 2002; Must & Strauss, 1999). Emotional complications can occur in children who are considered overweight or obese as well. Low self-esteem, loneliness, and negative body image are commonly found in overweight children (Ebbeling et al., 2002).

Physical inactivity, poor nutrition, genetics, and the home environment are factors that can have an effect on obesity among children (Ebbeling et al., 2002). Figuring out a solution to the obesity epidemic among children has become a top priority of the nation.

Children attend school over half the year and eat approximately half of their daily caloric intake during that time (Nollen et al., 2007). The focus of some public health efforts has been on the food environment at schools. If students are eating half of their daily food intake at school, logic would suggest that the food that is offered would have a significant impact on child and adolescent obesity rates. Public or nonprofit private
schools have the option of offering nutritious meals for lunch through the United States Department of Agriculture (USDA) School Lunch Program. This program is a federally assisted program that offers nutritional meals for all students in public or nonprofit private schools across the United States. Students with families with a specific income are eligible for free or low-cost lunches through this program as well. According to the United States Department of Agriculture (2007), almost 100,000 schools participated in this program. Food regulations recommended by the 1995 Dietary Guidelines for Americans are a required element of this program, ensuring that all participating schools meet standard criteria for healthy school lunches (Fleischhacker, 2007; USDA, 2007). As a result, all students are able to purchase and eat nutritional meals through this program; however, some students supplement or replace these standard offerings with other foods that are sold at the school (Fleischhacker).

The problem most schools face is the lack of regulations for these alternative food choices that are sold in the school. These sources are referred to here as a la carte lunch programs, and can include staffed or unstaffed vending areas that offer food in addition to the daily school lunch offering. Some of the foods offered in vending machines and snack bars have minimal nutritional value and are not regulated. According to Story, Kaphingst, and French (2006), students can usually find carbonated beverages, salty snacks, and baked goods that are high in fat. Fruits and vegetables make up 18% of the vending machine items (Story et al., 2006). Nollen et al. (2007) found that “90% of schools offer an a la carte lunch program and over 80% of high school students have
access to vending machines, school stores, snack bars, or canteens, which offer items consistently found to be low in nutrients and high in fat, calories, and sugar” (p. 2).

Regulating Food Choices

Research suggested that limiting the choices of low-nutritional value items can increase the consumption of fruits and vegetables (Cullen, Watson, & Zakeri, 2008). A study conducted in southeast Texas looked at food consumption by middle school students (Cullen et al.). Three years of food records were collected. Each year a different strategy for encouraging healthier food choices was implemented, such as completion of food records, removal of some snacks from the snack bar and vending machines, and starting the Texas Public School Nutrition Policy. The study found that “students might have made more healthful food choices when fewer high-fat sugary and salty foods were available, and these actions influenced their peers to also make healthier choices” (Cullen et al., p. 114). Based on this study, it appears that, when unhealthy options are limited, students are more likely to have a healthier breakfast or lunch.

Unfortunately, when left on their own, it appears that students choose the foods with low or no nutritional value over fruits and vegetables. A study was done in three public high schools that examined food purchases over 4 weeks (Snelling, Korba, & Burkey, 2007). The foods were labeled as red, yellow, and green. The red labels indicated low nutritional value, yellow had some nutritional value and green was high in nutritional value. The study found that “61% of the competitive foods were classified as red foods and the purchasing of these red foods made up 83% of the competitive food sales” (Snelling et al., p. 701). Based on this finding, it could be suggested that schools
should put limitations on the items being sold in vending machines and snack bars. Limitations could also be placed upon the time periods when competitive foods are available to students. This may reduce the amount of low nutritional items that are consumed by students. In fact, 19 states have put in place limitations to competitive foods being offered. These limitations included reducing access to competitive foods and making sure that the food being offered meets nutritional guidelines (Snelling et al.).

Offering Attractive Alternatives

Schools have control over what is offered in the snack bars, a la cartes, and vending machines that are available along side the National School Lunch Program. Simply forcing children to eat healthy lunches by removing these alternative food sources is often viewed as an unattractive option because of the revenues generated by these food sales (Bell & Swinford, 2004; Cho & Nadow, 2004; Cleland, Worsley, & Crawford, 2004). As such, another alternative would be to encourage students to purchase healthier foods when utilizing these alternative sources. Carr and Cross (2008) did a study that involved implementing vending lunches that were reimbursable. Two vending machines with food items that met the USDA requirements and nutrition standards were placed in the participating schools. Schools were reimbursed with Federal funds. Food was prepared at each school and put into cashless vending machines for students. Examples of the food items that were included were sandwiches, salads, fruit drinks, and milk. Software allowed the machines to identify students who qualified for free and reduced lunches. The students who did not qualify had to pay the full a la carte price for each item. Foods with minimal nutritional value offered on a la cartes and in vending
machines were located away from the reimbursable lunch vending machines. District A and B were the two school districts who participated in the study. District A student selections from the vending machines met the requirements for reimbursable lunch, but were never recognized. The director at the district started a vended reimbursable lunch program to make up for the lost revenue. District B had a lunch schedule change made by the principal that had a single lunch period at the end of the school day. In response to this schedule change, the director of district B implemented a vended reimbursable lunch. The results showed that participation in district B decreased due to the lunch schedule change. In district A, participation increased. Researchers felt that the sales would eventually increase with longer hours and better marketing of the lunches by each school (Carr & Cross, 2008). This study helps support the idea that schools can offer attractive alternatives to their vending machines and snack bars as a way to increase healthier choices among students.

As previously mentioned, Snelling et al. (2007) offered foods within schools that had low, medium, and high nutritional values. The goal was to see what students chose when healthier foods were offered along with foods that were less healthy. The majority of the sales consisted of foods with the lowest nutritional value, suggesting that simply providing a choice does not ensure healthy diet. Carr and Cross (2008) showed that, for a la carte and vending machines that had more attractive alternative options and less of the traditional items, sales for those alternatives were higher. Thus, the availability of healthy alternatives appears to have potential despite the observed tendency of children to choose less healthy items when they are readily available.
Other Influences

Limiting access to unhealthy foods and increasing access to healthy alternatives may not be the overall solution for childhood obesity. Furthermore, these changes may not be enough to significantly alter eating patterns of children during school hours. There are many other factors that contribute to the food choices of children and the likelihood that they eventually become overweight.

The first extraneous factor is the food children consume in the school environment. Unfortunately, factors other than health often drive school lunch offerings. As alluded to earlier, commercial food sales are used as a source of funding in many schools throughout the nation. One study found that most principals agreed that “lack of funding is a main issue obstructing the offering of quality lunch programs” (Cho & Nadow, 2004, p. 426). Students would rather eat the unhealthy choices. This is what sells during lunch time and gives schools the most funding. If schools were to take out the competitive food that is being sold, they would lose some of their funding.

Superintendents within the study found it hard to avoid selling unhealthy meals because those types of meals make the most money and are the ones that students choose to eat (Cho & Nadow, 2004).

This statement leads into another factor that prevents schools from providing quality meals and that is students’ preferences. Some schools offer the healthy items to give students the option, but the majority of foods that lunch workers throw away are those healthy items (Cho & Nadow, 2004). Students want to eat what tastes good. Since students like the unhealthy food better, they buy food in the a la carte, snack bars or
vending machines that offer unregulated and unhealthy alternatives to the standard school lunch.

Summary and Purpose Statement

Eating healthy helps children grow and develop into adulthood. Children with healthy eating habits have stronger bones, healthier skin, and fewer health problems when they become adults (Hills et al., 2007). Poor nutrition and inactivity are some of the main factors that cause children to be overweight (Ebbeling et al., 2002).

In recent years, schools have been under attack for their school lunch programs. Some say that the offerings that most schools provide are not recommended according to the dietary guidelines (Carter, 2002). Regulations have been established for the National School Lunch Program, but none have been put in place for the competitive foods that are being sold. Schools often claim that they are not able to take the competitive foods away because the sales provide school funding (Nollen et al., 2007).

As a result of these trends, the school lunch environment has become controversial and is often viewed as a contributing factor to the obesity epidemic. If schools would offer more nutritional foods in a la carte, vending machines and snack bars, while limiting the items with low or no nutritional value, they may be able to increase healthier eating habits by students. Evidence has clearly supported the effect of limiting access to food with low nutritional value, but it is still unclear what effect the provision of attractive, but healthy, food alternatives can have on the lunch diet of school children. Based on this need, the purpose of this study was to determine the impact of
healthy food alternatives on the food choices of secondary school students. The following research questions were addressed:

Q1: How does the availability of healthy food alternatives impact the sale of a la carte food items during school lunch periods?

Q2: How does pricing of healthy food alternatives impact the sale of a la carte food items during school lunch periods?
CHAPTER II
LITERATURE REVIEW

Childhood Obesity

Childhood obesity is a major problem among children and has increased throughout the years causing children to develop health problems in the future (CDC). The Center for Disease Control and Prevention (CDC; 2008) defines a child between the ages of 2-19 years to be obese when their Body Mass Index (BMI) is at or above the 95th percentile. BMI is the relationship of height and weight of a person and is an indicator of body fatness. Research has shown that obesity rates are “projected to be 30% by the year 2015 increasing to 40% by the year 2025” (Kiess et al., 2006, p. 124).

Must and Strauss (1999) wrote a report that identified risks and consequences of childhood and adolescent obesity. They divided them into three categories, immediate, intermediate, and long term. Problems occurring during childhood such as asthma and sleep disorders are categorized as immediate; whereas, intermediate and long term complications pertain to issues that persist into or manifest later on during adulthood. Some intermediate consequences include high blood pressure and cholesterol. Long term risks include adult morbidity and adult mortality. Substantial research has been found; some of which is presented below.

Emotional Complications

Freidlander et al. (2003) examined the relationship between health-related quality of life and body mass index in youth. Parents of the children participating in the study filled out a survey about their children. Children were put into categories according to
their height, weight, and BMI. The results showed that children considered overweight scored lower on the psychosocial health and physical functioning parts of the test compared to the children at normal weight (Freidlander et al.). Ebbeling et al. (2002) reported that overweight and obese adolescence in their study tended to have characteristics of a negative self-image and low self-esteem, loneliness, sadness, and nervousness.

Must and Strauss (1999) have also discussed some more emotional complications that are likely to occur in children who are obese. Complications for obese girls include “obsessive concern with body image, as well as expectation of rejection and progressive withdrawal” (Must & Straus, p. 4). The report also said that obese children were described negatively by other children. They would describe them as being sloppy, dirty, ugly and/or stupid (Must & Straus).

This type of bullying and teasing has been shown to have harmful effects on overweight children’s psychosocial well-being (Eisenberg, Neumark-Sztainer, & Story, 2003). Eisenberg et al. did a study that looked at the associations of weight-based teasing and emotional well-being among adolescents. The study involved several students within 31 middle schools in grades 7 to 12. A survey was given to the students asking them questions about socioeconomic, personal, and behavioral factors that were related to nutritional health. The results showed that 30% of adolescent girls and 24.7% of boys were said to be teased by peers about their weight. Approximately 28.7% of girls and 16.1% of boys were teased by family members about their weight. The students who were teased by peers and/or family were more likely to have emotional health problems
than ones that were not teased at all. This study showed some emotional complications that may be experienced by children who are overweight or obese.

Social isolation of overweight children could be an outcome of teasing and bullying. This is another aspect of childhood obesity that is an immediate influence on a child’s emotional well-being (Strauss & Pollack, 2003). Strauss and Pollack examined social marginalization of overweight children. Adolescents aged 13 to 18 who were enrolled in the National Longitudinal Study of Adolescent Health were chosen to participate. The students were participants of Add Health which is a federally funded study designed to assess the health status of adolescents and behaviors associated with their health. The results of the study showed that overweight adolescents were more isolated and had fewer friends than adolescents who were considered normal weight. Overweight adolescents were also considered to be less popular than normal weight participants. According to Straus and Pollack, friendship is an important factor that helps with social and psychological development among adolescents.

*Physical Complications*

Obesity can cause physical complications as well, most of which are categorized by Must and Strauss (1999) as immediate consequences. Obesity can limit activities that are involved in health-related quality of life (Friedlander et al., 2003). Some children are developing health problems during adolescent years that are taken into their adult years. Ebbeling et al. (2002) stated that “Type 2 diabetes, once virtually unrecognized in adolescence, now accounts for as many as half of all new diagnoses of diabetes in some
populations” (p. 473). Ebbeling et al. also reported that cardiovascular disease and pulmonary complications can be caused by childhood obesity.

Graf et al. (2004) did a study that assessed the effects of body mass index on motor abilities and leisure habits in children. A total of 668 children and their parents were given a questionnaire that had questions related to the children’s leisure behavior. The children also participated in a test that assessed their motor abilities as well as a 6-minute run. The motor abilities test had four items for the children to complete that involved balancing backwards, one-legged obstacle jumping, jumping from side to side, and sideway movements. Points were given for each task that made up the overall motor quotient. The results of the test showed that the motor quotient for obese and overweight children was worse than the children of normal weight. The mean value for the obese children came close to being a moderate motor disorder. The obese and overweight children also did not perform as well on the 6-minute run than children of normal weight. The results of the leisure behavior questionnaire showed that the children who were involved in the most exercise scored higher on the motor abilities test. Graf et al. has shown that children who are obese and overweight may have a higher prevalence of physical complications during childhood.

Swallen, Reither, Haas, and Meier (2005) did a similar study to examine the relationship between obesity and health-related quality of life in adolescents. An analysis was conducted using the National Longitudinal Study of Adolescent Health. A representative sample of children in grades 7 to 12 was used. General health, physical health, emotional health, and school and social functioning were four dimensions
measured within the study. The researchers found that adolescents who were overweight or obese reported poor general health and one or more functional limitations. Swallen et al. concluded that adolescents with higher BMI results have more physical limitations than adolescents of normal weights. This study has shown that functional limitations can occur among adolescents who are obese or overweight.

Into Adulthood

Not only does obesity limit the quality of life for children, it also has shown to carry into adulthood. The lifestyle that children develop during adolescence is hard to change when they become adults. Rimm and Rimm (1976) did a study with overweight women as the participants to see if children who are obese are predicted to be obese as adults. The overall weight of the women was determined by using the obesity index. To determine if the women were obese they were all asked the same question, “Were you considered to be a fat child?” (Rimm, p. 479). The results of the study showed that women who considered themselves to be fat as children were later considerably obese as adults. The study also indicated that juvenile obesity and adult obesity are related (Rimm, 1976).

Maffeis and Tato (2001) wrote an article discussing long-term effects of childhood obesity. The researchers found childhood obesity to be a risk factor for adult obesity. Furthermore, the authors reported that “Early onset obesity is a risk factor for morbidity and mortality later in life” (Maffeis & Tato, p. 44). This article also discussed critical periods in childhood that can result in childhood obesity. The first period discussed was the prenatal period, when eating habits and metabolism can impact fetal
growth. Severe overeating and diabetes among mothers were identified as risk factors for obesity in later life. The first year of life was also identified as a critical period. This is a time period where nutritional behaviors can change. Family food habits during this time can create specific preferences, which can influence adiposity. The pre-school period and adolescence were identified as critical periods as well. Puberty during adolescence is a time where body fat changes occur. Females develop more fat and distribute it throughout the body differently than males. Maffeis and Tato concluded that “several studies demonstrated that childhood obesity in 50% of cases persists into adulthood” (p. 45).

**Causes of Childhood/Adolescent Obesity**

Research has shown that there are many causes of overweight and obesity among children. There have been four causes mentioned in the literature as significant contributions to obesity in children: low physical activity, poor nutrition, genetic factors, and family/environmental factors (Ebbeling et al., 2002). Decreased physical activity and poor nutrition combined can be two of the main factors that increase the risk of obesity.

*Physical inactivity.* Research has shown that children who have a sedentary lifestyle or are less active weigh more than children who are active (Ebbeling et al., 2002). Bodyweight is regulated by how much energy a person takes in and is spent per day. Children who eat more and have a sedentary lifestyle are at risk for obesity. Physical activity helps children grow and develop. Exercise can help bones grow, maintain a healthy body composition, and prevent high blood pressure (Hills, King, &
Armstrong, 2007). If children do not participate in vigorous activity daily, then they will have more energy intake than energy spent, which causes weight gain.

It is hard for some children to participate in daily activity because of several factors. Technological advances such as television, computers, and video games keep kids inside and sedentary (Prentice & Jebb, 1995). Parents play a key role in the amount of activity children have as well. Steinbeck (2001) suggests that parents need to be good role models of physical activity, participate with their children and increase their child’s access to activity in order for their children to be more physically active (Steinbeck, 2001). Children will be able to see their parents being active and may want to participate with them (Steinbeck). Practicing this type of lifestyle with parents will allow children to be accustomed to that lifestyle later on in adulthood.

Physical activity plays an important role in the health of children. Children and adolescents who are not physically active on a regular basis are at risk for being overweight and obese and may carry this condition into adulthood. Steinbeck (2001) says, “…there is evidence that falling levels of physical activity are contributing to the obesity epidemic” (p. 117).

Poor nutrition. Children’s diets have been known to be a cause of childhood obesity. Their diets consist of foods that are high in fat and sugar. According to Porouznia (2001), a typical snack or meal for children may include items such as pizza, fries, candies, and other high-fat food. They are not getting their recommended daily nutrients by making these food choices. Consuming foods like these that are high in fat is causing children to be overweight or obese because they are consuming more energy
than what is being put out. The Centers for Disease Control and Prevention (2008) warns that large portion sizes, eating away from the home, frequent snacking, and consuming beverages that have a high sugar content contributes to high energy intake for children and adults.

There are many factors that promote poor eating habits of children. Pirouznia (2001) found that poor nutrition knowledge can reflect poor eating habits of children. If children do not know what foods are considered healthy, then it will be difficult for them to choose healthy items. Environmental factors such as social norms, mass media, and fast food also help children to eat unhealthy (Ebbeling et al., 2002; Pirouznia). The media advertises food that is low in nutrients and high in fat through commercials that children watch on television (Roblin, 2007). Billboards and signs promoting foods that are not considered to be healthy are found in areas where children participate in activities. Fast food is convenient for families to grab and go when they are in a hurry and is very accessible (Roblin). Ebbeling et al. found, “By the mid-1990s to late-1990s, the proportion of meals eaten away from home nearly doubled to 30%, and fast food consumption increased to five-fold, to 10% of total energy intake” (p. 478). All of these factors play a major role in the obesity epidemic in children as well as adults.

School Environment

There have been many concerns that the school environment does not provide students with the amount of activity children need or the proper nutrition to help prevent students from being overweight or obese. Children attend school approximately 9 months out of the year. This means that each day at school the children eat the food that
the school provides for them at lunch. Most schools even offer breakfast for the students. This is two of the three meals that children eat a day. According to Carter (2002), “25 million students eat the NSLP daily and approximately 7 million eat the National School Breakfast Program” (p. 1). Schools can have a large impact on the diet of students, and therefore, can also impact childhood obesity.

National School Lunch Program

School lunches try to provide food that has high nutritional value. The National School Lunch Program (NSLP) was developed in 1946 to help with the poverty and malnutrition problems among children. The meals that are served through the program are required by the United States Department of Agriculture to meet Dietary Guidelines for Americans (Fleischhacker, 2007). There are concerns that the meals are not as nutritious as they should be for the students; however, some research has shown that students who eat lunches provided by this program consume less sugar and foods that are high in fat. According to Fleishhacker, students who eat lunches prepared under these guidelines consume more milk and vegetables, and have a higher intake of many key vitamins and nutrients than students who do not eat meals provided by the National School Lunch Program. In addition, schools with federally funded meals were required to create and implement a wellness policy for the 2006-2007 school year. This is called the Child Nutrition and Women, Infant, and Children Reauthorization Act, which was developed by the federal government in 2004 (Nollen et al., 2007). The government hoped that this act would help make schools healthier and help with obesity among the children. Thus, schools do have a system that has been created to provide nutritious
lunches to children; however, students are also allowed to purchase other food choices or to bring their own lunches. This fact undermines these efforts to ensure healthy diets among school-aged children.

**Competitive Foods**

As noted above, the sale of competitive foods during school appears to be contributing to poor diet during school hours. Competitive foods are defined as foods that are sold outside the USDA school meals program (Kann, Grunbaum, Mckenna, Wechsler, & Galuska, 2005). The food items that usually are considered competitive foods also tend to be foods with minimal nutritional value. They are usually sold in vending machines, snack bars, or as a la carte items during lunch. The National School Health Policies and Programs Studies (2000) states that “out of the foods that are available through vending machines, school stores, or snack bars, only 18% are fruits and vegetables” (Story, Kaphingst, & French, 2006, p. 115). Kann et al. (2005) wrote an article that had the results of the 2004 School Health Profile. Profiles are conducted twice a year, and state and local departments of education and health pick public secondary schools to participate. Principals and the lead health education teachers fill out questionnaires about their school’s health. In the 2004 profile, principals were asked questions related to the sale of competitive foods sold in their schools. The results showed the average percentage of schools that allowed students to purchase snack foods or beverages outside of school lunch was 89.5%. The types of foods sold varied in each state. Fueling this trend is the fact that schools have become somewhat dependent upon the income generated from such sales. Fleischhaker (2007) suggested that this is
reducing the impact of the NSLP nutrition goals because schools are trying to make money from the sales causing a decrease in participation of students in the school lunch.

Factors Influencing Eating Behavior

There are several reasons people choose to eat certain foods. Some want to be healthy while others like foods that taste good no matter the nutritional value. Research has examined both issues. For example, Dubbert, Johnson, Schlundt, and Montague (1984) did a study in a cafeteria near a medical center examining purchase of labeled food items. Labels were placed only on low-calorie items telling customers caloric information of the items. There were three categories that labeled during each meal time, entrees, vegetables, and salads. Sales were recorded in the cash register. The results of this study showed that sales of low-calorie vegetables and salads increased immediately with labeling, but low-calorie entrees sales did not. The study also found that males would buy more items with higher calorie content than females. Dubbert et al. concluded that labeling low-calorie items is “informative and motivational” (p. 90).

Another study examined factors that influenced food choices of high school students in the school cafeteria. Shannon, Story, Fulkerson, and French (2002) created a survey that was given out to a convenience sample of students in Minneapolis, Minnesota asking questions that assessed several factors. Results indicated that there were several factors that influenced student choices. Approximately 42% of students said they had a difficult time distinguishing between low-fat and high-fat items. Close to 48% of students said they would like to have the low-fat items labeled so that they can make better choices. Taste was a factor as well with 93% of students saying they consider it
when making their choice. Approximately 46% of students said that schools should offer more healthy choices.

The results showed gender and health motivation both impacted food choices among the participants. Male and females with high health concerns were more interested in having the low-fat items labeled and more available than participants with low health concerns. Researchers concluded that taste and foods that were worth the money were the main factors that influence choice among students. Availability and labeling of low-fat foods were also important influences.

Roblin (2007) wrote a review that discussed trends and influences on children’s eating habits. The author looked at several studies that assessed eating habits among children. She found in Nova Scotia that fifth grade students were weighed and measured. The children who bought lunch at school were more likely to be at-risk of being overweight. The children who attended schools where lunch was provided by a foodservice company were 12% more likely to be overweight. Roblin found studies that assessed influences on children’s eating habits. Family factors and availability of foods in the home were the main influences on eating habits. Children depend on their parents to provide them with food. At times the media was a bigger influence than family. Advertisements of foods seen on television create preferences among children. School had an influence on children as well. The food that is provided by the school through breakfast and lunch programs can develop eating habits among the students.

Roblin (2007) concluded that parents need to have healthy eating habits so they can be positive role models for children. Family meals can help kids eat healthier at
home. School nutrition policies and positive messages through advertisements can help influence better eating habits in children.

Bower and Sandall (2002) examined the snacking behavior of primary school children in Scotland and England. A convenience sample of children between the ages of 7 and 8 were given a survey. The questions on the survey related to snacking behavior and eating habits along with demographic details of the students. The survey had a variety of results. All the schools that the students attended had a healthy eating policy in place that monitored foods that the children consumed. The children said that their parents had no restrictions on the children of what they could and could not eat, but had control over the availability of items in the home. The results of the survey also showed that 53% of the students had some sort of snack food for lunch and 27% had a meal provided by the school. Bower and Sandall concluded that the snack behavior of the participants were similar to other studies. Donkin, Tilson, Neale, and Gregson (1992) found that students ate more of foods that were advertised. Fruits and cereal bars were not in high demand because they were advertised less than the other foods. Taste and parents were the main influences that the authors observed regarding student snacking behavior.

**Food Preferences of Students**

One factor that schools have to consider when planning meals is the food preferences of the students. This is also a factor that is contributing to the obesity epidemic. Students would rather eat food that tastes good and looks appetizing. Unfortunately, the typical food items that meet these requirements are ones with minimal
nutritional value. Food service providers have found that they make more money offering foods high in fat and sugars because that is what students want. Items like these cause students to gain weight and develop bad eating habits as they go through school causing the obesity epidemic to continue.

Cho and Nadow (2004) developed a study to see what superintendents, principals, and other school health personnel in the state of Massachusetts felt were the barriers to implementing a quality school lunch and nutrition education programs. A qualitative survey was given to superintendents and principals throughout Massachusetts as well as nurses, food service directors, and health educators. The participants were asked what they felt were the barriers to having a quality lunch, and what they would need to address these issues. The results showed students’ preferences were one of the top barriers that schools need to overcome in order to have a quality lunch program (Cho & Nadow).

A similar study was done by Cleland, Worsley, and Crawford (2004) that surveyed students, as well as parents and teachers, asking them about school canteens. The results showed the types of foods that are purchased, the canteen usage, and roles that schools play in influencing children’s eating habits. The children felt that unhealthier choices tasted better than healthy foods. They also said that healthy items were not as available in the canteen. In order for the children to be more willing to choose the healthier items, availability needs to increase and more advertisement of the healthy items needs to be developed. Reducing the cost of the items was also a common response among the children.
Food Preference Interventions

Over the years, schools have tried to make their lunches healthier for their students. They have also tried to make lunches that students like and will eat. Schools have had troubles finding healthy foods that students like to eat. Most food offered in school vending machines, snack bars, or a la carte is high in fat and sugar. To address this problem, some schools have implemented policies or programs to restrict unhealthy offerings. Other schools have tried to broaden their offerings so that students have healthier choices. These two approaches are reflected in the literature and discussed in detail in the following section.

Availability. One intervention involves making fruits, vegetables and other foods that are high in nutritional value more available to students. Another is to restrict the sale of foods of poor nutritional value. The following section summarizes studies that have examined one or both of these approaches.

One study done by Cullen and Zakeri (2004) had two groups of students. The first group was fourth graders who only ate NSLP lunch during the first year of the study, but during the second year had access to snack bars and a la carte items as fifth graders. The second group was fifth graders who had access to a snack bar or a la carte items both years. Food records were completed for both years of the study. The results of the study showed that the first group’s consumption of fruits, vegetables, and milk decreased 33%, 42%, and 35%. The consumption of high-fat items increased. The results of the second group showed that the consumption of high-fat vegetables and milk increased by 30% and 14%. There was a decrease of regular vegetables and sweetened beverages
consumption by 10% and 12%. Students did not change the amount of fruit consumption between the 2 years. This study indicated that when students have access to snack bars, vending machines, or a la carte menus that have food items with minimal nutritional value, they eat less fruits, vegetables, and milk products.

Another study was done by Cleland, Worsley, and Crawford (2004) that looked at what fifth and sixth grade children in Australia were buying from school canteens. They also asked parents and teachers what they thought about their children eating from school canteens. Twelve schools agreed to participate in the study. Seven were involved in an intervention while the other five schools were designated as the control group. The students, parents and teachers of these schools were given a questionnaire to fill out. The students were asked various questions related to what foods they ate from the canteen and how often they consumed these items. There were also questions that asked about what healthy foods they would eat if they were offered. Parents and teachers were asked what role they felt their school canteen played in promoting healthy eating to the students. They were also asked if they felt the school encouraged healthy eating through their canteen and what barriers there were to increasing healthy food sales.

Results of the study showed that students who ate at the school canteens were regularly purchasing unhealthy foods. Furthermore, parents and teachers felt that the canteen did influence students’ choices on what foods to eat. All of the participants felt that there are barriers that cause students to choose foods with minimal nutritional value. The students felt that these barriers were “the lack of healthy options” and the availability of unhealthy options. This indicated that these barriers may have convinced students to
make unhealthy choices. This research suggested that students would make healthier choices if there were healthier options available.

A recent study was done by Cullen, Watson, and Zakeri (2008) that looked at the effects of the Texas Public School Nutrition Policy on middle school students’ food consumption during lunch times. The policy tries to promote a healthy school environment throughout Texas by decreasing the availability of high-fat and sugar items as well as how often these items are sold. During the first year the policy was implemented, only 1% milk was served and five different fruits and vegetables were offered. The researchers took 3 years of food records of middle school students in southeast Texas. The first year the schools participated as the control group and completed food records. The second year was the first year that the nutrition policy was in effect. Lunch records were completed during this year as well as the next year that the policy stayed in effect.

The results of this study indicated that consumption of various important nutrients increased while fat consumption decreased. More milk and vegetables were served, but less soft drinks and snack items were served. The Texas Public School Nutrition Policy had a positive effect on the schools lunch environment. It improved the students’ dietary behavior during the school lunch period by decreasing the availability of unhealthy items. They also made fruits and vegetables more available to the students.

Cost. The second intervention that has been introduced in the literature is cost. Some schools try to reduce the cost of the healthier items that are offered so that students are more willing to buy those items because they are cheaper. Two studies were done
that assessed the effect prices had on the purchase of reduced-fat items from vending machines. French, Jeffrey, Story, Hannan, and Snyder (1997) did a study that took place in a university setting where sales of low-fat and regular items of nine vending machines were monitored. During the first 4 weeks of the study, all items were regular price. Prices of the low-fat items were reduced to 50% of their usual price during the next 3 weeks of the study. The low-fat items were changed back to regular price the last 3 weeks of the study.

Results showed that sales of low-fat items increased during the 3-week intervention period. The sales increased from approximately 25% to 45% during that time period. Low-fat sales decreased to approximately 23% the last 3 weeks of the study when the prices moved back up to usual price. French et al. (1997) findings suggest that by reducing prices of low-fat items can promote healthy eating to students and increase consumption of these items.

The second study implemented by French et al. (2001) was very similar to the previous study. It took place not only in 12 schools in Minnesota, but in 12 worksites as well. Four different prices were selected along with three different promotional strategies. Prices for low-fat items were usual price, but then reduced during each level. The items were reduced to 50% of original price during the last level of pricing. The promotional strategies included having no signs, signs labeling the low-fat items, and signs labeling low-fat items along with encouragement to make healthier choices. Data were collected each time the machines were stocked. Sales of the low-fat items increased after each price reduction. The percentage of sales of low-fat items increased by 10%
from the beginning of the study to the end of the last pricing level. The highest increase of low-fat sales was during the period of 25% and 50% reduction in price. The strategies used in this study had positive effects on fruit and vegetable consumption. Schools can overcome the cost barrier of healthy food consumption by reducing the prices of healthy items sold in snack bars or as a la carte items. Reducing prices could be a very effective method for schools to get students to eat healthier. This study is evidence that barriers to eat healthy at school can be overcome.

Epstein et al. (2006) did two similar experiments examining the influence price and income has on food purchase in children. Participants in the first study were 10 to 12-year-olds that were given flyers in school or in the newspaper about the study. The children were asked to list what they had eaten that day. They also were measured to determine their BMI. After the tests, the children were given several items of food to taste and had to rate them on how much they liked each item. The children were then given red tokens that totaled $5. During the first task, students were able to choose from their favorite unhealthy snacks and healthy snacks. The price of the healthy snacks increased by 50 cents over five trials while the price of the unhealthy snacks stayed constant at one dollar. Then, the researchers reversed it during the second task, making the price of the healthy snack constant and the price of the unhealthy items increase each trial. Results indicated that prices of one type of food compared to the purchase of the other. If prices for unhealthy foods went up, then purchases of healthy items would increase.
The results lead into experiment two. In this study, Epstein et al. (2006) gave the children a different income to see what choice the children made when they had less money. The participants were 10 to 14-year-olds. Procedures were the same in this experiment except the children were given a plastic bag containing $1, $3, or $5. The children were not allowed to save their money that was left over from previous trials to make purchases in the following trials. They were encouraged to buy what they wanted now and save some of those items for later just in case they do not have enough money.

The results of experiment two showed that the children bought the cheaper food when their income was $1. There was difference in purchases when their income was $3. When their income was $5, they purchased less of the cheaper items because they had more money. After the two experiments, the researchers concluded that pricing did have an effect on food purchases among children. Purchases decrease as price increases. They also concluded that the higher the income students had, the less thought went into their choices. They were willing to buy the more expensive, tastier items if they could afford them.

A related study was done by Ard et al. (2007) that assessed the impact of cost on the availability of fruits in vegetables in homes of children in Alabama. The authors said that the cost of healthy items is a barrier to consuming these items such as fruits and vegetables causing people to purchase items with minimal nutritional value. The study involved elementary schools in three districts in Birmingham, Alabama. Parents were given a questionnaire asking the availability of some 100% fruit juices, 13 fruits, and 18 vegetables in the home. The results showed that about 17 juices, fruit or vegetable items
were available in the participants’ homes in the previous 2 weeks of the study. The cost of the items impacted the availability of them in the homes. Increased costs caused the availability to decrease. The households with a higher income and a female were more likely to have fruit or vegetable items available in the home. Ard et al. (2007) concluded that the cost-per-serving and availability related. The cost was a barrier that limited the consumption of fruit and vegetable items in the home.

Conclusion

Research has shown the prevalence of childhood obesity is increasing. There have been many concerns among parents, schools, and communities about this issue. Researchers believe there are several factors that have contributed to the epidemic. Factors such as poor nutrition, lack of physical activity, genetics, and environmental have been some of the known causes. Poor nutrition and lack of physical activity have been the main concern studied over the years. This literature review looked at several research studies that focused on poor nutrition in the school environment. Schools lunch programs have been under investigation to see if the programs contribute to overweight and obesity among children. The National School Lunch Program offers foods that are regulated by dietary guidelines. Schools are creating new ways to make more money, so they have developed snack bars and a la carte sales during lunch periods to sell extra food to the students. The food offered through these alternative sources is not regulated and can often have minimal nutritional value. Availability and cost are two of the main factors that influence the food choices made by students.
Based on past research, there is strong support that availability and cost can affect students’ food choices during school lunch periods. To examine this issue further, this study tested the following hypotheses:

Ha1: Introducing healthy food alternatives into a secondary school a la carte lunch menu will lead to a significant reduction in the sale of unhealthy food items from the same menu.

Ha2: Reducing the cost of healthy food items will lead to an increase in the sale of these same items and a reduction in the sale of unhealthy food items on the same menu.
CHAPTER III
METHODS

Population

This study utilized a single-subject research approach to examine the overall purchasing behavior of students in a single high school lunch room over several days. The target population for this study was made up of public high school lunch rooms in Missouri. The accessible population consisted of high school lunch rooms in the Nodaway County region of Missouri. There are seven school districts and 15 high schools total in Nodaway County with approximately 1,151 total high school students.

Sample

This study involved the study of a single lunch room environment. Maryville Public High School was chosen based on the feasibility of completing the study, making it a nonrandom sample. The school has a total of 462 high school students, grades 9-12 with 102 students qualifying for free and reduced lunches. Each lunch session that took place during the duration of the study was studied as a whole. Twenty six lunch sessions were studied over a 5-week period. The sessions consisted of high-school students taking part in a 45 minute lunch session that offered the opportunity to purchase food items other than the standard school lunch. During each session, data pertaining to the overall purchasing of certain types of foods from the a la carte menu were collected.

Instrumentation

Food sales for each item sold through an a la carte menu were tracked each day through the use of a daily sales tally sheet. To ensure the tally sheet was filled out in a
reliable manner, the same person filled out the sheet each day. Items to be tracked on the sheet included two categories: traditional items and healthy alternatives. Traditional items included potato chips, cookies, and candy. Healthy alternatives included whole apples, oranges, and bananas. The sales were counted by recording the number of pieces that were sold of each item.

Pricing

The prices of the healthy alternatives were determined based on the price of comparable traditional menu items. The healthy alternatives were designated as snack items. The majority of the traditional snack items were priced at 75 cents; therefore, the healthy alternatives were initially priced at 75 cents, and later reduced to 25 cents for a portion of the study. It should also be noted that larger, more expensive items, such as sandwiches, were also available to students as part of the traditional al a carte menu, but the sale of these items was not monitored or included in this study.

Procedures

Three agencies were approached to participate in this collaborative research effort. First, a local grocery store agreed to provide all of the healthy alternative food choices for free via their catering services. Second, the food services provider agreed to allow the items to be sold along side their traditional items. Once the food was delivered to the school, this organization was responsible for all food handling. All profits from food sales went to the food services provider. Third, Maryville High School agreed to allow the study to take place during their lunch periods. Once all three agencies had
approved the study, the Institutional Review Board at Northwest Missouri State University reviewed and approved the proposed methods.

The study involved tracking the sales of the traditional and healthy alternative choices on the a la carte menu during each school lunch period. The same food service worker recorded the food sales each day. The tally sheets pertaining to the number and monetary amount of sales were provided to the researcher by the food service provider at the end of the data collection period.

The study was divided into 4 phases. The first condition, or phase, of the study implemented was the offering of healthy alternative food items at full price (75 cents). During this phase, students were able to buy both healthy and traditional items for a period of 8 days. The next phase lasted for 5 days. During this phase, prices were reduced to 25 cents for all healthy alternative items. The third condition lasted for 4 days and involved a return to the original 75 cent price for the healthy alternative items. The final phase was implemented for 9 days. Only traditional items at usual price were offered and the healthy alternatives were not available for students to purchase.

Initially phase 1, or baseline, was planned for a 2-week period prior to any introduction of healthy alternative foods. Because the food service provider incorrectly recorded the requested data, summarizing the entire sales for the week rather than by the day, it was necessary to collect baseline data at the conclusion of stages 2, 3, and 4. It was not possible to delay the implementation of these phases based on the logistical arrangements that had been made for food provision. The days within each period did not include weekends because school was not in session.
Research Design and Data Analysis

This study involved the use of a single-subject research design. Originally, an A-B-C-B design was to be utilized, which would have examined a baseline period (traditional sales only), an intervention period (healthy alternatives at equal price), an alternative intervention period (healthy alternatives 67% price), and then again the initial intervention period (healthy alternatives equal price). Because of the data collection problems that occurred with the initial baseline, this design was modified to a B-C-B-A design (moving baseline to the end of the study). Data analysis involved three phases: visual interpretation of line graphs, examination of descriptive statistics, and hypothesis testing. In the latter phase, repeated measures Analysis of Variance (ANOVA) was used to determine if mean sales of traditional or healthy alternative foods across the four study periods differed significantly. Significance (a) was set at .05 for all comparisons.

Internal Validity

Condition length. The intervention period took place over 4 weeks. During the intervention period, each day represented a data point. Food sales were recorded daily for a total of 17 days. The baseline period was introduced after the intervention period. This period lasted 2 weeks for a total of 9 days. Each day represented a data point during this period as well. Food sales of the traditional items were recorded daily.

Controlling simultaneous changes. Three major extraneous factors may have changed either daily or periodically throughout the study. These changes are likely to have influenced al a carte sales, threatening the internal validity of this study. The first is the offerings of the general school lunch. Popularity, or dislike, of the primary lunch
menu could have influenced the number of students seeking food items from the a la carte menu. Second, the researcher discovered after the study that the kitchen staff occasionally prepared various items on site for the a la carte menu, such as home-made cookies. This variation in the a la carte menu resulted in a significant threat to validity. The third factor is general attendance in the lunch room each day. This factor is discussed later as a history threat, but is mentioned here as it also represents a fluctuation in study conditions outside of the study variables.

**Number of baselines.** This study only utilized one baseline period, which limited the strength of any judgements drawn concerning changes from baseline. This, when combined with the short duration of all study periods, represented a significant threat to internal validity.

**Instrument decay.** A problem occurred in this area creating a significant threat. The food service workers did not collect food records correctly for the initial baseline period. The researcher was forced to implement baseline after all other data had been collected. Further, in order to insure the accuracy of the recorded sales data, two food service workers worked together to record the sales so that they could monitor and make sure the recordings were done daily. The researcher was unable to personally observe or verify the accuracy of this data, leaving open the possibility of inaccurate data recording. This threat is especially concerning when considering the initial error in data collection during baseline.

**Data collector bias.** To control for any potential bias, the research did not inform the food service workers of the research hypotheses being tested. They were only
informed of the general purpose of the study and procedures of the tasks they performed. It is, however, possible that the added daily tasks may have influence attitudes toward the study in general.

History. Throughout the study, special events occurred on some days causing the school day to be shortened. Homecoming Day resulted in a light lunch crowd because the day was shortened and most students went home for lunch. This almost certainly caused a decrease in sales and compromised the meaning of any observed patterns. Teacher in-service days and parent-teacher conferences resulted in shorter days as well.

A problem in the delivery process occurred that caused another significant threat. During the second phase of the study, the grocer, who was delivering the fruit throughout the study, did not deliver on the designated day of that phase. They forgot about the delivery and did not have time within their work schedule to correct this error. The fruit was not delivered until 2 days after the designated day. The school only put out the fruit that had not been sold during the previous weeks. Students did not have the same variety of choices of healthy alternatives for 2 days when prices were reduced to 25 cents because one type of fruit had been thrown away due to expiration of that item. This could have caused sales of the healthy alternatives to be low for those 2 days because students might not have wanted the specific fruit that was available.

Summary

The single-subject research approach allowed the researcher to see the impact the four phases had on the purchasing behavior of students in a single high school lunch room. Many extraneous factors may have influenced the sales of the various items
offered during the lunch periods. Changes made due to these factors caused several threats to the internal validity of this study to develop.
CHAPTER IV
RESULTS

The results from this study examined if different food offerings during a school lunch period affected student purchases. The researcher looked for trends or patterns that may have developed throughout the data. The results have been interpreted and summarized in the following sections.

Interpretation of Line Graphs

Line graphs are commonly used to analyze data from single subject research designs. They are used to look at the effects of an intervention. In Figures 1 and 2, the conditions are labeled at the top of each graph with lines separating and showing when each condition ended. Each dot on the graph represents the amount of items sold on each day of the study during each condition. Figure 1 and 2 help to see if there were any trends or lack of trends in sales of food items within or across the conditions.

There does not seem to be a pattern that would be considered consistent with research hypotheses within the Figure 1. Two major increases occurred. One increase occurred during the condition when the healthy alternatives were half price. Sales of unhealthy items increased from 61 items sold to 117 during days 9 and 10. A second increase occurred during the last condition when healthy alternatives were not available. During days four and five of the last condition, sales of unhealthy items increased from 42 items sold to 86. The highest amount of unhealthy items sold (123) occurred during the half price condition. The lowest number of unhealthy items sold (32) occurred on the last day of the study.
Figure 1. Number of Unhealthy Items Sold Per Day and Across Conditions

Figure 2. Healthy Items Sold Daily Across Conditions
Figure 2 also indicates no apparent pattern that would appear to be associated with price of healthy food offerings. The graph shows that one item was sold on the fourth day during the full price condition and five items were sold on the fifth day showing the one major increase in sales that occurred when the fruit items were full and equal price of the unhealthy items. Following the increase, a major decrease occurred right before the fruit items were reduced in price. On the sixth day of the full price condition, the number of items sold decreased to two and then decreased to zero items sold on the seventh day. During the half price condition, the number of items sold increased from zero to two. This increase was not enough to show a pattern. The highest daily sales (5) occurred once when the fruit items were sold at full price. The lowest sales (0) occurred repeatedly throughout the study.

Descriptive Statistics

Analyzing means and standard deviations of the food sales across the observed conditions can provide further insight into any trends or changes from period to period. When considering the sale of healthy food alternatives (fruit) across the different pricing conditions, the following was observed. During the first full price sales period, the mean number of fruit items sold per day was 1.37 ($n = 8; SD = 1.60$). When the price was reduced to 33% of the original price, the observed mean number of items actually dropped to 1.00 ($n = 5; SD = 1.00$). The price of the fruit items was increased back to full price causing the observed mean number to drop more to 0.75 ($n = 4; SD = 0.50$).

When considering the sale of junk food over four time periods, the following was observed. During the first time period, fruit items were at full price. The observed mean
number of junk food items sold was 30.00 \( (n = 8; SD = 5.63) \). When the price of fruit items were reduced to one third price, the observed mean number of junk food items increased to 40.40 \( (n = 5; SD = 15.39) \). During the third time period, the price of fruit items increased back to full price. The observed mean number of junk food items dropped to 30.50 \( (n = 4; SD = 8.50) \). During the fourth time period, no fruit items were available for purchase. The observed mean number of junk food items increased to 36.67 \( (n = 9; SD = 11.28) \). These findings appear to contradict the research hypotheses, as very limited fruit sales were observed, and traditional item sales fluctuated in a manner that was the opposite of any expected changes.

Table 1.

Mean food sales by week for junk food and healthy alternatives.

<table>
<thead>
<tr>
<th>Period</th>
<th>Junk Food Sales</th>
<th>Healthy Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wk 1: Full Price</td>
<td>30.00</td>
<td>1.37</td>
</tr>
<tr>
<td>Wk 2: 1/3 Price</td>
<td>40.40</td>
<td>1.00</td>
</tr>
<tr>
<td>Wk 3: Full Price</td>
<td>30.50</td>
<td>0.75</td>
</tr>
<tr>
<td>Wk 4: No Fruit</td>
<td>36.67</td>
<td>None offered</td>
</tr>
</tbody>
</table>

To determine if these means are significantly different, the following hypothesis tests were conducted.
Hypothesis Tests

The research hypotheses in this study predicted that the availability of healthy food alternatives would lead to a drop in the number of sales regarding unhealthy food items. It was also hypothesized that this change would be exacerbated by a lowering of the cost of healthy food alternatives, and that fruit sales would increase as price dropped. Results from Analysis of Variance failed to support either hypothesis regarding the mean number of sales per day across the different conditions. No significant differences in sales across the various conditions were observe for either unhealthy food sales, \( F(3, 22) = 1.35, p = .26 \), or healthy food alternatives, \( F(2, 14) = .35, p = .71 \).
Introducing healthy food alternatives into a school’s lunch menu did not reduce the sales of unhealthy food items from the same menu in this study. Line graphs did not indicate a pattern or trend that showed a decrease in unhealthy food item sales, and results from ANOVA support a non-significant influence of both the presence of healthy foods and the price of those foods. The two major increases that are shown in the graphs are likely caused by other factors, such as a poor regular lunch menu planned for those days or an especially desirable offering on the a la carte menu. Students might have chosen to buy items off the a la carte because they did not like what was being served on the regular lunch menu. In addition, the variation in the type unhealthy offerings on the a la carte menu from day to day may have created spikes in the data. There were a few decreases in unhealthy food item sales within the results that may have been caused by daily scheduling of the school day. Some days the school may have had shortened school days due to a special event or holiday. Lunch periods may have been shortened which could have caused students to wait to eat lunch at home. Some students may have chosen not to attend lunch on the shortened days at all. This would have caused sales to decrease.

When the healthy food alternatives were reduced in price, there was no decrease in unhealthy food sales. There was also no increase in the healthy food alternative sales. In general, the very low number of daily fruit sales suggests that is it difficult to convince students to eat healthy or choose a healthier alternative. Regardless of the variations in the number of lunch attendants and the nature of other food offerings, the fact is that fruit
sales were almost non-existing throughout the study. In addition, price reductions seemed to have no impact on this lack of interest. During the price reduction, healthy alternative sales were at their lowest more frequently than during the other time periods.

This current study supports Epstein et al. (2006) who believe interventions to treat or prevent childhood obesity need to change food choices in school lunch rooms from unhealthy to healthy alternatives; however, the results of both studies were different. In particular, Epstein et al. (2006) examined price increases and decreases on food purchases among youth. Two experiments were performed by giving students a designated amount of money and were told to purchase what they wanted. Prices were increased and decreased throughout the experiment to see if this changed the purchasing behavior. Epstein et al. found that raising the price of a certain type of food item decreased the sales of that particular item.

The current study also supports the ideas of French et al. (2001) who said that student behaviors contributing to intake of high-fat foods are caused by consumption of competitive foods sold in vending machines or school snack bars. The study conducted by French et al. (2001) was similar to the current study, but found different results. French et al. examined the effects of pricing and promotional strategies on sales of low-fat items in vending machines throughout several worksites and schools. They found that price reductions of 25% and 50% caused a significant increase in low-fat sales, but a price reduction of 10% did not cause a major increase. French, Jeffrey, Story, Hannan, and Snyder (1997) did an earlier study that examined the same concept. Vending machines were monitored in one university setting at nine different vending locations.
The usual prices were kept during the 4-week baseline period and then decreased by 50% during the 3-week intervention period. Three more weeks at the usual price followed the intervention. The results showed that sales of low-fat snacks increased significantly during the intervention (low price) period. These findings suggest that lower prices promote low-fat food choices; however, French et al. (1997) also point out that schools do not profit when price decreases, and may be resistant to this strategy. This is a barrier that schools need to overcome. The current study supports this conclusion by French et al. (1997).

These four studies support the hypothesis that cost reduction of healthy food items will lead to an increase in the sale of these same items. The results of the present study did not show the same results. The price decrease did not cause sales of the healthy alternatives to increase. There was no pattern or trend found within the data to support this idea.

The current study showed that introducing healthy alternatives into a school a la carte lunch menu did not lead to a significant reduction in the sale of unhealthy food items from the same menu. One study found did have some findings that could be supported somewhat by these results. Cullen and Zakeri (2004) examined the impact availability of snack bars had on the consumption of fruit, vegetable, milk, and sweetened beverage consumption among middle school students. Students were given access to a snack bar or a la carte during lunch. Decreases in fruit and vegetable consumptions were found when students had access to the snack bars. Unhealthy food sales increased significantly when students gained access. One group of students had access to the snack
bar or a la carte throughout the whole study. The results from this group showed no significant changes. Even though this study was conducted differently and had healthy alternatives available at the start, it showed that the availability of junk food did have an effect on fruit and vegetable consumption when offered on the same menu. Junk food seems to have a strong influence on student food choices. The availability of healthy food items does not seem to have a limiting effect on the sales of junk food items.

As Cleland, Worsley, and Crawford (2004) noted in their study on student lunch preferences, students felt that if healthier foods were made more available and better advertising was developed they would be more likely to eat healthier foods. Cullen et al. (2004) also concluded that, “while the students possessed knowledge to make healthy food choices, they chose unhealthy options from the school canteens and their fruit and vegetable purchases were minimal” (p. 149). Both of these results are similar to the results of the current study. The sales of healthy alternatives were low compared to unhealthy food sales.

The low purchasing behavior or the offered healthy alternatives could be explained by student food preference. When Cho and Nadow (2004) examined what schools perceive to be barriers and resources needed to improve their nutritional environment, students’ preference was a huge barrier to implementing a more nutritional lunch menu. They say that students’ lack of preference for healthy items makes it hard to offer those items during lunch. Many schools end up throwing the healthy alternatives away and offering unhealthy items that make more money. The current study found
student preference appears to be a problem as well. The availability of unhealthy food items had a stronger influence.

**Limitations**

There were many things that were not considered during the implementation of the study resulting in several limitations. The biggest limitation throughout the study was the lack of control of daily scheduling of the regular school lunches, as well as fluctuations in the traditional al a carte menu. General menus were set before the school year and study started, whereas the al a carte menu was revised based on the preferences of the lunch staff. The fluctuation in unhealthy food sales could have been caused by the regular lunch menu not being a popular choice among the students. This was a consideration when the data was being analyzed and could explain several spikes and dips observed in the line graphs of the traditional food item sales.

Another limitation considered throughout the study was the inability to monitor data collection by the lunch staff. This caused a problem throughout the study due to records not being collected or lost that were during the baseline period. It was not communicated to the lunch staff that lunch records needed to be recorded daily during the initial baseline period. The lunch staff also did not communicate to the researcher that they do not take daily cold food records. Due to this lack of communication, there were no food records for the baseline period before the intervention period took place. The researcher had to change and add more time onto the data collection process after the second baseline data was completed in order to have all the necessary information. This lack of control could have caused the information from the study to be less accurate. The
accuracy of data collected during the other time periods was questioned after the problem occurred because sales were not verified by the researcher. The accuracy of data was not able to be confirmed.

A third limitation that occurred was the inability to monitor the delivery process of the fruit to the school. This caused a problem during the study due to some fruits not being delivered on the correct date. The researcher called the grocery store to make sure that the items had been delivered. The researcher was informed that the grocery store did not have time that day to make the delivery. The problem occurred during the week that the fruits were reduced in price. The school did not have some of the healthy alternatives available the first two days during this phase for students because they had to throw them away at the end of the previous week due to expiration. This lack of availability during an important time period could have caused students to choose an unhealthy food item. Healthy alternative sales were hypothesized to increase during the week the problem occurred. The problem could have contributed to the apparent minimal impact of the healthy alternatives.

The duration of the study was another limitation. It was not feasible to watch trends over a longer period of time, especially when it became necessary to move the baseline to the end of the study. This time limitation required that a smaller number of data points to be observed under each condition. The importance of longer data collection periods for each condition is illustrated by the wide variation in traditional food item sales from day to day.
Lack of variety among the healthy alternatives was a limitation as well. Fruit was easier and safer to handle so that was the only healthy alternative chosen. Vegetables could have been included, but the maintenance would have been more difficult and harder to keep them as fresh. The lack of variety gave students less choices among the healthy alternatives which could have caused the small number of sales.

The data were also limited to one public high school and do not reflect the practices of private, elementary, or other public schools. All the limitations presented may have affected the results of this study.

**Recommendations for Research**

This study identified some areas for improvement and future research. Longer duration to collect data would allow researchers to have more data points under each condition. It would be more feasible to watch for trends and patterns. One whole school year is recommended for healthier eating habits to develop among students.

A larger variety of healthy alternatives that includes vegetables is recommended as well. This would allow students to have more choices among those items. More precautions would need to be taken if vegetables were available because of the shorter expiration period that some vegetables have. This could also lead into a different approach to the problem. The study could be more experimentally designed by including more groups with different food options and more variety of healthy alternatives. The vegetables could be included in this design. The different groups and food options would allow researchers to see what healthy food options are preferred over others. Schools
could then offer these options to see if students pick the more popular healthy alternatives over unhealthy food items.

Another improvement that could be made to this study would be to monitor the regular school lunch menu. Researchers could be more involved in the planning of the lunch menu which would allow them to see if sales are affected by the regular lunch menu. This could be a different approach as well to the problem. Researchers could figure out the more popular lunches among the students and see how sales of competitive foods are affected by these menus. It could show the impact that the regular school lunches and the options have on competitive food purchases.

Another improvement or change that could be made to this study could also be made into a completely different approach to the problem. Along with making healthy alternatives more available, junk food could become less available. Limiting the unhealthy choices could cause students to choose the healthier alternative. Researchers could create a more experimental design by having different conditions that have junk food more available while healthy alternatives do not have many choices. Another condition could have the healthier alternatives more available with little choices of unhealthy items. Then the last condition could have equal offerings of both types of items. This would allow researchers to see if availability has an impact on student choices.

The study could also be implemented differently to test other variables. A study could be done to see if advertising of healthier alternatives would increase sales. Schools could hang flyers, write newsletters, or have daily announcements that advertise healthy
eating and give students tips. This might affect their decision when they want to purchase an item from the a la carte. Researchers could collect food records with and without advertisements to see how sales were impacted. A similar approach could be made with nutrition education programs. Schools could require students to attend or develop programs that teach nutrition education and collect food records before, during, and after the programs are implemented. This would allow researchers to see if healthy alternatives sales are affected.

Finally, it is suggested that researchers consider ways to influence student preferences. Most likely, this would involve early intervention, as a major barrier to the use of healthy alternatives appears to be the life-long conditioning of adolescents to favor foods associated with high sugar and fat content. In other words, American children are raised on sweets and high-fat foods, and develop a liking for these foods at an early age. Future research may be more productive in finding solutions to the obesity problem if it examines ways to break the fast-food cultural tradition that plagues our young people today.

*Recommendations for Practice*

Until healthy alternatives are developed that are preferred by children, professionals and parents should limit the availability of unhealthy food items to kids. Limiting junk food and making healthy alternatives more available would give children more choices of healthy items. If this strategy works, unhealthy food items could be completely taken out of school lunch menus. If some schools cannot afford to do this or are not successful, then it is recommended for unhealthy items to slowly be taken out of
the menu. Schools could start off by taking the least sold unhealthy food item off the menu.

It also recommended for schools and health professionals to encourage healthy eating and discourage unhealthy eating habits. Schools could have nutrition programs that show the disadvantages of eating healthy. These programs could influence student choices during lunch time. They would give children the knowledge to be able to make healthier choices and develop better lifestyles. Advertising for healthy alternatives would also promote healthier choices. It would show students the better choice during lunch. Students would be influenced to choose the healthier alternative.

Health professionals and schools need to figure out a different way for school lunch programs to make money. Instead of selling unhealthy food choices through a snack bar or a la carte, schools could hold fundraisers for the lunch program. Concession stand sales during a sporting event could go to the lunch program. If schools made enough money through these fundraisers, competitive foods would not have to be made available to children. Funding had been shown to be a barrier for school lunches and a la carte sales help with this problem. There needs to be an alternative way for school lunch programs to earn money besides sales from the regular lunch program.

Again, it may be that the bigger answer is to explore how practitioners can promote healthier eating habits, and preferences, at an early age. It may be that first grade classrooms or parents of toddlers are the people who professionals and researchers should be working with rather than the high school population. Creating healthy preferences among young people would likely lead to healthier eating habits in later life.
Conclusion

Childhood obesity has been shown to be a major problem among children. Literature has shown that many health problems develop for children who are considered to be overweight or obese during childhood and even into adulthood. Researchers are trying to find the causes of the epidemic and solutions to the problem. This study has tried to help with this research by looking at the school environment to see if it plays a role in the obesity epidemic among children. Two hypotheses were tested. One introduced healthy alternatives to lunch menus to examine if unhealthy food item sales decreased. The other looked at price reduction of healthy alternatives to see if sales of these items increased.

In order to test these ideas, a variety of fruit was added to the menu over a certain time period. Within that time period, prices for those items were reduced to see if this had an effect on the sales. Results showed that the introduction of healthy alternatives and price reductions of these items had no effect on the sales of unhealthy items. Most studies within the literature found that sales of healthy alternatives increased when prices dropped.

Additional research is needed to find a way to get students to eat healthier during school. Once a school is successful with this concept, it will be one step closer to finding ways to prevent childhood obesity.
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