QUANTITATIVE AND QUALITATIVE EVALUATION OF THE IMPACT AND ACCEPTABILITY OF CHOICE ARCHITECTURE STRATEGIES ON MIDDLE SCHOOL AGE STUDENTS' FRUIT AND VEGETABLE CHOICES

By

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VEGETABLE CHOICES

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CHAPTER I

INTRODUCTION

A major problem facing children in America today is the threat and consequences of childhood obesity (Daniels, 2006). Childhood overweight and obesity affects a significant amount of American children with around 30% of school aged children being overweight and having a BMI equal to or greater than the 85th percentile on BMI for age growth charts (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). This statistic is considerably troubling since obesity can cause a wide variety of health complications that can be either acute or long term (Daniels, 2006). While there are several reasons why children can become overweight, it is important to remember that excess adiposity gain is directly related to a higher caloric intake and a decreased caloric output (U.S. Department of Agriculture, 2010). Possible factors that initiate this caloric imbalance include parental influence, physical inactivity, and, more importantly, diet (Reilly et al., 2005).

One contributing factor to this epidemic is the lack of fruit and vegetable consumption among children, especially in Oklahoma (Center for Disease Control, 2009). Fruits and vegetables, along with their vast framework of phytochemicals (Van Duyn & Pivonka, 2000), have low energy density and high water content (Rolls, Ello-Martin, & Tohill, 2004). This suggests that fruits and vegetables can aid in weight management by increasing satiety as well as preventing a wide variety of

diseases (Rolls et al., 2004; Van Duyn & Pivonka, 2000). However, students are not consuming enough servings per day to achieve these benefits (Guenther, Dodd, Reedy, & Krebs-Smith, 2006). The 2010 Dietary Guidelines for Americans (U.S. Department of Agriculture, 2010) recommends middle school aged children consume 1½ cups of fruit and 2½ cups of vegetables per day. Specifically for Oklahoma, the State Indicator report showed that less than 10% of Oklahoma youth consumed the recommended daily amounts of fruits and vegetables in 2009 (Center for Disease Control, 2009). This supports the idea that the majority of children do not consume enough fruits and vegetables, which increases their risk of obesity.

School nutrition programs provide several opportunities for children to eat fruits and vegetables since children spend the majority of their time and eat at least one meal in the school environment each day (Leviton, 2008). The National School Lunch Program serves around 31 million children each school day (U.S. Department of Agriculture, 2009). Although federal regulations have mandated better nutrition standards (Briggs, 2010), schools have several limitations which hinder their nutrition programs. Lack of funding is a major problem since administrators are faced with tough decisions about where to spend money (Leviton, 2008). Secondly, scholastic achievement is the first priority of schools, therefore, the majority of funding typically goes to academics rather than the improvement of school nutrition (Leviton, 2008). In addition, numerous community stakeholders are calling for radical changes within the lunchroom (Leviton, 2008). A primary example is cooking from scratch and elimination of all competitive foods without concern for expense, labor, or effect on participation in the school meal program.

These issues are exacerbated by federal reimbursement to schools falling short of financial needs (Leviton, 2008). The use of competitive foods, which are typically high in calories, solid fats and added sugars, accrue profit which is used to subsidize reimbursed meals. As such, removing these items is not a viable option (Leviton, 2008). Middle and high school environments, in particular, have more competitive food availability and selection than elementary schools which might be a contributing factor to the decreased consumption of fruits and vegetables among middle school aged children (Fox & Abt, 2001).

Problems also exist in making fruits and vegetables an appealing food preference among children. Neumark-Sztainer, Story, Perry, and Casey (1999) found that children were mostly concerned with appeal, taste and convenience when it came to their food choices. Less important categories included perceived benefits and body image. In order to nudge children to eat more fruits and vegetables, it is important to fulfill their most important preferences including convenience and appeal Neumark-Sztainer et al. (1999) also found that children in the focus group believed that healthy food was not important at that point in their life and they would worry about eating healthy when they were older. This finding may support the idea that nutrition education alone may not be enough to increase fruit and vegetable choices in the school environment.

A potential strategy to increase fruits and vegetable consumption in schools without significantly adding to the financial burden is behavioral economic principles. Originally used in the business sector (Thaler & Sunstein, 2009), behavioral economics combines psychology and marketing principles to alter a person's perception biases and influence food choice as well as the overall appeal of food (Just, Mancino, Wansink,

2007). The emerging use of behavioral economic principles in school nutrition settings has shown potential for influencing students' food choices (Mancino & Guthrie, 2009; Just & Wansink, 2009; Just, Wansink, Mancino, & Guthrie, 2008; Just et al., 2007). The key to behavioral economics in school is promoting the healthier food items without restricting the unhealthy items, thus allowing students to freely make their own food choice decisions. One component of behavioral economics includes choice architecture which analyzes how certain foods are presented to consumers, (Mancino & Guthrie, 2009). Examples of choice architecture strategies include altering the location of foods, lighting, arrangement, and preparation of food (Wansink, 2004). These practices have the potential to nudge students to include more fruits and vegetables in their diet.

Several studies have been conducted that incorporate behavioral economics in order to increase consumption of healthy foods (Perry, Bishop, Taylor, Davis, & Harnack, 2004). A multi-component intervention to increase fruits and vegetables in school found that nutrition education, verbal encouragement, cutting up fruit, pleasing arrangement, and increasing variety significantly increased fruit and vegetable choices. Increasing portion sizes of healthier food was shown to significantly increase consumption as well (Spill, Birch, Roe, & Rolls, 2010). Moving the salad bar to a more prominent and central location and only accepting cash for dessert items are other strategies that increased fruit and vegetable choices in school (Just & Wansink, 2009). The success of these strategies demonstrates how behavioral economics indirectly encourages children to choose the healthier food items more often and there by increases fruit and vegetable consumption.

Problem Statement

While schools offer fruits and vegetables, they also offer less nutritious competitive foods that are perceived by students to have better taste, appeal, and convenience (Neumark-Sztainer et al., 1999). As such, middle school students frequently choose these items over fruits and vegetables. Therefore there is need to study interventions that accommodate the desires of students while supporting school meal nutrition goals.

Purpose, Objectives, and Hypotheses

This study aimed to better understand the use and impact of choice architecture strategies on students' fruit and vegetable choices in middle school settings. Specific objectives included:

1. Use action research methods to test the impact of feasible fruit and vegetable choice architecture strategies on student selection of fruit and vegetables in three middle school nutrition program settings in Oklahoma. This objective is based on the hypothesis that the use and implementation of choice architecture strategies will increase students' fruit and vegetable selection.
2. Conduct a plate waste study in one setting to evaluate plate waste of fruit and vegetables when a choice architecture strategy has been implemented. This objective tests the hypothesis that students will consume self selected fruit and vegetables when choice architecture strategies are implemented.
3. Assess the attitudes of school nutrition professionals regarding use of choice architecture strategies.

Assumptions & Limitations

It was assumed that the number of days of both baseline and intervention periods were of appropriate length to observe the extent of change in fruit and vegetable selection. The preparation methods and types of fruits and vegetables offered in the three school sites were considered representative of common fruits and vegetables served in Oklahoma middle schools. Student selection of fruits and vegetables was determined to be an adequate representation of actual consumption.

There were several limitations of this feasibility study. The distance to school sites and budget constraints allowed for a limited number of visits to each school site. Therefore, each visit was planned in advance along with a list of items to discuss to ensure maximum productivity. Menu inconsistency between baseline and intervention periods had the potential to change the fruit and vegetable varieties offered, which might have affected student selection.

Definition of Terms

Action research: A participatory process concerned with solving significant community problems by doing research with, rather than on, people and therefore bettering an individual or community (Bradbury & Reason, 2003).

Body mass index (BMI): A ratio if a person's weight to height squared. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (Center for Disease Control, 2011).

Choice architecture: Strategies for presenting foods in such a way that subtly influence decisions (Mancino & Guthrie, 2009).

Competitive foods: Foods sold in competition with the National School Lunch Program to children in food service areas during lunch or breakfast periods (Hirschman, Eadie, & Miller, 2005).

Free meal: A school meal served to a student who meets federal income eligibility guidelines defined as at or below 135% of the poverty level in accordance with the National School Lunch Program meal pattern requirements (U.S. Department of Agriculture, 2008).

Childhood obesity: A BMI at or above the 95th percentile for children of the same age and sex (Barlow & Committee, 2007).

Childhood overweight: A BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex (Barlow & Committee, 2007).

Offer versus serve: A meal selection policy where students may refuse menu items as long as they accept the minimum number of components (Hirschman et al., 2005).

Positive deviance: Use of uncommon but beneficial practices by persons at risk for a particular health implication that results in better outcomes when compared to their at risk neighbors. These behaviors are likely to be affordable, acceptable, and sustainable since individuals are already practicing those (Marsh & Schroeder, 2002).

Qualitative research: Investigates human behavior and why or how people behave a certain way in natural settings through observations, focus groups, dialogues, interviews, etc. The findings are not reported by statistical analyses or other quantitative methods (Swift & Tischler, 2010).

Reduced price meal: A school meal served at a reduced price to a student who meets income eligibility guidelines between 130 percent and 185 percent of the poverty guidelines and in accordance with the National School Lunch Program meal pattern requirements. The maximum amount a school food authority can charge for a reduced price meal is 40 cents for lunch, 30 cents for breakfast and 15 cents for a snack (U.S. Department of Agriculture, 2008).

Reimbursable meal: A school meal that meets the specific food and nutrient requirements of the United States Department of Agriculture Child Nutrition Program (Hirschman et al., 2005).

Salience: Pertaining to school meals programs, Salience describes placement of specific food items to adjust their relative prominence and distinction to student consumers (Just, Mancino, & Wansink, 2010).

CHAPTER II

REVIEW OF THE LITERATURE

In today's American society, children are at higher risk of obesity and chronic diet related disease due in part to poor eating behaviors and low levels of physical activity compared to children 3 decades ago (Daniels, 2006). One of the characteristics of poor diet among American school-age youth is the low consumption of fruits and vegetables (Rolls et al., 2004). It has been suggested that behavioral economic principles may be useful in encouraging youth to choose and consume fruits and vegetables more frequently, especially in school settings (Just et al., 2010). In order to understand the significance of using these principles, one must first understand metabolic mechanisms of fruits and vegetables in weight and health maintenance. In addition, it is important to understand the role of the school nutrition environment as an appropriate setting for intervention, barriers to consumption of healthy foods in school environments and how behavioral economics principles can be used to influence food choices.

Definition, Prevalence and Consequences of Childhood Obesity

Defining the terms overweight and obesity is necessary in determining the degree of risk in American children. According to the Centers for Disease Control, overweight is defined as a body mass index (BMI) at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex (Barlow, 2007). Childhood obesity

is a BMI at or above the 95th percentile for children of the same age and sex (Barlow, 2007). The prevalence of childhood obesity drastically increased between 1980 and 1999 when the rate of BMI for age and gender at or above the 95th percentile nearly tripled from 6% to 17% among school-age children and adolescents (Ogden et al., 2010). Although these rates are starting to plateau, the rates remain high with nearly 17% of youth being obese and approximately 30% of school age children having a BMI at or greater than the 85th percentile (Ogden et al., 2010).

Children who are overweight and obese have greater risk of health consequences which can carry over into their adult lives (Daniels, 2006). These health conditions may result in today's children living less healthy and shorter lives than their parents (Daniels, 2006). Some of the health consequences referred to include hypertension, atherosclerosis, diabetes, and metabolic syndrome. Asthma, non-alcoholic fatty liver disease, and polycystic ovary syndrome can also develop as a result of childhood obesity (Daniels, 2006). Psychological and emotional issues like depression can be an indirect result of bullying and social stigma associated with overweight children. Obesity can affect all of the internal organ systems and unfortunately, these devastating consequences are being seen at earlier ages (Daniels, 2006).

Obesity and overweight are a direct result of an imbalance between calorie intake and expenditure. This imbalance is the result of poor food choices and lack of physical activity. Other contributing factors include birth weight and parental obesity, personal behaviors such as TV viewing snacking, sleep habits, and the food environments in which children make food choices (Reilly et al., 2005). Parental obesity acknowledges the role of genetics in a person's weight status (Anzman, Rollins, & Birch, 2010).

Parental influence helps to explain the importance of parental modeling and provision of foods and opportunities for physical activities and the impact these influences have on the child's development of healthful behaviors (Anzman et al., 2010). The environments in which children live and learn and the foods that are available in these environments also impact the food consumption trends that result in calorie imbalance.

The Role of Fruits and Vegetables in Weight Management & Disease Prevention

One possible strategy for addressing obesity is promoting fruit and vegetable consumption among children. Fruits and vegetables have a low energy density and high water and fiber content which enhance satiety and reduce hunger (Rolls et al., 2004). This implies that adding fruits and vegetables to the diet can help with weight management by increasing satiety with fewer calories. Epstein, Paluch, Beecher, & Roemmich (2008) also found associations between fruit and vegetable consumption and reduced BMI among children. Forty-one overweight children, ages 8-12 years, enrolled in a 1 year treatment program where researchers randomly assigned them to one of two treatment groups. The first group focused primarily on increasing fruits and vegetables while the other group aimed to decrease consumption of high energy dense foods. Significantly greater reductions in BMI were seen in the group that focused on increasing fruits and vegetables at both the 12 and 24 month follow ups (Epstein et al., 2008). Fruits and vegetables also contain specific components that can decrease the risk of diet related disease on a metabolic level. The phytochemicals present in fruits and vegetables have precise functions which can decrease the risk of certain diseases (Van Duyn & Pivonka, 2000). Major diseases like cancer, heart disease, and diverticulosis may be prevented with the help of these phytochemicals, which can prolong or promote healthier lives of children.

Fruit and Vegetable Recommendations and Consumption Trends

In order to obtain the full benefit of fruits and vegetables, the recommended amounts must be consumed. According to the 2010 Dietary Guidelines for Americans (U. S. Department of Agriculture, 2010), healthy adults should consume about 2 cups of fruit and 2½ cups of vegetable per day as well as eating a variety of each. There is some variance in these recommendations when it comes to children since these numbers depend on gender, age, and level of physical activity. The Dietary Guidelines for Americans recommends children, ages 9-13 years, consume 1½ cups of fruit per day. It is also recommended that males in this age group consume 2½ cups of vegetables per day and females consume 2 cups per day (U.S. Department of Agriculture, 2010).

However, most American youth are not meeting these recommendations. The State Indicator Report reveals that in 2009, the percentage of U. S. adolescents who consumed the recommended amounts of fruits and vegetables per day ranged from only 5.2% to 11.4% (Center for Disease Control, 2009). For Oklahoma youth, the report shows that less than 10% of children eat the recommended daily amounts of fruits and vegetables (Center for Disease Control, 2009). These statistics support the idea that the majority of children both in Oklahoma and nationwide are not eating enough fruits and vegetables and, therefore, are at risk for obesity and other diseases. As previously mentioned, multiple levels of the child's environment contribute to these low consumption trends. One setting that has drawn a great deal of attention is the school environment.

The School Nutrition Environment

Although American children come from vastly different backgrounds and home lives, the school environment serves as a common environment for most children.

Ninety-seven percent of children five years and older spend six to eight hours a day at school for nine to ten months a year (Leviton, 2008). "It is the position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education that comprehensive, integrated nutrition services in schools, kindergarten through grade 12, are an essential component of coordinated school health programs that will improve the nutritional status, health, and academic performance of our nation's children" (Briggs, 2010, p. 1738). This statement exemplifies the support and expectations of the country concerning school nutrition. As such, the school environment, particularly the school lunch room, creates a base setting that can reach the entire school-age child population in America and serves as a logical setting for childhood obesity prevention interventions.

Furthermore, school meals currently authorized by the Healthy and Hunger Free Kids Act of 2010 provide children with nutritious breakfast and lunch meals during the school day (U.S. Department of Agriculture, 2011). In 2009, the National School Lunch Program operated in over 101,000 locations and provided reimbursable lunches to 31 million children each school day (U.S. Department of Agriculture, 2009). Children living in households that have incomes at or below 130% of the poverty level can receive a free meal and those between 130% and 185% can receive a reduced-price meal priced at no more than 40 cents (U.S. Department of Agriculture, 2009). Schools are able to provide these free and reduced priced meals to students through USDA reimbursement. Schools who participate in the National School Lunch program receive a cash reimbursement for every full price, free, and reduced price meal served (National school lunch, special milk, and school breakfast programs, national average payments/maximum reimbursement rates; notice, 2010). The 2010-2011 reimbursement rates for lunch, where less than 60%

of meals are free or reduced, are $2.72 for free, $2.32 for reduced, and $0.26 for full price lunches Schools which served 60% or more free and reduced lunches had reimbursements rates of $0.28 for full price meals, $2.34 for reduced price, and $2.74 for free meals served. In order to be eligible for reimbursement these meals must meet the current meal pattern requirements which are listed in Table 2.1.

In addition to serving nutritious meals, schools participating in the National School Lunch Program must also provide students with a healthy environment. In 2004, the Child Nutrition and WIC Reauthorization Act mandated that schools participating in the National School Lunch Program develop and implement a wellness policy that includes nutrition education, promotion of physical activity, and that encompasses the involvement of parents, students, and school administration (Briggs, 2010). While the act encourages schools to take responsibility for improving the school health environment, schools frequently experience barriers that inhibit them from making the lunch program the most nutritious and successful program for children. The major problem for school boards when it comes to nutrition is funding (Leviton, 2008). Therefore, difficult decisions are made concerning where to spend funds. The Child Nutrition Reauthorization Act of 2004 is a prime example of a mandate not supported with adequate funding in that only $4 million was given to implement the program nationwide (Leviton, 2008).

Another perceived barrier to improving the school nutrition environment and nutrition education is, first and foremost, academic achievement of students (Leviton, 2008). Focus on scholastic achievement limits time in the school day for both nutrition education as well as lunch periods. Staff and administration have several requirements to

meet academically, and as a result, find it difficult to actively execute programs not directly supporting academics. As a result, most funding and attention goes towards academic programming thereby leaving out nutrition and physical education, and shortening the time in which students have to eat.

In addition to financial constraints, community stakeholders who are unhappy with current school nutrition programs are demanding major change (Leviton, 2008). These stakeholders include parents and community officials who want their children to receive better nutrition from school but do not consider the consequences including increased expenses, and effect on meal participation. One such community activist, Jamie Oliver, campaigned for radical reform in school nutrition by drastically changing cooking methods and food products (Oliver, 2011). His methods did not take into account the extra labor and over all attitudes of those implementing change. This further supports the concept that interventions must be feasible and realistic in order to be successful.

Another hindrance to increasing consumption of healthful foods in school settings is the presence of competitive foods. Competitive foods are any foods or beverages offered to children other than meals served through the USDA school meal programs including a la carte items and vending machines (Hirschman, Eadie, & Miller, 2005). Schools frequently use profit from these foods to subsidize reimbursable meals. These foods are generally much higher in calories, solid fat, added sugars and sodium than foods commonly served as part of the reimbursable meal (Leviton, 2008). When sold within the lunch room during the meal service periods the revenue must accrue to the school nutrition account (Nutrition standards and menu planning approaches for lunches

and requirements for afterschool snacks, 2004). When sold outside of the meal service area the revenues may accrue to the general school fund. If competitive foods were removed, schools would lose a significant amount of revenue which makes it difficult to completely ban them.

In keeping with federal law to keep school meal nutrition requirements consistent with the most current Dietary Guidelines for Americans, the USDA commissioned the Institute of Medicine to review the current meal pattern requirements and make recommendations for revisions (Institute of Medicine, 2010). In response to these recommendations the USDA published proposed meal pattern changes for school nutrition programs (Nutrition standards in the national school lunch and school breakfast programs; proposed rule, 2011). The comment period for the proposed rules closed April 2011 and is currently under final clearance. Table 2.1 provides a comparison of the proposed meal pattern with current meal pattern requirements.

Table 2.1 Current and Proposed Meal Pattern Requirements for Lunch		
	Current Requirement	Proposed Requirement[a]
Meal Pattern		
Fruits (Cups)	½-1 Cup of fruit and vegetables combined per day	½-1 Cups per day
Vegetable (Cups)		.75-1 Cups per day
Dark Green	No Specifications as to type of vegetable	½ Cups per week
Orange		½ Cups per week
Legumes		½ Cups per week
Starchy		1 Cup per week
Other		1.25-2.5 Cups per week
Grains (oz)	1.8-3 oz (daily average over 5-day week)	1.8-2.6 (daily average over 5-day week)
Whole grains	Encouraged	At least half of grains must be WG
Meats/ Alternatives (oz)	1.5-3 oz (daily average over 5-day week)	1.6-2.4 oz (daily average over 5-day week)
Fluid Milk (Cups)	1 Cup per day	1 Cup per day, fat content to be 1% or less
Daily amount Based on the Average 5 day week		
Calories (Kcal)	No Maximum Kcal limit	550-850 Kcal
Saturated Fat (% of total Kcal)	<10	<10
Sodium (mg)	1400	≤640 Grades K-5 ≤710 Grades 6-8 ≤ 740 Grades 9-12
Trans Fat	Nutrition label must specify zero grams Trans Fat	
[a] Requirements are age group specific (Grades K-5, 6-8, 9-12) Table adapted from (Nutrition standards in the national school lunch and school breakfast programs; Proposed rule, 2011)		

As seen in Table 2.1, the proposed recommendations differ from the current ones concerning fruits and vegetables. For fruit, schools will be required to serve ½ to 1 cup per day depending on the age group. Vegetable requirements include ¾ to 1 cup per day depending on age group. Schools will also have to offer at least a ½ cup serving each of dark green vegetables, orange vegetables, and legumes weekly. Starchy vegetables, which include white potatoes, corn, lima beans, and green peas, will be limited to 1 cup per week.

It has been suggested that school environments are one location to impact healthful dietary behaviors because children spend a great deal of their time there, (Leviton, 2008). However, schools are highly regulated to meet both academic

outcomes and provide healthful environments with limited resources (Leviton, 2008). As such a gap exists between both mandated expectations and actual outcomes.

Along with funding and scholastic achievement concerns, important barriers to increasing fruit and vegetable consumption among adolescents include their thoughts, preferences, and opinions concerning food provided at school. After all, the school cannot make food choices for children, thus it is vital to know what school aged children think about when choosing food. Several research and survey studies have investigated factors that influence a child's food choices and more importantly, why they do not choose more fruits and vegetables. A study by Neumark-Sztainer et al. (1999) attempted to find answers using a focus group of adolescents who were in either grade 7 or grade 10. This study showed the general categories of factors perceived by students when making a food choice. Factors most important to students included appeal/taste of food, time, and convenience of food. Factors having some importance included availability, parent influence, perceived benefits, and the overall situation. Least important categories were body image, habit, cost, media, and vegetarian lifestyle. Since the most important factor to children is taste, when asked how to increase consumption, the focus groups suggested making fruits and vegetables look and taste better. This statement is congruent with the idea of behavioral economics which focuses on aspects like lighting and appearance to "nudge" children to choose the fruits and vegetables over less nutritious foods.

Another interesting consensus from the focus groups related to the health benefits of fruits and vegetables. Children in the focus group believed that healthy food was not important at this point in their life they have to worry about other things like school and

extracurricular activities (Neumark-Sztainer et al., 1999). Some children even mentioned that they would worry about eating healthy foods when they are older and suffering from related diseases. These findings support the idea that telling children to eat fruits and vegetables because they are healthy and will prevent disease is nearly a lost cause because most children are more concerned about taste and convenience than health benefits. These findings support the need for an intervention that fulfills students' desire for appeal and convenience of food while also following school meal requirements.

The factors that influence the middle school aged child's food choices can correlate to the child's stage of development. Children between the ages of 7 and 11 years are thought to be in the concrete operational stage of Piaget's stages of cognitive development (Karpowitz, 2007). In this stage, children can look at several aspects of a concrete problem and can think in an organized logical fashion. These children cannot yet fully perceive abstract ideas or future implications of problems. The inability to recognize future implications of abstract problems might explain the need to address the level one factors rather than using nutrition education alone.

Furthermore, a study conducted by Story and Resnick, (1986), explored the student perceptions of food and nutrition. The study concluded that the students were well informed about good nutrition but did not incorporate this knowledge into food behavior. Student identified barriers included lack of time as well as decreased sense of urgency. These barriers also coincide with the concrete operation stage because lack of urgency identifies children's inability to perceive future implications. As such interventions should focus on student barriers to change behavior instead of nutrition education.

Behavioral Economics

A potential strategy for the school nutrition program is the use of behavioral economics to nudge students towards increased fruit and vegetable consumption while keeping added expenses to a minimum. Behavioral economics is an emerging idea using psychological and economic theories to influence consumers to choose a desired product (Thaler & Sunstein, 2009). This concept was originally used in the business and marketing sector and then was applied to consumer trends and mindful eating (Thaler & Sunstein, 2009). When applied to food behaviors, it demonstrates how perception, memory, or thought processes can influence the consumption of food (Just & Wansink, 2009). Specifically, it identifies environmental triggers that influence decisions on a subconscious level. In addition, it recognizes perception biases, both environmental and cognitive, that can alter the quantity a person consumes as well as the personal perception of the overall appeal of certain foods (Just et al., 2010). This concept has been used by marketing and food corporations for several years and it helps them influence consumers to buy their product. Recently, health researchers and nutrition professionals have started applying behavioral economic principles to positively influence healthier food choices in children as well as adults. The National School Lunch Program has been of particular interest to behavioral economic researchers because the implementation of these tools is simple and cost effective and prompts healthier choices without restricting the unhealthy options (Just, 2006). As such, behavioral economics may prove useful in identifying aspects of the cafeteria lunchroom that can help promote students' fruit and vegetable selections.

The primary purpose for using behavioral economics in school settings is to promote healthful food choices, without totally restricting competitive foods that are high

in calories and fat. This characteristic is important in that it has been shown that parental feeding restriction is most often associated with child overeating and obesity (Faith, Scanlon, Birch, Francis, & Sherry, 2004).

Researchers have applied behavioral economics to environmental triggers that include location, container size, variety, lighting, and preparation of food that can influence healthful food choices without limiting access to less healthful choices (Wansink, 2004). For example, behavioral economics suggests that the location of fruit on the lunch line can nudge children to take it, especially if it is at the beginning or end of a lunch line, thus making the healthful food choices more convenient. This type of strategy is referred to as choice architecture (Mancino & Guthrie, 2009). Other examples include illuminating the fruit assortment which makes it stand out and look more appealing (Just & Wansink, 2009). Another example is to arrange fruits by color thus causing them to stand out and increasing appeal, and to cut up fruit making it easier to eat. For vegetables, Just & Wansink (2009) found that giving children the option of choosing between two or more vegetables instead of requiring them to take one increases vegetable purchases over all. Using larger containers for fruits and vegetables unconsciously prompts children to eat more as well increasing the likelihood the child chooses the portion because it is perceived as having greater value (Just & Wansink, 2009). As shown, behavioral economics principles have the potential to nudge children's food choices in school cafeterias to include more fruits and vegetables.

Behavioral Economics Research Studies

Although behavioral economics can be used to influence a variety of food choices, recent research studies demonstrated its usefulness for increasing fruit and vegetable choices. A multi-component, research study used nutrition education,

entertaining mascots, and behavioral economics principles to influence fruit and vegetable consumption (Perry et al., 2004). The behavioral economic strategy consisted of adding additional varieties of fruits and vegetables each day that were cut up and arranged by color. In addition, the lunch staff verbally encouraged students to take fruits and vegetables. Randomly selected students were observed during lunch by researchers who recorded items eaten as well as portion size. The researchers found significant increases in fruit consumption but no significant differences were seen in vegetable and juice consumption. Furthermore, verbal encouragement and number of varieties of fruits and vegetables were significantly associated with increased fruit and vegetable consumption (Perry, 2004).

Researchers have also recently looked at the use of portion size to increase consumption of vegetables in children (Spill et al., 2010). A test lunch was served once a week to children ages 3-5 years. Each time the portion size of carrots was increased. The study found that total vegetable consumption increased as portion size increased; however, when the portion size of carrots was tripled there was no significant increase in consumption (Spill et al., 2010). The study suggests that moderate increases in portion size will increase consumption in children but that large increases are not beneficial.

Successful interventions have found that behavioral economic strategies can increase healthy foods consumption in schools (Just & Wansink, 2009). Wansink, Just, & McKendry (2010) conducted one study concerning salad bar location. By simply moving the salad bar to a central and convenient location, the salad sales tripled. Another study reported the difference between requiring one vegetable and giving a choice between two. Results indicated that 69% of youth required to take carrots ate them while

91% of those given a choice between carrots and celery actually ate their vegetable (Just & Wansink, 2009). This indicates that giving children the option to choose what they eat dramatically increases consumption of healthy food. Another study assessed the order of healthy foods presented to college students to determine changes in selection (Wansink & Just, 2011). The study found that placing vegetables as the first food item in the line increased sales by 11%.

A comprehensive review of behavioral economic strategies used in the school environment is listed in Table 2.2. All of these studies provide evidence that behavioral economics principles are useful strategies for school nutrition programs and can be successfully applied into several different areas in school nutrition programs. As such, behavioral economics is a concept that has potential to increase students' selection of fruits and vegetables and contribute to reduced risk for obesity.

Table 2.2 Behavioral Economics Choice Architecture Strategies in Child Nutrition Programs

Article	Purpose	Choice Architecture Strategy	Summary of results
Kahn & Wansink (2004)	To determine whether or not perceived variety and assortment structure affects consumption quantities in adults and children.	Increase variety and assortment	When actual variety of jelly beans increased from six to 24 colors, consumption quantities increased for organized assortments but not for disorganized assortments. This supports the idea that a variety of food that is organized by color, children will consume more than from disorganized assortments.
Swanson, Branscum, & Nakayima (2009)	This study examined how changing the preparation method of fruits could increase accessibility and, therefore, influence consumption in an elementary school.	Cutting up fruit	16.2% of students selected sliced oranges which was significantly greater than whole orange selection of only 5.5%.
Schwartz (2007)	This study evaluated an environmental intervention intended to increase consumption of fruit servings among children participating in the NSLP using verbal prompts by cafeteria staff.	Verbal prompting	Nearly 70% of the children who were exposed to verbal prompts consumed a fruit serving at lunch, while fewer than 40% did so in the control school with no verbal prompting.
Wansink, Van Ittersum, & Painter (2005)	Researchers propose that favorably descriptive menu names can increase sensory perceptions of appearance and taste just as they have been shown to influence food sales, restaurant attitudes, and repurchase intentions.	Descriptive food names	For practitioners, the use of descriptive names may help improve perceptions of foods in institutional settings, and it may help facilitate the introduction of unfamiliar foods.

Perry et al. (2004)	To determine if a multi-component, cafeteria based intervention would increase the fruit and vegetable consumption of elementary age children.	Increase quality, quantity, variety and availability of fruits and vegetables	Students in the intervention schools significantly increased their total fruit intake. No significant changes seen in juice or vegetable intake.
Spill et al. (2010)	To test the hypothesis that serving larger portions of low-energy-dense vegetables at a meal could have beneficial effects on children's food and energy intakes.	Increasing portion sizes	Total vegetable consumption at the meal increased as the portion size of carrots increased. Doubling the portion size of the first course increased carrot consumption by 47% but tripling the portion size of carrots, however, did not lead to a further increase in intake. This suggests that moderate increases in portion size can lead to increased consumption.
Just (2006)	Determine how to provide for the food-insecure while encouraging healthy lifestyles using behavioral economics.	Moving competitive foods to less convenient locations.	The article suggests moving competitive foods to less convenient areas or outside the normal path of students in order to discourage unhealthy eating.
Just et al. (2008)	To understand how behavioral economic interventions influence food choice of college students. Specifically, assessing the effects of various menu selection methods and payment options on food choices.	Cash for dessert, preselect meals	Those paying with cash made healthier food choices than those paying with an unrestricted debit card, which were significantly more likely to purchase an unhealthy items but less likely to buy healthful side items and desserts. Students using restricted cards made significantly healthier choices than students paying with either cash or unrestricted cards.
Just & Wansink (2009)	To illustrate how behavioral economic concepts can help increase the nutritional content of school lunch without harming the bottom line.	Choice between vegetables	Results suggest that requiring a vegetable, while offering an active choice between at least two options substantially reduces the waste from vegetables.

Just, Wansink, & McKendry (2010)	Evaluated behavioral economic changes in the lunch area and their effect on student selection.	Prominent salad bar location	Moving the salad bar off the wall into a more high traffic area tripled salad sales.
Wansink & Just, 2011	To determine if the order of food presented in the lunchroom effects student selection.	Placing vegetables as first item on the lunch line	The ordering of vegetables as the first item increased sales by 11%. Offering a healthier burrito before less healthy tacos increased burrito sales and decreases taco sales by 28%.

In summary, obesity is a fast growing epidemic that can have life-long effects on a child and contribute to development of diseases including depression, diabetes, and atherosclerosis (Daniels, 2006). About 30% of American children are overweight and the number grows every year (Ogden, 2010). However, fruits and vegetables can contribute to the prevention of disease and obesity because of the low energy content and high fiber and water content, all of which increase satiety and reduce hunger (Rolls et al., 2004). Unfortunately, most of America's children do not get the recommended amount of fruits and vegetables as evidenced by less than 10% of Oklahoma adolescents eating the recommended amounts (Center for Disease Control, 2009). In order to increase fruit and vegetable consumption, it may be one of the best places to have an intervention is the school environment where children spend, on average, about nine to ten months out of the year in school and eat one or more meals daily there (Leviton, 2008).

Originally used in the business sector, food corporations and marketing companies use behavioral economics in much the same way to promote the consumption of their product. After implementation of this principle demonstrated how consumers can be influenced to select certain products, the idea was expanded to the health and nutrition fields. When applied to the school environment, behavioral economics has shown

potential to influence students' selection of fruits and vegetables. This is accomplished by creating external cues that are consistent with factors that positively influence students' food choices (Just et al., 2010). These factors include lighting, visual appeal, convenience, package size, and increasing variety to persuade children to consume more fruits and vegetables (Wansink, 2004; Just & Wansink, 2009). As such, behavioral economics may be a useful tool that can influence children to consume more fruits and vegetables and, therefore, decrease the prevalence of childhood overweight and obesity.

CHAPTER III

PILOT STUDY TO EXPLORE THE IMPACT OF CHOICE ARCHITECTURE STRATEGIES ON MIDDLE SCHOOL AGE STUDENTS' FRUIT AND VEGETABLE CHOICES AND METHODS TO MEASURE CHANGES

Introduction

Obesity and overweight have become a highly prevalent problem for American children as evidenced by approximately 30% of school aged children having a body mass index (BMI) equal to or greater than the 85th percentile (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Because of the severe complications associated with childhood obesity, the argument can be made that today's children may have a shorter lifespan than their parents because of obesity (Daniels, 2006). These health complications include depression, hypertension, asthma, and diabetes (Daniels, 2006). Obesity is the result of an imbalance where caloric input exceeds caloric output (U.S. Department of Agriculture, 2010). This imbalance is due to several factors including physical inactivity, feeding environments, and most importantly, poor diet (Reilly et al., 2005).

Adequate consumption of fruits and vegetables , which have a high water and fiber content along with the low energy density, can increase satiety and reduce hunger therefore limiting the over intake of calories (Rolls et al., 2004). As such, they are

beneficial in maintaining a healthful weight. Epstein et al. (2008) found that increasing fruits and vegetables in children ages 8 to12 years showed significantly greater reductions in BMI than in children who focused on just cutting calories. Unfortunately, children are not consuming adequate amounts of fruits and vegetables to achieve the desired benefits (Guenther et al., 2006). According to the 2009 Youth Risk Behavior Survey (Center for Disease Control, 2010), 77% of adolescents nationwide did not consume the recommended amounts of fruits and vegetables. Specifically, only 14% of Americans 2 years and older are meeting the vegetable recommendation (U. S. Department of Agriculture). Only 21% of Americans consume the recommended amount of fruit per day, which further supports the idea that there is inadequate consumption of fruits and vegetables nationwide.

Students' preferences, thoughts, and opinions of school nutrition programs must be evaluated when determining appropriate methods to increase fruit and vegetable selection. Neumark-Sztainer et al. (1999) administered student focus groups to find the factors considered when students make food choices. The research concluded that children mainly considered taste, appeal, and convenience of food when making food selections. The research also discovered that children were not as concerned with making healthy food choices or about risk of future disease (Neumark-Sztainer et al., 1999). The previously identified factors coincide with Piaget's stage of concrete operation which is seen in children between the ages of 7 and 11 (Karpowitz, 2007). The theory suggests that children at this age have an inability to fully perceive abstract ideas and future implications such as improving health. These findings suggest that interventions must

take into consideration the psychological factors influencing student food choice in order to be successful.

A child's environment can contribute to low consumption of fruits and vegetables, particularly the school setting. Schools are a common setting since more than 97 percent of children 5 years and older spend 6 to 8 hours a day at school for 9 to 10 months a year (Leviton, 2008). Therefore school nutrition programs have the unique opportunity to influence children to choose more fruits and vegetables.

Although federal regulations enforce strict adherence to nutrition requirements and standards (Briggs, 2010), schools have several limitations that hinder their nutrition programs. Academic achievement is the first priority for schools so nutrition programs do not always get the full attention they should (Leviton, 2008). Limitations on nutrition programs also can be attributed to lack of funding and budget restrictions. The use of competitive foods may also deter fruit and vegetable selection at school but nutrition programs use the profits of competitive foods to subsidize reimbursable meals. Therefore school administrators need nutrition programs to be financially sound and include foods that students will actually eat. School nutrition professionals must work within these boundaries to satisfy school administration, government regulations, and community stakeholders who want wholesome, quality food while at the same time try to appease student preferences.

Schools participating in the National School Lunch Program are eligible to receive reimbursement for served meals that meet meal pattern and nutrition requirements (Nutrition standards and menu planning approaches for lunches and requirements for afterschool snacks, 2004). Compliance with these requirements is

documented in food production records. Federal regulations require that the records include a list of menu items, quantities of foods prepared and left over, as well as number of meals served.

In 2008, the USDA commissioned the Institute of Medicine to review the current meal pattern requirements and make recommendations for revisions (Institute of Medicine, 2010). In response to these recommendations the USDA published proposed meal pattern changes for school nutrition programs (Nutrition standards in the national school lunch and school breakfast programs; proposed rule, 2011). These recommendations are summarized in Table 2.1. If the recommendations are approved as proposed, schools will be required to increase fruit and non starchy vegetables and limit starchy vegetables. However, simply adding more fruits and vegetables into the menu does not imply that students will select the food items.

Although schools offer fruits and vegetables, they also offer a variety of competitive and less nutritious foods that students consider as having better taste, appeal, and convenience (Neumark-Sztainer et al., 1999). Middle school environments, specifically, have more competitive food availability than elementary schools which might be a reason for decreased fruit and vegetable consumption among middle school aged children (Fox et al., 2001). For these reasons, there is need to study an intervention that satisfies the needs and desires of students while still meeting school meal regulations.

Behavioral economics can be used to influence fruit and vegetable selection while taking into account student preferences as well as labor and cost restraints. Behavioral economics applies psychology and marketing principles to alter a person's perception biases and influence food choice as well as overall appeal of food (Just, Mancino,

Wansink, 2007). The theory, which was first used in the business sector (Thaler & Sunstein, 2009), has shown promise to influence student choice in school nutrition settings (Mancino & Guthrie, 2009; Just & Wansink, 2009; Just, Wansink, Mancino, & Guthrie, 2008; Just et al., 2007). Behavioral economics is useful in identifying aspects of the cafeteria that can be altered to promote healthy food through a process known as choice architecture which analyzes how certain foods are presented to consumers (Mancino & Guthrie, 2009). These aspects include location of foods, lighting, arrangement, and preparation of food (Wansink, 2004). Behavioral economics, when applied to the school setting, focuses on promoting student selection of the desired food without restricting or limiting the less desirable foods.

Multiple studies have used behavioral economics in the school setting to improve the diet of students. Spill, Birch, Roe, & Rolls (2010) found that increasing portion sizes of vegetables served to students and saw an increase in the amount consumed. Another study implemented behavioral economics principles by using verbal encouragement, increasing variety of healthy food, and making fresh fruit more convenient by cutting it up (Perry, Bishop, Taylor, Davis, & Harnack, 2004). The study found significant increases overall in fruit selection but not vegetable selection. Just & Wansink (2009) incorporated the strategy of offering two vegetables instead of requiring just carrots. Results indicated that 91% of students given the choice between vegetables consumed them as opposed to only 69% of students required to take carrots. Another study analyzed effects of placement of a salad bar within the lunch area (Just, 2010). Researchers moved the salad bar to a more prominent location which nearly tripled salad sales (Just, 2010). Wansink & Just (2011) compared student selection of food items to the order of food

items in the service area. Results showed that sales of vegetables increased by 11% when placed as the first item in the lunch line. These studies show that behavioral economics can be a useful intervention to increase students' selection of fruits and vegetables without forcing choices.

While approximately 1 in 3 youth are overweight or obese (Ogden et al., 2010), and even more or at risk due to obesegenic environments, efforts to encourage fruit and vegetable consumption particularly in school settings may help address the public health problem. Schools offer fruits and vegetables but also offer a variety of less nutritious competitive foods. Frequently, students choose the competitive foods rather than the fruits and vegetables (Leviton, 2008). This creates a need to find strategies, like behavioral economics, that accommodate the nutritional needs and desires of students while supporting school meal nutrition goals.

This feasibility study aimed to identify successful behavioral economics practices from the literature and implement selected practices in 3 middle-school settings. In addition, the study tested the usefulness of school production records to measure changes in students' fruit and vegetable selections. Because school nutrition settings differ greatly in factors such as facilities and equipment, food delivery schedules, and length of lunch periods it was not realistic to think that one choice architecture strategy would be appropriate for multiple school sites, As such, the researchers utilized action research methods which allows researchers to have a collaborative relationship with school nutrition directors and give them an active role in identifying problems and generating interventions (Bradbury & Reason, 2003). The action research process includes community members in addressing their own problems and allowing for better

compliance (Bradbury & Reason, 2003). A benefit of utilizing action research is that the staff and nutrition directors involved felt empowered and supported the research study.

Purpose, Objectives, and Hypotheses

Specific objectives of this feasibility study included:

1. Use action research methods to test the impact of selected choice architecture strategies on students' selection of fruits and vegetables in three middle school nutrition program settings. This objective is based on the hypothesis that the use and implementation of choice architecture strategies will increase students' fruit and vegetable selections.
2. Conduct a plate waste study in one setting to evaluate plate waste of fruits and vegetables when a choice architecture strategy has been implemented. This objective will test the hypothesis that students will consume self selected fruits and vegetables when choice architecture strategies were implemented.
3. Assess the usefulness of food production records for measuring changes is students' fruit and vegetable selections. This objective will test the hypothesis that food production records meeting federal requirements will detect changes in students' fruit and vegetable selections.

Methodology

The purpose of this feasibility study was to utilize action research to investigate the use and impact of choice architecture strategies in middle school nutrition settings on students' selection of fruit and vegetable offerings. Specific objectives included 1) implementing a choice architecture strategy at each school site school and measuring the

impact on the amount of fruits and vegetables served using school nutrition food production records; 2) conducting a plate waste study on a free self-serve fruit and vegetable bar; and 3) using school food production records to measure changes in students' fruit and vegetable selections Researchers hypothesized that 1) the use and implementation of choice architecture strategies would increase students' fruit and vegetable selection; 2) existing school nutrition food production records would be sufficient to document changes in fruit and vegetable trends; 3) students would consume self selected fruits and vegetables when choice architecture strategies were implemented; and 3) school food production records would provide sufficient data to detect changes is students' selections.

Study Sites and Period

Three middle schools representing 3 school districts in a south central state of the United States served as study sites. They represented diverse segments of the state, including rural, suburban and urban. All three schools participated in the Child Nutrition Program during the 2010-2011 school year, with interventions being conducted in 1 month periods from October 2010 to March 2011. September 2010 served as the baseline period. Each of the three participating schools received a monetary stipend to cover costs related to implementing the intervention and data collection. Each site housed a combination of 6^{th}, 7^{th} and 8^{th} grade students. Table 3.1 provides an overview of each site's demographic characteristics during the study period. At the time of this research study, Site 1 had an enrollment of 785 students and served an average of 663 student lunches per day. Site 2 had an enrollment of 539 students at the time of the study and served approximately 380 student lunches per day. Site 3 had an enrollment of 2,240

students and served an average of 1,500 student lunches per day. A complete case study for each school site is listed in Appendix A.

Table 3.1 Demographic Characteristics of Each School Site at Time of Study*

School Site	**Site 1**	**Site 2**	**Site 3**
Race/Ethnicity			
Caucasian	77%	78%	66%
Af. American	13%	14%	14%
Hispanic	4%	5%	7%
Asian	1%	2%	7%
Other	1%	1%	5%
Grade levels	6^{th}, 7^{th} & 8^{th}	6^{th} and 7^{th}	6^{th} & 7^{th}
Avg. daily lunch participation	663	380	1500
Enrollment	785	539	2240
% free/reduced price meal eligibility	80.5%	61.78%	56.25%

* Information adapted from Oklahoma public schools free and reduced-price meals eligibility report for the 2010-2011 school year (Oklahoma State Department of Education, 2011)

Inventory of Choice Architecture Strategies

Formative research consisted of reviewing the existing literature to identify behavioral economics interventions, specifically choice architecture strategies, with potential to influence students' fruit and vegetable selections. They were compiled into an inventory and presented to the school site kitchen manager and school district's nutrition director in each of the study sites. Each inventory item included a description as well as the rationale thought to effect student choice. The inventory of choice architecture items are presented in Table 3.2.

Table 3.2 Inventory of Choice Architecture Strategies	
Strategy	**Description & Rationale**
1. Fruit and Vegetable Bar after point of service	Fill a salad bar with a variety of fruit and vegetables. Allow students who purchase a reimbursable meal to freely take fruits and vegetables from the bar. Rationale: The bar appeals to the students because they are getting more for their dollar.
2. Verbal encouragement of fruit and vegetable consumption	Cafeteria employees act friendly with the students and ask questions like, Would you like a piece of fruit with your lunch? What vegetable do you want today? Rationale: These verbal cues work the same way as marketing techniques. Example: A fast food employee asks, “Do you want fries with that?”
3. Allowing unlimited amounts of fruit and vegetables with a reimbursable meal	Students who purchase a reimbursable meal are allowed as many fruits and vegetables as they want from the lunch area. Rationale: “Unlimited amounts” make the students think they are getting more food for the same price.
4. Placement of Fruit and Vegetables as the first item on the service line	The first item students pass by in the lunch line should be a fruit or vegetable. Examples include a relish tray of raw vegetables, whole fruit, or portioned servings of canned fruit. Rationale: Students will be hungry and eager to fill their empty tray.
5. Offer fresh fruit and vegetables in multiple places with in the service line	Instead of having one area designated for fruit and vegetables put them in several different areas. Rationale: Increases the opportunities for students to choose a fruit or vegetable and looks like there is more variety
6. Offer monthly sampling of unfamiliar fruits and vegetables. Then incorporate them into the menu	Prepare small samples of new fruits or vegetables for students to try at no cost then serve them as part of the school menu. Rationale: Exposure to new foods can be fun for students and they will be more likely to choose the new fruit or vegetable if they have tried it before.
7. Move the reimbursable salad bar to a prominent and central position	Put a salad bar in a place where the students have to walk around it instead of off to the side Rationale: This forces children to walk past the salad bar, increasing the chance that they might take something from it.
8. Offer vegetable options as opposed to requiring one vegetable	If a vegetable is served as a side dish to a main meal, give two options that students can choose from instead of only one. Rationale: Allowing students a choice instead of forcing increases the chance that they will actually consume it

9. Accept only cash for food items not sold as part of reimbursable meal	Accept only cash for chips, cookies, etc. instead of allowing students to pay from their account. Rationale: Students will have to prepare a head of time to bring cash and will have the feeling of a direct loss when using money.
10. Placement of whole fruit at point of service	Use a decorative basket and fill it with pieces of whole fruit near the cashier kiosk Rationale: Impulse buying that works the same way as the assortment of items before the cash register at the grocery store.
11. Cut up fruit and arrange by color to increase visual appeal and garnish.	Cut up fruit into smaller pieces and group them by color instead of only offering whole fruit. Add garnish to increase appeal Rationale: Cut up fruit is easier and more convenient to eat especially for students with dental braces.
12. Offer an additional option of one fruit and vegetable each day to increase variety	Instead of only serving one type of whole/canned fruit or one vegetable offer several different varieties each day. Rationale: This gives children more options to choose from and increases visual appeal
13. Change the default options for vegetable side items	Instead of automatically giving French fries with the option of substituting them for apple slices, automatically give apple slices with the option of substituting French fries Rationale: Some students will decide to keep the default option because it is easier than asking for a substitute item
14. Place snack foods in less convenient areas within the lunchroom	Move the chips, cookies, snacks, etc. to the side or to a less convenient area Rationale: Students will be less tempted to select these items
15. Creatively rename fruit and vegetable dishes	Vegetable chili becomes “Grandma’s slow cooked vegetable chili.” Cut up oranges and grapes become “Fruity Citrus Salad” Rationale: Creative names appeal to the student who then expects the food will taste better

Preliminary Assessment

In keeping with action research, **s**chool nutrition directors and cafeteria staff at each site had an active role in the intervention study. Preliminary site visits were made to each school site and background information was collected in order that researchers would adequately understand the school site conditions and operating procedures. The Kitchen manager or school nutrition director gave tours of the cafeteria so researchers would have knowledge of the layout of the facility. Other shared information included a school profile (including enrollment, ethnicity composition, open versus closed campus, and percent eligible for free and reduced priced meals); a nutrition program profile (menu planning method, number of serving lines, ratio of scratch to convenience cooking, meal count system, length of lunch period, food production record characteristics), and an analysis of strengths, weaknesses, opportunities, and threats for implementing choice architecture strategies. These analyses are located in Appendix A. Thereafter, researchers and school nutrition personnel discussed the strengths and challenges of each school nutrition program with emphasis on positive deviance to identify choice architecture practices that were already being used and weaknesses that could be improved using behavioral economic principles.

The selected strategy and purpose was then shared with all the cafeteria staff and any questions or concerns were addressed and revised as needed. The cafeteria staff and the school nutrition director worked out specific details concerning implementation and assigned the task to specific staff members. The researchers strived for comprehension and approval from both the staff and director to ensure compliance and adherence to the intervention. After the commencement of the intervention periods, researchers discussed

the changes with the cafeteria staff and documented any comments related to increased labor due to the intervention.

Choice Architecture Interventions

After touring the Site 1 Middle School cafeteria and kitchen, the school nutrition director, kitchen manager and researchers discussed multiple intervention strategies and decided on two that were appropriate for the school site. Intervention strategy 4, fruits and vegetables as the first item in the serving line, was selected. The fresh vegetable relish tray was located in a spot that was easily overlooked by students. However when students approached the relish tray, their food trays were full and it was not convenient to add items from the fresh vegetable tray. Therefore, the first intervention moved the relish tray to a more prominent and convenient location at the beginning of the line. Small paper food boats and tongs were provided to the students for self-serve as they waited to receive their lunch tray. It was hoped that moving the relish tray to the beginning of the line might tempt hungry students to fill their empty tray. The intervention period lasted from October 2010 to November 2010 which yielded a total of 16 intervention days.

It was then decided that another behavioral economics intervention would be incorporated at Site 1 after the conclusion of the first intervention. The nutrition staff and director recognized the cafeteria area as a place to showcase posters promoting healthful food choices. The second intervention involved displaying posters and signs in the cafeteria area that encouraged consumption of fruits and vegetables. Colorful pictures and appealing slogans were used to influence children to select more fruits and vegetables. This intervention period began in November 2010 and ended in December 2010 yielding 19 total intervention days.

The school nutrition director and kitchen manager of Site 2 and the research team chose to combine multiple behavioral economics tactics into one intervention. Site 2 cafeteria shares space with the gymnasium and the kitchen has very limited space as well so researchers and nutrition staff realized the intervention could not require a lot of space or rearranging of equipment. The idea of salience was used by improving visual appeal, increasing the variety, and locations on the lunch line where fruits and vegetables were offered. Garnishing was used to increase the visual appeal of fruits and vegetables. Salads were garnished with carrot shavings and tomato. Fruit cups were displayed on top of full leaves of lettuce. Fresh fruit was placed in colorful baskets and elevated to eye level at the end of the serving lines. The intervention period lasted from November 2010 to December 2010 which comprised 22 total intervention days.

Unlike other middle schools, Site 3 had the financial means to incorporate more fruits and vegetable options even with a small rise in expenses. Therefore, the nutrition director, researchers, and staff chose to implement a strategy that could increase fruit and vegetable options by adding another bar filled with a colorful variety of vegetables and cut up fruit. Because of Site 3's financial means, students could take multiple items from the display at no extra cost with a purchase of a reimbursable meal.

Researchers and the school nutrition administration at Site 3 selected inventory strategy 1, placement of a fruit and vegetable bar after point of service. The mobile serving bar included a wide assortment of fruits and vegetables such as apricots, kiwi, blueberries, bananas, mushrooms, celery, carrots, broccoli, and spinach. All students who purchased a reimbursable meal had complete access to the self-serve bar with no limit on the amount of food selected. Initially, the bar was to be placed after the payment

kiosks in a pathway between the lunch area and the seating area to provide prominent location and attention. Unfortunately, the pathway was a high traffic area with students passing through to their next classes so the bar was moved inside the lunch area next to the salad bar. The intervention period was from January 18, 2011 to February 18, 2011.

Data Collection & Analyses

In keeping with federal regulations, food production records are kept by every school nutrition program to record the amounts of each food prepared, served, leftover and discarded in order to document that meals served met meal pattern requirements. The records were copied and made available to the researchers. Fruit and vegetable side dishes were identified for each day of the baseline and intervention periods and analyzed to measure changes in students' selection of fruit and vegetable consumption.

September 2010 was established as the baseline measure for fruit and vegetable side dish servings. Mean fruit and vegetable side dishes served in September 2010 were compared to September 2009 data to ensure that consumption patterns were stable

Food production records were collected after the intervention period concluded at each school. Fruit, vegetable and fried white potato side items were the units of analyses as it was not feasible to obtain amounts of fruits and vegetables that were inside main dishes. All fruit and vegetable side dishes and fried white potatoes were converted into 1 cup servings using the USDA Food Buying Guide for Child Nutrition Programs as a reference (USDA Food and Nutrition Service, 2008). Amounts discarded or leftover were subtracted from amount prepared to get the total amount served for that particular food item. Once each food item total was calculated, total fruit, total vegetables, and total fried white potato variables were computed for each day. Sweet potato fries were included in total vegetables since they contain Vitamin A and a lower fat content than

fried white potatoes and as they were not targeted for restriction by USDA's proposed meal pattern requirements. Total 1 cup servings of fruit, vegetables, and fried white potatoes were each divided by the number of meals served per day to calculate the number of servings per day, thus controlling for daily meal participation variances.

The 1 cup servings per day for each fruit and vegetable variable were statistically compared to baseline data to evaluate the impact of the choice architecture strategy on the number of students' fruit and vegetable selections. Nonparametric Wilcoxon Signed Rank Test was used to detect statistical significance in the 1 cup servings of fried white potatoes/meal/day, total fruit side dishes/meal/day, and total vegetables side dishes/meal/day selected by students between the baseline period and the intervention period. The level of significance was set at ($P < .05$) for all analyses.

The plate waste study of the free fruit and vegetable bar was conducted over a two day period during two consecutive weeks, on different days of each week. All four lunch periods were observed. Before the meal service started, researchers measured out ½ cup servings of each food item available on the fruit and vegetable bar using ½ cup serving scoops used by students for self-service. Pictures were taken of each measured food item for use as a visual reference amount during tray analysis. Protocols for the study were based on those established by Comstock, Pierre, & Mackiernan (1981). The researchers asked students who were observed making selections from the fruit and vegetable bar if their lunch tray could be photographed before and after they ate. To prevent bias, the students were told a study was being conducted of what foods students ate in the cafeteria. Each student who agreed to participate was given a color coded number card so researchers would know the location of each participating student in the

cafeteria and allowed for a pair-wise comparison of before and after pictures. A picture was taken of the tray before the student began eating. Visual perception in the photograph was held constant by using identical cameras and by aligning the edges of the tray with the frame of the camera lens. Before the students discarded their trays, they held their number card up so researchers knew they had finished. Another picture was taken to document what foods were left on the tray and to assess consumption and waste. Student trays were excluded from analysis if no second picture was taken.

Before and after pictures were visually compared and analyzed using the equation; quantity of each fruit and vegetable selected from the bar – quantity left on plate = total quantity consumed. These values were then used to compute the percentage of fruit and vegetables consumed for each student. The study protocol was approved by the Oklahoma State University Institutional Review Board.

Findings

Choice Architecture Interventions

The impact of choice architecture interventions at all three school sites are summarized in Table 3.3. Table 3.4 shows the percent increases in mean fruit and vegetable servings per day when compared to the average number of meals served per day.

Table 3.3 Mean student Selections of 1 Cup Servings of Fruit, Vegetable, & Fried Potatoes by Baseline and Intervention Periods.

School Site	Baseline		Intervention			Intervention 2		
	n	Mean	n	Mean	(P Value)*	n	Mean	(P Value)*
Site 1								
Total Fruit	19	0.20	21	0.24	(0.327)	17	0.24	(0.093)
Total Vegetables	19	0.13	21	0.20	(0.184)	17	0.19	(0.113)
Total Fried Potatoes	19	0.15	21	0.15	(0.972)	17	0.20	(0.382)
Site 2								
Total Fruit	20	0.22	22	0.23	(0.681)			
Canned Fruit	20	0.09	22	0.07	(0.117)			
Fresh Fruit	20	0.13	22	0.16	(0.015)*			
Total Vegetables	20	0.20	22	0.25	(0.575)			
Total Fried Potatoes	20	0.13	22	0.14	(0.263)			
Site 3								
Total Fruit	20	0.12	15	0.12	(0.865)			
Total Vegetables	20	0.11	15	0.12	(0.910)			
Total Fried Potatoes	20	0.20	15	0.13	(0.041)*			

* Level of significance set at P =0.05

Table 3.4 Change in Average 1 Cup Servings of F&V at Each School Site

School Site	Avg. 1 Cup servings of Fruit and Vegetables [a] per Day	Avg. # of meals served per day	Avg. 1 Cup servings of Fruit and Vegetables [a] per meal
Site 1			
Baseline	238.8	700	.34
Intervention 1	300.1	685	.44 (↑ 29%)
Intervention 2	271.9	643	.42 (↑ 24%)
Site 2			
Baseline	163.2	396	.41
Intervention	172.8	367	.47 (↑ 15%)
Site 3			
Baseline	345.5	1557	.22
Intervention	352.1	1447	.24 (↑ 9%)

[a] Does not include fried white potatoes

Site 1 middle school executed two separate interventions that focused on minimal added expense and addressed some of the serving area weaknesses, including 1) moving the fresh vegetable relish tray to a more convenient and prominent location, and 2) using signage to encourage fruit and vegetable selection.

In the first intervention, total fruit servings per meal increased from 0.2 cup at baseline to 0.204 cup but was not shown to be statistically significant ($P = 0.33$) using the Wilcoxon Signed Rank test. Total vegetable servings also increased from 0.13 cup at baseline to 0.20 cup post intervention which is not statistically significant ($P = 0.18$). Total fried potatoes remained the same at 0.15 cup to 0.15 cup ($P = 0.97$). When the second intervention was compared to baseline data, total fruit increased to 0.24 ($P = 0.09$). Compared to baseline total vegetable servings increased to 0.19 but were not statistically significant ($P = 0.11$). Total fried potatoes were also measured and were found to increase to 0.20 ($P = 0.38$).

When fruit and vegetable servings were combined and controlled for meals per day average 1 cup servings of fruits and vegetables increased by 29% percent in the first intervention and by 24% from the baseline in the second intervention.

Site 2 chose to use the strategy of increasing fruit and vegetable availability and salience. The September 2010 baseline period included 20 days of food production records and 22 days in the intervention period. Mean total fruit servings per meal for the baseline period were 0.22 cup and changed to 0.23 cup in the intervention period. Further analysis revealed that mean canned fruit servings decreased from 0.09 cup at baseline to 0.07 cup during the intervention. In contrast, mean fresh fruit at baseline was 0.13 cup and increased to 0.16 cup during the intervention. Mean total vegetables per

meal increased from 0.20 cup at baseline to 0.25 cup during the intervention. Total fried potatoes at baseline had a mean of 0.13 cup servings and 0.14 during the intervention. The Wilcoxon Signed rank test revealed no significant difference in total fruit (P = 0.68) or canned fruit (P = 0.12), but found a significant increase in fresh fruit (P = 0.02). No significant difference was found in total vegetables (P=.58) or total fried potatoes (P = 0.26).Analysis of change in average 1 cup servings of combined fruit and vegetables revealed a 15% increase from Baseline to intervention.

At school site 3 the baseline period of September 2010 included 20 days of food production records while the intervention period (January 2011- February 2011) included 15 days. One cup servings/day/meal of total fruit, vegetables, and fried potatoes were used in the Wilcoxon Signed Rank test to assess significant changes in these variables between baseline and intervention periods. Mean vegetable servings at baseline was 0.11 cups and increased to 0.1207 after the intervention. At baseline, mean fruit servings were 0.12 cup while mean fruit servings after the intervention was 0.1243. Mean fried potato servings significantly decreased from 0.20 at baseline to 0.1316 after intervention. Results of the Wilcoxon Signed Rank test found no significant differences in total fruit (P = 0.87) or vegetable servings (P = 0.91) between baseline and intervention periods. However, a significant difference was found with the change in total fried potatoes between periods (P = 0.04). Site 3 showed a 9% increase from baseline to intervention when assessing changes in average 1 cup servings of combined fruit and vegetables per meal per day

Plate Waste Study

The 2 day plate waste study performed at Site 3 consisted of measuring the trays of 149 students who selected fruits or vegetables from the reimbursable bar during a two

day collection period. The findings are summarized in Table 3.5. Analysis of each picture for both before food was consumed and after each student was finished eating revealed that each student took an average total of 0.73 cup (almost ¾ of a cup) of fruits and vegetables from the bar. Students left an average of 0.06 cup, or about 1 tablespoon, of fruits and vegetables on their tray. Therefore, average portion consumed by each student was 0.68 cup (approximately 2/3 of a cup) which translates to percent consumed by students as 92% of what they self-selected from the reimbursable bar.

Table 3.5 Average Amount of F&V Consumed During Plate Waste Study at Site 3

Day	# of Students	Avg Taken/ Student	Avg Left Over/ Student	Avg Consumed/Student	% Consumed
1	71	.75 (3/4 Cup)	.06 (1 Tb)	.69 (> 2/3 Cup)	92%
2	78	.72	.05	.67	93%
Total	149	.73	.06	.68	92%

Discussion & Conclusion

Positive trends were seen in all three school sites. At Site 1, mean fruit and vegetable 1 cup servings increased by 29% after intervention 1 and by 24% after intervention 2. The mean number of 1 cup servings of vegetables at Site 2 also increased by 25%. More importantly, the mean number of 1 cup servings of fresh fruit increased significantly by 23%. At Site 3, the mean number of total vegetable 1 cup servings increased by 9%. And perhaps more importantly there was the significant 35% decrease in fried potato servings.

Similar to findings of studies conducted by Perry et al. (2004) and Kahn & Wansink (2004), when variety and assortment strategies were implemented at Site 2 and Site 3, selection of vegetables by students increased. Although vegetables increased at

Site 3 fruit did not even though both were offered on the reimbursable bar. Just and Wansink (2009) found that location of a salad bar influenced selection from it and the more prominent the salad bar was, the more salad sales increased. Perhaps, if the fruit and vegetable bar had been placed in the originally planned location which was more prominent (after point of service), there would have been greater usage and therefore larger increases in students' use and selection from the fruit and vegetable bar.

Feasibility was a primary goal at each school site and justified the action research design of the study. The use of food production records was examined as a simple and practical way to obtain data from school nutrition programs since these records are already in use in every school. The study established that food production records are the most feasible way for school nutrition programs to collect and document changes in fruit and vegetable preparation and student selection.

Although these records were the most feasible way for nutrition staff to document data, the daily recordings may not have been precise enough to detect changes. In some school sites, the food production records were updated and some nutrition staff expressed concerns that they may not fully understand how to accurately complete the records at the time of data collection. Future research should include a review of visual measurements and the importance of accurate recording. Beyond this however, it is unrealistic to expect foodservice personnel to use methods such as weighing and individually measuring servings of food prepared to obtain more accurate data. These methods would only promote noncompliance mainly because personnel do not have sufficient time in their day to complete this request.

Also in keeping with feasibility parameters, intervention and baseline periods were kept to one month spans to keep in accordance with over all time frame agreed upon by researchers and nutrition directors. Longer periods of time could give more detailed information of how the choice architecture strategies affected student selection and whether or not the change was sustainable. Unfortunately, the time to copy and mail food production records to researchers and the grant funding period limited the amount of days studied. Although these factors may have limited the study design and findings, feasibility of implementing action-based research methods in natural school settings was vital to building relationships with and establishing research capacity between researchers and school nutrition personnel.

Possible limitations of this research include menu inconsistency between baseline and intervention periods. Due to menu cycles and seasonal offerings, it was not possible to have the exact same fruits and vegetables and the same cooking methods each period although many fruits and vegetables were the same between periods. Therefore, student preferences may have played a role in some of the observed differences. Nutrition directors informed researchers that more fresh fruit is available during the early school months primarily due to growing seasons. Therefore, greater abundance of fresh fruit was seen during the baseline period than during the intervention periods which could influence the average number of fruit offerings and student selection.

Potential, foreseen caveats or hindrances were managed accordingly during the research study. To minimize miscommunication between researchers and those who implement the intervention, such as cafeteria staff, attempts were made to achieve full understanding of each intervention for those involved in implementing it. Open and

frequent correspondence was also maintained. Proximity of the researchers to each school site was challenging since it increased travel expenses and decreased the ideal amount of time spent at each site. Therefore, each visit was planned in advance along with a list of items to discuss to ensure maximum productivity.

This study examined how behavioral economics can influence children's food choices by altering external cues within the lunchroom that change students' perception of fruits and vegetables (Just et al., 2007). It is imperative to remember that behavioral economics influences change without forcing. This is important because feeding restriction of parents has been associated with child overeating (Faith, Scanlon, Birch, Francis, & Sherry, 2004). Therefore, the project altered certain aspects of the food environment to subconsciously influence students instead of demanding they take more fruit and vegetables or restricting food choices. Furthermore, considering Piaget's stage of concrete operation, this research focused on incorporating student perception rather than on improving health which is an abstract idea with future implications that are poorly perceived by students in this stage of cognitive development. This research implemented and analyzed the effects of four choice architecture strategies that showed promising results. Increases in combined fruit and vegetable servings per meal were seen in all three schools. Further research should continue to test the remaining choice architecture strategies seen in the inventory to assess their influence on fruit and vegetable selection in schools. Furthermore, it would be extremely beneficial to collect the opinions and thoughts of food service staff and directors concerning the inventory of strategies since they determine implementation and maintenance of the strategies.

CHAPTER IV

QUALITATIVE ASSESSMENT OF SCHOOL NUTRITION PROFESSIONALS' ACCEPTANCE OF CHOICE ARCHITECTURE STRATEGIES IN OKLAHOMA MIDDLE SCHOOLS

Introduction

Obesity among children is a well known problem in America particularly because of physical inactivity and poor eating behavior. The obesity epidemic drastically increased between 1980 and 1999 when body mass index (BMI) for gender and age at or above the 95th percentile nearly tripled from 6% to 17% among school aged students (Ogden et al., 2010). In addition, nearly 30% of school aged children are reported to have a BMI for gender and age at or above the 85th percentile. These rates of childhood overweight and obesity are of concern due to the increased risk for adulthood obesity and related chronic health consequences (Daniels, 2006). As such, it has been predicted that today's children may live less healthy and shorter lives than their parents. Some of these health consequences include atherosclerosis, diabetes, and hypertension. Psychological and emotional issues like depression can also be caused as an indirect result of bullying and social stigma associated with overweight children. Obesity can affect all of the internal organ systems and unfortunately, these devastating consequences are being seen in earlier ages.

The basic cause of obesity and overweight is an imbalance between calorie intake and expenditure. This imbalance can result from several different environmental and diet related factors. Possible precursors for obesity include birth weight, parental obesity, parental influence, and sleep duration, (Reilly et al., 2005). Environmental factors that play a role in the development of obesity include food availability and accessibility, preferences and portion sizes (Reilly et al., 2005). All of these factors can easily influence the weight status of children.

Promoting fruit and vegetable consumption in children is a possible strategy for addressing obesity and related health issues. The dietary makeup of fruits and vegetables, characterized as low energy density and high water and fiber content, are known to enhance satiety and reduce hunger without providing excessive calories (Rolls et al., 2004). Fruit and vegetable increases were shown to significantly decrease BMI in a study conducted by Epstein at al. (2008). In the study, 8-12 year old children participated in a program to increase fruit and vegetable consumption and were placed in either a group focused on limiting unhealthy foods or another group focused on increasing fruits and vegetables. The fruit and vegetables group showed significantly greater reductions in BMI than children not in the program at both the 12 and 24 month follow up (Epstein et al., 2008). Fruit and vegetables also have the ability to decrease the risk of diet related disease on a metabolic level. The phytochemicals present in fruit and vegetables have precise functions which are associated with decreased risk of certain diseases (Van Duyn & Pivonka, 2000). Cancer, heart disease, and diverticulosis are some diseases that can be prevented with the help of these phytochemicals which can prolong or promote healthier lives of children.

The recommended amounts of fruits and vegetables must be consumed in order to obtain the full benefit of lowering risk of obesity. According to the Dietary Guidelines for Americans (U. S. Department of Agriculture, 2010) healthy children ages 9 to13 years should consume 1½ cups of fruit and 2½ cups of vegetables per day. Unfortunately, most American youth are not meeting these requirements (Guenther et al., 2006). The 2009 Youth Risk Behavior Survey (Center for Disease Control, 2010) reported that 77% of adolescents nationwide did not consume the recommended amounts of fruit and vegetables. Furthermore, the Community Nutrition Mapping Project (U. S. Department of Agriculture) found that only 14% of Americans 2 years and older are meeting the vegetable recommendation. Only 21% of Americans consume the recommended amount of fruit per day. These statistics support the idea that the majority of children are not eating enough fruits and vegetables and therefore are at risk for obesity and other diet-related diseases.

Multiple elements of a child's environment can affect fruit and vegetable consumption and in turn risk for obesity. The school environment is a common environment among most children with 97% of children 5 years and older spending 6 to 8 hours a day at school for 9 to 10 months a year (Leviton, 2008). The school nutrition program in particular creates a base setting that can reach the child population in America and serves as a logical setting for childhood obesity prevention interventions.

Schools that participate in the National School Lunch (NSLP) program receive a cash reimbursement for every full price, free, and reduced price meal served (National school lunch, special milk, and school breakfast programs, national average payments/maximum reimbursement rates; notice, 2010). The meals served as part of the

NSLP must meet specific meal pattern requirements in order to be eligible for reimbursement. Recently the USDA proposed meal pattern changes for school nutrition programs to improve the nutrient content of the meals served (Nutrition standards in the national school lunch and school breakfast programs; Proposed rule, 2011). These proposed meal pattern requirements will mandate increases in fruit and vegetable offerings while setting an upper limit on starchy vegetables. Table 4.1 provides a comparison between the current and proposed meal requirements.

Table 4.1 Current and Proposed Meal Pattern Requirements for Lunch

	Current Requirement	**Proposed Requirement[a]**
Meal Pattern		
Fruits (Cups)	½-1 Cup of fruit and vegetables combined per day	½-1 Cups per day
Vegetable (Cups)		.75-1 Cups per day
Dark Green	No Specifications as to type of vegetable	½ Cups per week
Orange		½ Cups per week
Legumes		½ Cups per week
Starchy		1 Cup per week
Other		1.25-2.5 Cups per week
Grains (oz)	1.8-3 oz (daily average over 5-day week)	1.8-2.6 (daily average over 5-day week)
Whole grains	Encouraged	At least half of grains must be WG
Meats/ Alternatives (oz)	1.5-3 oz (daily average over 5-day week)	1.6-2.4 oz (daily average over 5-day week)
Fluid Milk (Cups)	1 Cup per day	1 Cup per day, fat content to be 1% or less
Daily amount Based on the Average 5 day week		
Calories (Kcal)	No Maximum Kcal limit	550-850 Kcal
Saturated Fat (% of total Kcal)	<10	<10
Sodium (mg)	1400	≤640 Grades K-5 ≤710 Grades 6-8 ≤ 740 Grades 9-12
Trans Fat	Nutrition label must specify zero grams Trans Fat	

[a] Requirements are age group specific (Grades K-5, 6-8, 9-12)
Table adapted from (Nutrition standards in the national school lunch and school breakfast programs; Proposed rule, 2011)

While these proposed program regulations encourage schools to take responsibility for improving the school nutrition environment, schools frequently experience barriers that inhibit them from making the school meal program the most

nutritious and successful program for children. Funding is a major problem for school boards when it comes to school nutrition and difficult decisions are made concerning where to spend or not spend funds (Leviton, 2008). Since education is the first priority, most funding goes towards academic programming thereby leaving out school nutrition (Leviton, 2008).

In addition to financial constraints, community stakeholders who are unhappy with current school nutrition programs are asking for major change (Leviton, 2008). These expectations often do not take into consideration the implications on labor, increased expenses, and availability of needed equipment and kitchen facilities. .

The presence of competitive foods also hinders consumption of healthier foods among students. Competitive foods are defined as food or beverages other than those served as part of the reimbursable USDA school meal, such as a la carte items (Hirschman, Eadie, & Miller, 2005). These foods are often much higher in calories, solid fat and added sugars than foods served as part of the reimbursable meal. However, they frequently generate revenue needed to make up the difference between costs and federal reimbursement rates (Leviton, 2008). From a school's perspective, banning these foods is frequently viewed as lost revenue.

In addition, while some suggest that these foods be fully banned from the school environment, there are indications that restrictions of such foods may actually promote consumption (Fisher & Birch, 2000). School nutrition professionals must also consider students' thoughts, attitudes, and preferences of food options served. A study by Neumark-Sztainer et al. (1999) used a focus group of students to identify the influencers of student food choice. Factors most important to students included appeal/taste of food,

time, and convenience of food. Availability, parent influence, perceived benefits, and the overall situation were perceived to have some influence. Least important categories included body image, habit, cost, media, and vegetarian lifestyle (Neumark-Sztainer et al., 1999).

The availability of competitive foods combined with students preferences and desire for convenience have been associated with decreased consumption of fruits and vegetables (Cullen et al. 2000) A potential strategy to address the preferences of students is the use of behavioral economics which nudges students to choose more fruit and vegetables without complete restriction of other foods. The concept of behavioral economics was originally used in the business and marketing sector and then was applied to consumer trends and mindful eating (Thaler & Sunstein, 2009). When applied to food behaviors it demonstrates how perception, memory, or thought processes can influence the consumption of food (Just & Wansink, 2009). Specifically, it identifies environmental triggers that influence decisions on a subconscious level by recognizing perception biases that can alter the quantity a person consumes as well as the personal perception of the overall appeal of certain foods (Just et al., 2007). Another potential setting to apply this concept to is National School Lunch Program because the implementation of these tools is simple and cost effective and thereby induces healthier choices without restricting the unhealthy options (Just, 2006).

Location, container size, lighting, and variety are all examples of environmental triggers that behavioral economics principles have been applied in order to increase healthful choices (Wansink, 2004). Choice architecture, a concept of behavioral economics, incorporates strategies that present foods in such a way that influences

choices (Mancino & Guthrie, 2009). An example of this is to cut up fruit and arrange by color thus making it more visually appealing and convenient (Just & Wansink, 2009).

Several studies have demonstrated the usefulness of behavioral economics for increasing fruit and vegetable consumption. Perry et al. (2004) conducted a multi-component research study that incorporated nutrition education, entertaining mascots and behavioral economics principles to influence fruit and vegetable consumption. The behavioral economic strategy consisted of adding several more options of fruit and vegetables each day that were cut up and arranged by color. In addition, the lunch staff verbally encouraged fruit and vegetables. Although researchers were unable to determine which intervention component had the greatest influence, they still found significant increases in fruit consumption but no significant differences were seen in vegetable and juice consumption.

Portion size was examined as a behavioral economics strategy to increase fruit and vegetable consumption (Spill et al., 2010). Children, ages 3-5 years, were given a portion size of carrots at lunch which gradually increased each week. Carrot consumption significantly increased when portion size doubled but no significant change was seen in consumption when portion sizes tripled.

Just and Wansink (2009) reported the difference between requiring one vegetable and giving a choice between two. Results indicated that 69% of youth required to take carrots ate them while 91% of those given a choice between carrots and celery actually ate their vegetables. Therefore, giving children the option to choose what they eat dramatically increases consumption of healthy food.

While these strategies have been successfully implemented by researchers in a variety of settings it is vital to assess the opinions and point of view of those who would be responsible for implementing the strategies on a daily basis in school settings. Focus groups have been shown to be an effective qualitative method because they explore what people think and why they think that way based on the participants' experiences and knowledge (Kitzinger, 1995).

Purpose, Objectives, & Hypotheses

The purpose of this qualitative study was to better understand the potential use of choice architecture strategies in the school settings, especially those aimed at increasing students' fruit and vegetable choices by conducting focus groups with school nutrition professionals. Specific objectives included 1) identifying the perceived strengths and weaknesses of implementing choice architecture strategies in middle schools from the point of view of those who will execute the strategies, 2) identifying choice architecture strategies already in use by Oklahoma middle schools; and 3) document any suggestions or comments that could improve strategy implementation.

Methodology

The purpose of the project was to qualitatively assess the attitudes of school nutrition professionals regarding the use and implementation of choice architecture strategies. Focus groups were utilized to accomplish this objective. Choice architecture strategies were compiled and presented to school nutrition professionals in order to gauge their feasibility for implementation in Oklahoma middle schools.

A comprehensive review of literature and related studies was conducted to identify successful behavioral economic strategies meant to influence fruit and vegetable selection. Behavioral economic principles and choice architecture theories were evaluated in terms of the potential impact on students' selection of fruit and vegetable offerings in middle school settings. Evaluation criteria for inclusion consisted of published research studies showing effective increases in fruit and vegetables using choice architecture strategies. Studies must have been conducted in the school or day care setting and could be part of a multi-component intervention. Middle school aged subjects were preferred but not required. Fifteen strategies were identified and compiled into an inventory listing that included a description of the strategy and rational for use. Table 4.2 presents the strategies included in the choice architecture inventory.

Table 4.2 Inventory of Choice Architecture Strategies Aimed to Increase Students' Fruit and Vegetable Selections	
Strategy	**Description & Rationale**
1. Fruit and Vegetable Bar after point of service	Fill a salad bar with a variety of fruit and vegetables. Allow students who purchase a reimbursable meal to freely take fruits and vegetables from the bar. Rationale: The bar appeals to the students because they are getting more for their dollar.
2. Verbal encouragement of fruit and vegetable consumption	Cafeteria employees act friendly with the students and ask questions like, Would you like a piece of fruit with your lunch? What vegetable do you want today? Rationale: These verbal cues work the same way as marketing techniques. Example: A fast food employee asks, "Do you want fries with that?"
3. Allowing unlimited amounts of fruit and vegetables with a reimbursable meal	Students who purchase a reimbursable meal are allowed as many fruits and vegetables as they want from the lunch area. Rationale: "Unlimited amounts" make the students think they are getting more food for the same price.
4. Placement of Fruit and Vegetables as the first item on the service line	The first item students pass by in the lunch line should be a fruit or vegetable. Examples include a relish tray of raw vegetables, whole fruit, or portioned servings of canned fruit. Rationale: Students will be hungry and eager to fill their empty tray.
5. Offer fresh fruit and vegetables in multiple places with in the service line	Instead of having one area designated for fruit and vegetables put them in several different areas. Rationale: Increases the opportunities for students to choose a fruit or vegetable and looks like there is more variety
6. Offer monthly sampling of unfamiliar fruits and vegetables. Then incorporate them into the menu	Prepare small samples of new fruits or vegetables for students to try at no cost then serve them as part of the school menu. Rationale: Exposure to new foods can be fun for students and they will be more likely to choose the new fruit or vegetable if they have tried it before.
7. Move the reimbursable salad bar to a prominent and central position	Put a salad bar in a place where the students have to walk around it instead of off to the side Rationale: This forces children to walk past the salad bar, increasing the chance that they might take something from it.
8. Offer vegetable options as opposed to requiring one vegetable	If a vegetable is served as a side dish to a main meal, give two options that students can choose from instead of only one. Rationale: Allowing students a choice instead of forcing increases the chance that they will actually consume it

9. Accept only cash for food items not sold as part of reimbursable meal	Accept only cash for chips, cookies, etc. instead of allowing students to pay from their account. Rationale: Students will have to prepare a head of time to bring cash and will have the feeling of a direct loss when using money.
10. Placement of whole fruit at point of service	Use a decorative basket and fill it with pieces of whole fruit near the cashier kiosk Rationale: Impulse buying that works the same way as the assortment of items before the cash register at the grocery store.
11. Cut up fruit and arrange by color to increase visual appeal and Garnish.	Cut up fruit into smaller pieces and group them by color instead of only offering whole fruit. Garnish to increase visual appeal Rationale: Cut up fruit is easier and more convenient to eat especially for students with dental braces.
12. Offer an additional option of one fruit and vegetable each day to increase variety	Instead of only serving one type of whole/canned fruit or one vegetable offer several different varieties each day. Rationale: This gives children more options to choose from and increases visual appeal
13. Change the default options for vegetable side items	Instead of automatically giving French fries with the option of substituting them for apple slices, automatically give apple slices with the option of substituting French fries Rationale: Some students will decide to keep the default option because it is easier than asking for a substitute item
14. Place snack foods in less convenient areas within the lunchroom	Move the chips, cookies, snacks, etc. to the side or to a less convenient area Rationale: Students will be less tempted to select these items
15. Creatively rename fruit and vegetable dishes	Vegetable chili becomes “Grandma’s slow cooked vegetable chili.” Cut up oranges and grapes become “Fruity Citrus Salad” Rationale: Creative names appeal to the student who then expects the food will taste better

Setting, Participants, and Collaborators

School nutrition directors and staff have the experience to provide insight to strengths and challenges associated with the strategies that may not be apparent to those outside the daily operation of school nutrition programs. As such, researchers collaborated with the Oklahoma School Nutrition Association to conduct the study. The inclusion criteria for participating consisted of Oklahoma School Nutrition Association members who had experience in Oklahoma school nutrition programs and held employment as a nutrition coordinator or as cafeteria staff. The Oklahoma School Nutrition Association allowed researchers to hold a state wide forum at the quarterly meeting on April 7, 2011 which consisted of a brief overview of behavioral economic principles and focus group sessions. The participants included school nutrition directors and staff from school districts throughout Oklahoma. Each focus group participant was provided a monetary stipend of $40 for their participation. Two nutrition professors and three graduate students were recruited as group facilitators of each of the 6 focus groups in addition to the researchers. Each group consisted of 5 to 6 participants. The study protocol was approved by the Oklahoma State University Institutional Review Board.

Focus Groups

Prior to the state wide forum, researchers developed a handout for focus group participants that included a description of behavioral economics and its usefulness in the school environment. The handout also included the inventory of strategies along with a description of and rationale for each strategy which is listed in Table 4.2. The complete handout described can be found in Appendix B. A list of open ended questions about the inventory of strategies was then created for the group facilitators to lead the discussion

and instigate more in depth conversations. The purpose of the questions was to provoke nutrition directors and staff to evaluate each strategy and assess the pros and cons of implementing choice architecture principles in the middle school setting. The questions also insured consistency and similarity between focus groups. Topics addressed included advantages and disadvantages of each strategy as well as feasibility of strategies, and strategies already being used in middle schools. The complete list of questions is in Table 4.3.

Table 4.3 Focus Group Questions

1. Are the strategies clear or do any need to be reworded to make them more understandable?
2. Are you currently using any of these strategies? How do you know if they are successful?
3. Which strategies seem to be less feasible and why? What are the disadvantages? How could we alter the strategy to make it more user friendly?
4. Which of the tools seem to be most feasible and why? What are the advantages of the strategy? Are the any disadvantages?
5. Do you have any suggestions or comments regarding implementation of the inventory of strategies?

Group facilitators were trained by the researchers prior to conducting the focus group. Agenda items included review of the handout and question guide, tips for conducting a focus group, and use of the tape recorders. Group facilitators were instructed to adapt a listening attitude and to remind the participants to focus primarily on their middle school setting when considering the choice architecture strategies.

Prior to participating in the focus groups the principal investigator provided the participants with a brief overview of choice architecture principles and briefly covered the methods and results of the pilot study previously discussed. After this presentation, the principal investigator explained the purpose and process of the focus group sessions as well as how researchers intended to use the gathered information. The audience was

able to ask questions to ensure comprehension and had to provide informed consent with a signature in order to participate. The 36 audience members were then split into 6 focus groups, each with a group facilitator. Focus group protocol followed that of Kitzinger (1995). Each focus group member was provided with the inventory of strategies along with a description of each strategy. Dialogue of each focus group was recorded using a digital recorder and later transcribed by the research assistant. In addition, one participant in each group took notes to provide referential adequacy and clarification if needed during the transcription process. The principal investigator acted as a floating moderator to evaluate consistency of focus group processes and to provide further clarification as needed. The group facilitators began by introducing themselves and stating their experience in nutrition. This strategy helped to establish rapport and trust between the researcher and focus group participants and created a safe environment for the sharing of credible and dependable information. The group facilitators explained the purpose of the focus groups which is to use their knowledge and experiences in school nutrition to assess the potential success and complications associated with the choice architecture strategies. The participants were then given time to look through the inventory of strategies and become familiar with the concept of each one. Interview questions were directed toward various themes which included; 1) clarity and comprehension of the inventory as a whole; 2) identifying strategies that were currently being used in their middle schools and reasons for current implementation; 3) disadvantages and; 4) feasibility of each strategy. Any comments, questions, or concerns regarding the choice architecture strategies were documented as well.

Content Analysis

Upon completion of the focus groups, the graduate assistant transcribed each of the six tape recorded one hour sessions. The framework for organizing and analyzing the data was driven by the project's objectives and followed established protocols (Patton, 2002; Harris et al., 2009). These objectives were matched to units of dialogue. The research assistant took multiple passes at reading each focus group transcript to identify and categorize data. When a unit of dialogue seemed to apply to multiple objectives it was categorized under each objective. Similar dialogue repeated by across groups was considered to be important recurring themes. The common themes were tested for adequacy through an independent critique of the principal investigator.

Findings

Group dialogue focused on clarity of strategies in the inventory list, strategies already used in middle schools, least feasible strategies, feasible strategies, and suggestions on how to improve strategies. Table 4.4 summarizes the emergent themes for each area of discussion.

Table 4.4 Focus Group Findings Considering Inventory of Strategies				
Clarity & Comprehension	Strategies Already in Use	Feasible Strategies	Problematic Strategies	Suggestions & Comments
The inventory list was clear and understandable. "They were well written," and, "It all makes sense."	*Offering an additional option of one fruit and vegetable each day to increase variety* "We found that kids will not take a vegetable over fries but they will take a vegetable along with the fries." *Placement of a Fruit and Vegetable Bar after point of service* "It is hard to keep the fruit and vegetable bar stocked because kids take so much." *Cutting up Fruit and Arranging by color* *Offering monthly sampling of unfamiliar fruits and vegetables.* "It's like having the fresh fruit and vegetable project without all the rules." *Placement of whole fruit at point of service* *rename fruit and vegetable dishes creatively*, "Fresh" or "crisp" were used to describe dishes.	*Verbal Encouragement of fruit and vegetable consumption* "This is easy because the staff already communicates with the kids." *Cut up fruit and arrange by color to increase visual appeal.* "This is easy because you can buy pre-cut fruit or use machinery." *Offering Fruit and vegetables in multiple places within the service line* participant made the comment that she had not thought about placing fruits and vegetable in multiple places in the line because directors tend to get focused on meal components and just don't think about offering in multiple places.	*Accepting only cash for food items not sold as part of a reimbursable meal.* Participants felt that this strategy would cut into profit, slow down lines or may not be feasible because several parents would not trust their children with cash. *Placing snack foods in less convenient areas within the lunch room.* Loss of revenue and student theft would be a problem because these items would not be near the point of purchase where staff could monitor. *Changing the default options for vegetable side items* "Kids already associate certain side items with certain entrees." *Verbal encouragement of fruit and vegetable consumption.* "We are not allowed to talk to the children because it slows the line." *Creatively renaming fruit and vegetable dishes* "we don't have time to be creative and think of names."	Using portion cups for fruits and vegetables can increase efficiency of serving lines particularly with salad bars. *Changing default options of vegetable side dishes,* Not menuing French fries several days a week was more successful than changing the default options. "We recognize that visual presentation has a lot to do with student choices." Students have limited time to eat so time constraint needs to be considered when choosing a strategy to implement. Participants would like more training and information and implementing choice architecture strategies.

Clarity of Inventory of Strategies

Focus group participants found that the descriptions and rationales of the inventory list were clear and understandable. Supporting statements include, "They were well written," and, "It all makes sense."

Strategies Already in Use

Focus group facilitators lead discussions on inventory strategies which were already being used by Oklahoma nutrition programs. *Offering an additional option of one fruit and vegetable each day to increase variety* was mentioned in 5 of the 6 focus groups and was easy to implement with fruit but can add extra costs. One participant stated that offering a variety of vegetable options helps because, "We found that kids will not take a vegetable over fries but they will take a vegetable along with the fries." *Placement of a fruit and vegetable bar after point of service* was also identified as being a strategy already in place. This was reflected in the statement, "It is hard to keep the fruit and vegetable bar stocked because kids take so much." *Cutting up fruit and arranging by color* was also a common strategy already in place. Some also reported that they incorporated the strategy of *offering monthly sampling of unfamiliar fruits and vegetables.* One participant made the comment that, "Offering monthly samplings is like having the fresh fruit and vegetable project without all the rules." Another participant stated that "the unfamiliar foods do not have to be super foreign foods because kids sometimes do not know about the regular fruits and vegetables." *Placement of whole fruit at point of service* was indicated to be a commonly used tactic. Although participants did not completely *rename fruit and vegetable dishes creatively*, some reported positive outcomes associated with adding "fresh" or "crisp" to the dish name.

Feasible Strategies

The strategies deemed feasible by the focus groups included those perceived to be easy to implement and maintain. *Verbal encouragement of fruit and vegetable consumption* was frequently mentioned as feasible with comments such as, "This is easy because the staff already communicates with the kids." Another feasible strategy was to *cut up fruit and arrange by color to increase visual appeal.* Statements concerning this strategy included, "This is easy because you can buy pre-cut fruit or use machinery," "This strategy seems simple but packaging could be a barrier," and, "You might not even have to cut up the fruit because we found that kids take more whole fruit when there is variety and different colors which increases appeal." *Offering fruits and vegetables in multiple places within the service line* was also considered very feasible by the participants. One participant made the comment that she had not thought about placing fruits and vegetables in multiple places in the line because directors tend to get focused on meal components and just don't think about offering in multiple places.

Problematic Strategies

Each of the six focus groups reported that there were major problems associated with *accepting only cash for food items not sold as part of a reimbursable meal.* Participants felt that this strategy would cut into profit, slow down lines or may not be feasible because several parents would not trust their children with cash. Several groups raised concerns about *placing snack foods in less convenient areas within the lunch room.* These concerns included loss of revenue and student theft since these items would not be near the point of purchase where staff could monitor. *Changing the default options for vegetable side items* also provoked concerns from the participants. One participant stated, "Kids already associate certain side items with certain entrees so they will

naturally want to have that side item." Other participants believed that students will always want fries over a healthier side item even if they have to ask for fries. Interestingly, some participants reported that slowed serving lines are associated with *verbal encouragement of fruit and vegetable consumption.* One person said, "We are not allowed to talk to the children because it slows the line." *Creatively renaming fruit and vegetable dishes* was reported to be problematic because, "we don't have time to be creative and think of names," and students might become suspicious if names are too creative.

Suggestions and Comments

Several comments were made at the conclusion of the focus groups that might be helpful in future implementation projects. Using portion cups for fruits and vegetables was suggested to increase efficiency of serving lines particularly with salad bars. Pertaining to *changing default options of vegetable side dishes*, it was stated that not menuing French fries several days a week was more successful in reducing French fry consumption than changing the default options. Several participants supported implementing choice architecture strategies because, "We recognize that visual presentation has a lot to do with student choices." Multiple comments were also made about the fact that students have limited time to eat so time constraint needs to be considered when choosing a strategy to implement. Over all the participants conveyed that they would like more training and information about behavioral economics and implementing choice architecture strategies in local school nutrition program.

Discussion & Conclusion

The results indicate that several choice architecture strategies are feasible especially since some are already being used in middle school settings. *Offering monthly sampling of unfamiliar fruits and vegetables,* and *placement of whole fruit at point of service* certainly seem feasible because multiple schools have already implemented these strategies into their service. *Offering fruit and vegetables in multiple places on the line*, *placement of a fruit and vegetable bar* and *garnishing fruit to increase visual appearance* were also deemed to be feasibly sound. This is further supported by the fact that these three strategies were chosen to be implemented in Oklahoma middle school interventions discussed in chapter 3.

Less feasible strategies were also identified by school nutrition professionals to be problematic. It is important to consider the stress, limited funding, and high expectancies of school nutrition programs which may explain how some strategies seemed impractical to staff. Although limited funding and resources was the main concern when determining problematic strategies, some problematic strategies did not necessarily require additional funding. For example, *creatively renaming food items* was considered unfeasible for nutrition directors because of time constraint as well as lack of creativity. This strategy may be feasible for others who have less time constraints and creative ideas. This lack of creativity may be due to stress of the program on these nutrition directors and staff. Furthermore, the Oklahoma School Nutrition Association, which provides a link between school nutrition programs, could be used as a platform for more creative nutrition staff to share creative menu names with others. The statement was also documented that children become suspicious of creatively named menu items. Another prospect to resolve this

problem is for nutrition directors to focus on more descriptive names instead of creative names. Examples may include “chilled fruit” or “seared vegetables.”

Verbal encouragement did not require additional funding but some schools had policies against staff communication with students. Again, this could be a feasible strategy for schools that do not have these types of policies in place. Another reasonable alternative would be to request that administration allow nutrition staff to make brief statements when serving such as “Would you like a fruit?”

Participants also labeled *changing default options of vegetable side dishes* as problematic because of increased cost and student preferences. Contrary to the previous statement, another component of the research project, previously discussed in Chapter 3, found French fry selection to significantly decrease when a fruit and vegetable bar was placed in the lunch area. Although participants believed students would always select fries over healthier side items, findings from chapter three indicates otherwise.

In the comments period of the focus groups it was brought to attention that many schools have found success in reducing the number of times fried white potatoes are on the menu. This tactic needs further investigation but appears to be a promising alternative to changing default options as it was stated that students might better tolerate the reduction in menu cycles of fried white potatoes. Fried white potatoes will soon be reduced in the menu cycles as a federal requirement. The proposed meal pattern changes of USDA (Nutrition standards in the national school lunch and school breakfast programs; proposed rule, 2011) will require that the serving of starchy vegetables be limited to 1 cup per week so compliance to this regulation early on will help nutrition programs make an easier transition to the new regulations. Again, the research

component discussed in chapter 3 found significant decreases in French fry selection when a fruit and vegetable bar was implemented. This suggests that offering healthier side items might have a greater effect on French fry selection than participants think.

Accepting cash for desserts and other ala carte items was deemed problematic because it was thought to cut into profits or because parents do not trust their children with cash. Interestingly, other participants stated that their electronic meal system allows parents the option to block student purchase of competitive foods which essentially accomplishes the same goal as this strategy. Although certain strategies were considered to be problematic, the range of comments reflected that feasibility is often school site specific.

Researchers understand that in order to implement a successful intervention in the school nutrition program, there must be acceptance and "buy in" of nutrition staff and directors. The general consensus of the focus groups included interest in behavioral economics interventions and desire for further information. This positive response is likely due to the fact that the proposed interventions are not mandated but are meant to be helpful ideas that can be implemented at little or no cost. Furthermore, the inventory of strategies allows schools to self select interventions that best meet their local needs and situations. The focus group sessions were found to be a successful data collection of useful input from school nutrition professionals concerning implementation of choice architecture strategies. The findings provide support for further development of training opportunities and resources to assist school nutrition professionals to implement behavioral economic principles, especially choice architecture strategies aimed at increasing students' fruit and vegetable choices. Expansion of such efforts should assist

schools in not only encouraging students' selection of fruits and vegetables but provides potential to increase students' consumption of these foods and ultimately reduce risk for obesity. The relationships established as a result of the project also provides opportunities to conduct action-based research and evaluate impact of the interventions.

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APPPENDICES

APPENDIX A

SCHOOL SITE 1 CASE STUDY

Background

Site 1 Public School District was comprised of 5 elementary schools, 1 middle school, and 1 high school. Site 1 Middle school included grades 6- 8 and children's ages range from 11-14. There were approximately 4013 students in the school district with an enrollment of 828 in the middle school which serves 663 meals a day. Approximately 79% of students were eligible for a free or reduced meal while 21% have full priced meals. The average daily participation was broken down into 483 free meals, 55 reduced meals, and 125 full price meals. A full price meal at the middle school cost $2.00 and a reduced price meal costs $0.40.

Lunchroom Profile

The Site 1 cafeteria included a self operated kitchen while the seating area was made up of standing tables and 4- seat tables. Site 1 used four different serving lines, each with a different entrée. The Twilight line served the main meal, the O'Cubbys line offers hamburgers and sandwiches, The Bionic Burrito line offered burritos, and there was a line for pizza only. The students used Styrofoam trays as serveware for every line. Fruit and vegetable sides were provided after the entrée but before snack items. The snack items were available at the point of service in order to reduce theft. Vending machines were not available to students. Site 1 used a payment code system where students enter an account code at the cashier kiosk. Parents could deposit money into their child's account and it would be deducted with each meal purchase.

Site 1, like all schools, was required to serve a variety of fruit and vegetables per day. They typically served 1 type of fresh fruit per day which can include apples, oranges, grapes, or bananas. Typically the canned fruit consisted of pears, peaches, pineapples, or mixed fruit. Site 1 also offered a small relish tray that could include carrots, cucumbers, broccoli, celery, and cauliflower. The sandwich bar offered toppings including onion, lettuce, tomato, and pickle. Site 1 also offered chef salads which contain carrots, cucumbers, tomatoes, celery, shredded lettuce, broccoli, or cauliflower. Site 1 participated in programs to promote fruit and vegetables including Farm to School and receives fresh produce from the Department of Defense.

Lunchroom Analysis

In the assessment of Site 1 Middle School, several strengths and aspects of positive deviance could be observed. Site 1 went beyond the regular guidelines and also followed the Healthier US School Challenge regulations and menu recommendations. This showed that Site 1 was concerned with promoting healthier foods to students. Site 1 also limited French fries to three days weekly and substitutes with sweet potato fries which have more nutrients children need. A closer look at school statistics indicated that the majority of students were getting their lunch from school rather than from home which means that any intervention had the potential to affect fruit and vegetable consumption for the majority of children.

There were weaknesses in the lunchroom that hindered attempts to increase fruit and vegetable consumption. The fruit and salad sections were sparse and lacked decoration which easily allowed children to pass by without noticing. The inability to promptly restock fruit and vegetables also added to the sparse appearance on the lunch line. The cafeteria staff had a hectic schedule and often forgot to refill the serving lines

allowing the fruit and vegetable display to look sparse. Another weakness included student theft which caused the convenience foods to be placed near the cashier kiosks in a prime location. This location could be filled with fruits and vegetables if theft was not a concern in the cafeteria.

Site 1 Middle school had the potential to turn the weaknesses stated above into strengths or opportunities for improvement. Using the fruit display and relish tray as an opportunity to increase fruit and vegetable consumption was a possibility especially since these items are self-serve. Altering the placement or variety of these foods could have the potential to affect the students' choice of healthier items. Another opportunity to limit less healthy choices involved the controlled serving of fries. Cafeteria staff served the fries while other vegetables were self serve which allowed students to take bigger portions. These two opportunities could be a focus of the intervention in order to limit fry consumption and make the fruit and relish tray more appealing.

As with any intervention, external threats can be addressed and alleviated in order to make the lunchroom changes successful. The most obvious threat to the intervention was financial status and expenditure requirements. School districts are always hard pressed financially with strict budgets so the intervention had to be low cost in order to be financially feasible. Cafeteria expenses included staff labor, kitchen equipment and food costs so there was often little money left over. A sufficient intervention would increase fruit and vegetable consumption using low cost tactics. The threat of childhood obesity can be seen in almost all American schools including Site 1. So many different factors influence obesity including parental influence and food preferences both within and outside of the lunch room. Finding, a strategy to reduce the rates of childhood obesity is

both beneficial and imperative for child health. Specific threats to Site 1 included student theft and financial dependence on a la carte items. The sale of a la carte items was a major supplement to the nutrition program income which made fruits and vegetables less important profit wise. Reducing the amount of a la carte items was not feasible since they were so vital to the school income. The short lunch periods posed another threat to increasing fruit and vegetable consumption. Administrative staff often rushed children through the lunch line so they had limited time to eat. This hurried atmosphere did not allow enough time for children to make sound choices or to be influenced by behavioral economics practices.

Intervention

Behavioral Economics, within the school lunch room, is meant to offer a choice between healthy and unhealthy foods while making healthier options, like fruits and vegetables, appear more appetizing. Behavioral economics allows for subtle changes in choice architecture that will have great impact on children's food choices. The behavioral economics interventions must not add to the problems associated with cost and labor. Therefore, low cost changes that require minimal extra effort are desired. Below are outlines of two interventions to increase fruit and vegetable consumption at Site 1 Middle School.

Intervention 1: Placement of Relish Tray

- Move the Relish tray to the beginning of the serving line.
- Increase variety of vegetables offered on the tray

Rationale: Moving the tray will give vegetables a more prominent place in the serving line and it will be the first food item seen by hungry students with empty trays. The need to fill their empty tray could provoke students to choose vegetables from the relish tray.

Intervention 2: Signage Promotion

- Hang colorful and eye catching posters in the lunchroom to promote fruit and vegetable consumption.

Rationale: The posters could encourage students to choose fruit and vegetables with entertaining pictures and thoughtful phrases.

Measuring Outcomes

In order to measure any changes in food consumption, Researchers analyzed food production records both before and after the intervention to see if there were any increases in fruit and vegetables served. A cost analysis should also be performed to understand if the interventions lead to increased expenses.

SCHOOL SITE 2 CASE STUDY

Background

Site 2 Public School District was comprised of 5 elementary schools, 1 middle school, 1 junior high school, and 1 high school. The ethnic distribution of the school district was mainly Caucasian (78%) followed by Native American (14%) with smaller populations of African American (5%), Hispanic (2%), and Other (1%). Site 2 Middle school included grades 6 and 7 and children's ages range from 11-13.

Site 2 Middle School had an approximate enrollment of 546 and served around 380 meals per day. The average daily participation was broken down into 227 free meals, 50 reduced meals, and 109 full price meals. A full price meal at the middle school cost $2.00 and a reduced price meal costs $0.40.

Lunchroom Profile

Lunchtime was divided into two separate, 30 minute periods with grades 6 and 7 represented at both times. The lunchroom also served as the school gymnasium so tables and chairs were not set up for lunch until about 5 minutes before lunch starts. The kitchen itself was extremely crowded and there was limited space for staff to prepare and set up the food. The students formed three lines to either receive hamburgers, pizza, or the main line dish. Typically the lines were not very long and children usually began eating fairly quickly. Styrofoam trays were used for service where children could choose either a multi-compartment or single-compartment tray. Single compartment trays were most often used for the pizza line. Fresh fruit was displayed and offered near the cashier kiosks as well as cookies which were not visible and were kept under the kiosk. Students paid for items using a keypad system which required them to enter a code that corresponds to their account. Parents were able to put money in their child's account in advance where it was deducted after each purchase. 3 Vending machines, 2 for beverages and 1 for snacks, were located in a back hallway where the main course line exits. Once students received their meal and sit down at a table, teachers and staff perused the pathways with trashcans.

Site 2, like all schools, was required to serve a variety of fruit and vegetables per day. Their fresh fruit selection usually included whole apples and oranges while offering grapes and bananas about twice a week. The canned fruit served consists of apple sauce, mixed fruit, pineapple tidbits, pears, or peaches. These fruits were portioned out and served on trays. Along with the vegetables offered as side dishes, Tossed salad mix was portioned up and displayed next to the canned fruit. Chef salads with various toppings were offered as well. The hamburger line began with a relish cart and toppings

assortment for the hamburgers. This cart included pickles, tomato slices, onion slices, and lettuce.

Lunchroom Analysis

In the assessment of Site 2 Middle School, several strengths and aspects of positive deviance could be observed. Fruit was offered in every line as well as at every cashier kiosk giving each student an opportunity to take a fruit regardless of what line they are in. Although children knew that cookies were offered, the cookies were hidden out of site because of theft precautions so they were not directly competing with the fruit. This tactic made the cookies less convenient and made the fruit look more accessible. Positive deviance could also be seen with the cafeteria staff. The cafeteria staff created a pleasant environment by being friendly and occasionally asking the children if they want a fruit with their lunch. A closer look at school statistics indicated that the majority of students are getting their lunch from school rather than from home which means that any intervention had the potential to affect fruit and vegetable consumption for the majority of children.

There were weaknesses in the lunchroom that hindered attempts to increase fruit and vegetable consumption. Vending machines remained on during lunchtime which gives children another less healthy option for lunch. Although the machines contained foods with more than minimal nutritional value, fruits and vegetables were still a much healthier option for the students. Other weaknesses within the lunch line existed as well. The use of small, single compartment trays only allowed room for one or two food items which could deter students from choosing a fruit or vegetable since their tray was already full. The fruit and salad sections of the lunch lines were sparse and lacked decoration which easily allowed children to pass by without noticing. The salad and fruit cups

themselves also appeared sparse and lacked color and garnishing making the food items look less appealing. In the hamburger line, the relish cart was pushed to the side where students could easily pass by. Sometimes, the staff forgot to uncover the items on the cart which could cause students to subconsciously avoid the food because it appeared unavailable.

Site 2 had the potential to turn the weaknesses stated above into strengths or opportunities for improvement. The vending machines could be turned off during lunch periods in order to compel students to buy from the lunch line. Since there were also less healthy options in the lunch line, turning off vending machines would not interfere with the healthy choices ideals of choosing a healthy option over a less healthy option. Eliminating the single compartment trays and only using the larger, multi-compartment trays allows room for more food item like fruit and salad and can create a need for students to completely fill their tray. Simply garnishing the canned fruit and salad or using more decoration in the fruit and salad section could create a visually appealing space that would draw the attention of the students. Another opportunity is to place the relish cart directly in front of the hamburger therefore forcing children to walk around it and possibly take vegetables from it. Finally, using external opportunities to increase fruit and vegetable consumption could benefit the students. Using a school newsletter to raise awareness about the benefits of fruits and vegetables could encourage faculty and parents to influence their students to consume more.

As with any intervention, external threats can be addressed and alleviated in order to make the lunchroom changes successful. The most obvious threat to the intervention was financial status and expenditure requirements. School districts are always hard

pressed financially with strict budgets so the intervention must be low cost in order to be financially feasible. Cafeteria expenses included staff labor, kitchen equipment and food costs so there was often little money left over. A sufficient intervention would increase fruit and vegetable consumption using low cost tactics. The threat of childhood obesity can be seen in almost all American schools including Site 2. So many different factors influence obesity including parental influence and food preferences both within and outside of the lunch room. Finding, a strategy to reduce the rates of childhood obesity is both beneficial and imperative for child health.

Intervention

Behavioral Economics, within the school lunch room, is meant to offer a choice between healthy and unhealthy foods while making healthier options, like fruits and vegetables, appear more appetizing. Behavioral economics allows for subtle changes in choice architecture that will have great impact on children's food choices. The behavioral economics interventions must not add to the problems associated with cost and labor. Therefore, low cost changes that require minimal extra effort are desired. Below are outlines of two interventions to increase fruit and vegetable consumption at Site 2 Middle School.

Intervention 1: Increase Salience of Fruit and Vegetable Display

- Place Whole fruit selection in a decorative basket to increase appeal and attention.
- Garnish mixed salads with hints of color using cherry tomatoes, cheese, etc. Garnish Canned Fruit portions with colorful fruit including grapes, slices of strawberry, etc.

- Make Fruit/salad section look more bountiful by increasing the quantity of product served and decorating the area

Disadvantages: Possibility of increased labor and preparation of food. Possibility of extra food costs.

Intervention 2: Verbal Nudging

- Have cafeteria staff verbally encourage students to choose a fruit or vegetable with their lunch.
- Example: "Would you like a banana with your lunch today?"

Disadvantages: No feasible way to ensure that the staff verbally encourages students to consume fruit and vegetables.

Measuring Outcomes

In order to measure any changes in food consumption, Researchers analyzed food production records both before and after the intervention to see if there were any increases in fruit and vegetables served. A cost analysis should also be performed to understand if the interventions lead to increased expenses.

SCHOOL SITE 3 CASE STUDY

Background

Site 3 Public School District was located in the Tulsa area and served approximately 15,000 students total. The district was comprised of 13 elementary schools, 1 grade center for $6^{th}/7^{th}$, 1 grade center for 8^{th}, 1 junior high school, and 1 high school. The ethnic distribution of the school district was mainly Caucasian (66%) followed by African American (14%) with smaller populations of Asian (7%), Indian

(6.9%), and Multi-Racial (5.1%). Site 3 Middle school included grades 6 and 7 and children's ages range from 11-13.

Site 3 Middle School had an approximate enrollment of 2240 and served around 1500 meals per day. 947 students were eligible for free meals while eligibility for reduced price meals and full price meals was 167 and 1124. The average daily participation was broken down into 811 free meals, 132 reduced meals, and 474 full price meals. A full price meal at the middle school costs $2.00 and a reduced price meal costs $0.40.

Lunchroom Profile

Lunchtime was divided into four separate, 30 minute periods where grades 6 and 7 have separated lunch periods. The first lunch started at 10:41AM and the last lunch ended at 12:55PM. The large lunchroom also served as the school auditorium but tables and chairs were always set up for lunch. The kitchen was also fairly large with adequate room for preparing food. Site 3 did not allow any vending machines to be available to students and there was only one vending machine on campus which was located in the Teacher's break room. Site 3 used multi-compartment Styrofoam trays as serve ware so students could fit several items on their tray. The students entered the cafeteria area through two opposite entrances but one line was exceedingly longer than the other. The shorter line consisted of Student members of the Pride group, which was reserved for students with excellent grades. The other line tended to wrap around the lunchroom which means students could be waiting in line for prolonged periods of time. Once inside the food area, there were several different stations including 2 main meal stations, a salad bar, a sandwich bar, and a competitive food section. The pride line passed the salad bar first while the longer line passed the competitive food first.

There were usually five kiosks open during lunch where students paid for items using a keypad system which required them to enter a code that corresponds to their account. Parents were able to put money in their child's account in advance where it was deducted after each purchase. A small pan of whole fruit was displayed at each kiosk. Similarly to the initial line, the lines at the kiosk tended to be long and slow. Once students received their meal and sat down at a table, teachers or designated students perused the pathways with trashcans.

Site 3, like all schools, was required to serve a variety of fruit and vegetables per day. Their fresh fruit selection usually included whole apples, oranges, grapes, and pears. They also offered a variety of cut up fresh fruit including, watermelon, cantaloupe, and honeydew. Other side items included carrots with ranch dressing and mixed greens. A la carte fruit and vegetables were also available and consisted of a mixed fruit and vegetable tray, cut up strawberries, and yogurt parfaits. The salad and sandwich bars consisted of several different toppings and sandwich options. There was a wide variety of fruit and vegetables offered at Site 3.

Since Site 3 was part of such a large district, it offered an ample selection of competitive foods. These foods consisted of frozen custard, chips, snack cakes and granola bars, muffins, 100 calorie packs, Italian ice, Izze drinks, and smoothie king.

Lunchroom Analysis

Several strengths and aspects of positive deviance could be seen in the assessment of Site 3 Middle School. Fruit was offered at almost every station as well as at every cashier kiosk giving each student an opportunity to take a fruit regardless of what station they go to. The fruit display was very appealing with offerings of both whole and cut up fruit. The fruit area looked very colorful as well because of the variety of fruits being

offered. The Salad Bar had a wide variety of toppings and looked appetizing because of the different colors and textures. The fruit and vegetable displays followed the ideals of behavioral economics with a colorful and visually appealing presentation. Another aspect of positive deviance dealt with the fact that Site 3 did not allow vending machines to be used by the students at all, making fewer options available for unhealthy foods.

There were weaknesses in the lunchroom that hindered attempts to increase fruit and vegetable consumption at Site 3. The regular lunch line was extremely long and students usually had a lengthy wait due to the large student population at Site 3. Students were rushed and felt less inclined to make a healthy food choice with the limited time. Another problem in the cafeteria was the placement of the Salad bar. The regular lunch line, where the majority of students enter, was on the opposite side of the salad bar and could be completely avoided. A more prominent placement of the salad bar has the potential to reach more students and create more opportunities for vegetable consumption. Another weakness was the substantial amount of competitive food. From chips to ice cream, sugar drinks to snack cakes, the overwhelming amount of choices only deterred students from choosing fruits and vegetables. Perhaps if fewer options were made available for competitive food, than more fruits and vegetables would be chosen.

Site 3 had a unique opportunity to increase fruit and vegetable consumption among children. First of all, the sheer size and population of the Site 3 School district created an opportunity to increase fruit and vegetable consumption for a substantial population of children in the Tulsa area. Unlike other middle schools, Site 3 had enough financial means to incorporate more fruits and vegetable options even if there is a small

rise in expenses. Site 3 had an opportunity to have financial support in order to reach a large population of students.

As with any intervention, external threats can be addressed and alleviated in order to make the lunchroom changes successful. The most obvious threat to the intervention was expenditure requirements. School districts are always hard pressed financially with strict budgets so the intervention must be financially feasible. Cafeteria expenses included staff labor, kitchen equipment and food costs so there was often little money left over. A sufficient intervention would increase fruit and vegetable consumption using low cost tactics. The threat of childhood obesity can be seen in almost all American schools including Site 3. So many different factors influence obesity including parental influence and food preferences both within and outside of the lunch room. Finding, a strategy to reduce the rates of childhood obesity is both beneficial and imperative for child health.

Intervention

Behavioral Economics, within the school lunch room, is meant to offer a choice between healthy and unhealthy foods while making healthier options, like fruits and vegetables, appear more appetizing. Behavioral economics allows for subtle changes in choice architecture that will have great impact on children's food choices. Below is an outline of one intervention to increase fruit and vegetable consumption at Site 3.

Intervention: Increase quantity of fruit and vegetables after point of service

- Place a fruit & vegetable bar after the kiosks before the seating area where children can freely take items if they paid for a meal.

Advantages: Gives students an extra opportunity to take fruits/vegetables. The bar is free for students who have purchased a meal which increases its appeal.

Disadvantages: Possibility of increased labor and preparation of food. Possibility of extra food costs. Possibility of theft if no one is available to monitor the bar.

Measuring Outcomes

In order to measure any changes in food consumption, Researchers analyzed food production records both before and after the intervention to see if there were any increases in fruit and vegetables served. A cost analysis should also be performed to understand if the interventions lead to increased expenses.

APPENDIX B

BEHAVIORAL ECONOMICS HANDOUT FOR FOCUS GROUP PARTICIPANTS

Behavioral Economics and School Lunch

Nutritional Sciences

COLLEGE OF HUMAN ENVIRONMENTAL SCIENCES

Inventory of Strategies

1. Fruit and Vegetable Bar after point of service
Fill a salad bar with a variety of fruit and vegetables. Allow students who purchase a reimbursable meal to freely take fruits and vegetables from the bar.

Rationale: The bar appeals to the students because they are getting more for their dollar.

2. Verbal encouragement of fruit and vegetable consumption
Cafeteria employees act friendly with the students and ask questions like, Would you like a piece of fruit with your lunch? What vegetable do you want today?

Rationale: These verbal cues work the same way as marketing techniques. Example: A fast food employee asks, "Do you want fries with that?"

3. Allowing unlimited amounts of fruit and vegetables with a reimbursable meal
Students who purchase a reimbursable meal are allowed as many fruits and vegetables as they want from the lunch area.

Rationale: "Unlimited amounts" make the students think they are getting more food for the same price.

4. Placement of Fruit and Vegetables as the first item on the service line
The first item students pass by in the lunch line should be a fruit or vegetable. Examples include a relish tray of raw vegetables, whole fruit, or portioned servings of canned fruit.

Rationale: Students will be hungry and eager to fill their empty tray.

5. Offer fresh fruit and vegetables in multiple places with in the service line
Instead of having one area designated for fruit and vegetables put them in several different areas.

Rationale: Increases the opportunities for students to choose a fruit or vegetable and looks like there is more variety

6. Offer monthly sampling of unfamiliar fruits and vegetables. Then incorporate them into the menu
Prepare small samples of new fruits or vegetables for students to try at no cost, then serve them as part of the school menu.

Rationale: Exposure to new foods can be fun for students and they will be more likely to choose the new fruit or vegetable if they have tried it before.

7. Move the reimbursable salad bar to a prominent and central position
Put a salad bar in a place where the students have to walk around it instead of off to the side

Rationale: This forces children to walk past the salad bar, increasing the chance that they might take something from it.

8. Offer vegetable options as opposed to requiring one vegetable
If a vegetable is served as a side dish to a main meal, give two options that students can choose from instead of only one.

Rationale: Allowing students a choice instead of forcing increases the chance that they will actually consume it.

9. Accept only cash for food items not sold as part of reimbursable meal
Accept only cash for chips, cookies, etc. instead of allowing students to pay from their account.

Rationale: Students will have to prepare a head of time to bring cash and will have the feeling of a direct loss when using money.

10. Placement of whole fruit at point of service
Use a decorative basket and fill it with pieces of whole fruit near the cashier kiosk

Rationale: Impulse buying that works the same way as the assortment of items before the cash register at the grocery store.

11. Cut up fruit and arrange by color to increase visual appeal
Cut up fruit into smaller pieces and group them by color instead of only offering whole fruit.

Rationale: Cut up fruit is easier and more convenient to eat especially for students with dental braces.

12. Offer an additional option of one fruit and vegetable each day to increase variety
Instead of only serving one type of whole/canned fruit or one vegetable offer several different varieties each day.

Rationale: This gives children more options to choose from and increases visual appeal

13. Change the default options for vegetable side items
Instead of automatically giving French fries with the option of substituting them for apple slices, automatically give apple slices with the option of substituting French fries

Rationale: Some students will decide to keep the default option because it is easier than asking for a substitute item

14. Place snack foods in less convenient areas within the lunchroom
Move the chips, cookies, snacks, etc. to the side or to a less convenient area

Rationale: Students will be less tempted to select these items

15. Creatively rename fruit and vegetable dishes
Vegetable chili becomes "Grandma's slow cooked vegetable chili." Cut up oranges and grapes become "Fruity Citrus Salad"

Rationale: Creative names appeal to the student who then expects the food will taste better

An Overview of Behavioral Economics

Purpose: To decrease risk of childhood obesity by improving student food choices in the school environment without significantly increasing costs or implementing radical changes

Goal: Present healthy and unhealthy items in a way that students willingly choose the healthier items.

Why it Works:

- Examines the way people think to find what influences food choices
- Uses marketing principles to impact people's food choices
- Children feel they have freely and consciously made the decision to choose the healthier foods without being forced to do so.

Advantages:

- Easy to implement
- Inexpensive
- Prepares children to make better food choices in the future

Not This!

Do This!

For more in information visit

www.smarterlunchrooms.org

APPENDIX C

Institutional Review Board Compliance

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

Federal regulations and OSU policy require IRB review of all research involving human subjects. Some categories of research are difficult to discern as to whether they qualify as human subject research. Therefore, the IRB has established policies and procedures to assist in this determination.

1. Principal Investigator Information

First Name: Deana	Middle Initial: A.	Last Name: Hildebrand
Department/Division: Nutritional Sciences		College: Human Environmental Sciences
Campus Address: 315 HES		Zip+4: 74078-6141
Campus Phone: 744-5059	Fax: 744-1357	Email: deana.hildebrand@okstate.edu
Complete if PI does not have campus address:		
Address:		City:
State:	Zip:	Phone:

2. Faculty Advisor (complete if PI is a student, resident, or fellow) X NA

Faculty Advisor's name:		Title:
Department/Division:		College:
Campus Address:		Zip+4:
Campus Phone:	Fax:	Email:

3. Study Information:

A. Title
Using Positive Deviance Principles to Identify Best Practices of Choice Architecture and Build Research Capacity with School Food Authorities

B. Give a brief summary of the project. (See instructions for guidance)
The goal of the planning grant project is to develop relationships among interdisciplinary researchers, the School Nutrition Association of Oklahoma, and state and local school food authorities for the purpose of identifying and expanding the use of affordable, acceptable and sustainable choice architecture strategies to increase fruit and vegetable consumption among middle school age students.
Specific objectives for this planning grant include:

1) Gather information to identify acceptable and sustainable practices of choice architecture in middle school settings; and identify currently available school nutrition data to evaluate the impact of these practices;
2) Compile an inventory of successful choice architecture practices including methods of using school nutrition data to evaluate impact of choice architecture on middle school students' FV consumption; and
3) Develop a proposal for training SFA personnel to use the choice architecture inventory and conducting multi-site action research[1] to investigate the impact of choice architecture best practices on middle school students' FV consumption.

The study does not obtain data through intervention or interaction with individuals. Rather, researchers will be observing changes in placement of fruits and vegetables in three middle school food service areas and will be measuring the impact on student choices by evaluating data as recorded in the school's food production records. Fruit and vegetable plate waste will be evaluated in one of the three middle schools .

These observations will occur on three days during a single menu cycle. Digital photographs will be taken of 50 trays at the end of the lunch line and again before students discard the remains of the meal. When taking the first photo, a coded card will be placed on the tray so the two pictures can be matched for analysis. Food items will also be weighed at each point to determine consumption. Only the tray and food items will be photographed so no individuals will be identified. Students agreeing to have their tray photographed will receive a token of less than $.50 for their time. These observations will take place in regular school cafeteria settings and use regular school nutrition data.

Successful choice architecture strategies will be shared with school nutrition service (SNS) professionals at a statewide forum scheduled for April 2011. SNS professionals will be asked to provide feedback regarding the feasibility of using the strategies in a variety of school nutrition settings. No information regarding living individuals will be obtained.

C. Describe the subject population/type of data/specimens to be studied. (See instructions for guidance)

Information will be gathered in regular middle-school cafeteria settings in Oklahoma, including Sapulpa Middle School, Shawnee Middle School and Union Middle School. Data will be obtained from school food service production records and will include number of students served, amount and variety of fruits and vegetables offered, and amount of fruits and vegetables left over. As such, none of the 18 individual identifiers will be part of the collected data. Original food production documents will be maintained by the school district. While the researchers' records will not identify individual students, they will be maintained in a file cabinet in HES 315, office of the principal investigator. To maintain the confidentiality of the school district, schools will be identified as "school A", "school B," and "school C."

4. Determination of "Research".

45 CFR 46.102(d): *Research* means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy whether or not they are conducted or supported under a program which is considered research for other purposes.

One of the following must be "no" to qualify as "non-research":

A. Will the data/specimen(s) be obtained in a systematic manner?
☐ No X Yes

B. Will the intent of the data/specimen collection be for the purpose of contributing to generalizable knowledge (the results (or conclusions) of the activity are intended to be extended beyond a single individual or an internal program, e.g., publications or presentations)?
☐ No X Yes

5. Determination of "Human Subject".

45 CFR 46.102(f): *Human subject* means a living individual about whom an investigator (whether professional or student) conducting research obtains: (1) data through intervention or interaction with the individual or (2) identifiable private information. Intervention includes both physical procedures by which data are gathered (for example venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject. Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

A. Does the research involve obtaining information about living individuals?
X No ☐ Yes
If no, then research does not involve human subjects, no other information is required.

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

If yes, proceed to the following questions.

All of the following must be "no" to qualify as "non-human subject":

B. Does the study involve intervention or interaction with a "human subject"?
☐ No ☐ Yes

C. Does the study involve access to identifiable private information?
☐ No ☐ Yes

D. Are data/specimens received by the Investigator with identifiable private information?
☐ No ☐ Yes

E. Are the data/specimen(s) coded such that a link exists that could allow the data/specimen(s) to be re-identified?
☐ No ☐ Yes
If "*Yes*," is there a written agreement that prohibits the PI and his/her staff access to the link?
☐ No ☐ Yes

6. Signatures

Signature of PI Deana A. Hildebrand **Date** Sept. 27, 2010

Signature of Faculty Advisor _____ **Date** _____
(If PI is a student)

☒ Based on the information provided, the OSU-Stillwater IRB has determined that this project **does not** qualify as human subject research as defined in 45 CFR 46.102(d) and (f) and **is not subject to oversight by the OSU IRB.**

☐ Based on the information provided, the OSU-Stillwater IRB has determined that this research **does** qualify as human subject research and **submission of an application for review by the IRB is required.**

Shelia M. Kennison
Dr. Shelia Kennison, IRB Chair

9/28/10
Date

VITA

Caryn Judith Bangs

Candidate for the Degree of

Master of Science

Thesis: QUANTITATIVE AND QUALITATIVE EVALUATION OF THE IMPACT AND ACCEPTABILITY OF CHOICE ARCHITECTURE STRATEGIES ON MIDDLE SCHOOL AGE STUDENTS' FRUIT AND VEGETABLE CHOICES

Major Field: Nutritional Sciences

Biographical:

Education:

Completed the requirements for the Master of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in May, 2012.

Completed the requirements for the Bachelor of Science in Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma in 2010.

Experience:

Dietetic job shadow experience at North Texas Food Bank, Dallas Independent School District, and The Cooper Clinic of Dallas.
Planned and executed a nutrition lecture for 4H student members.

Professional Memberships:

Oklahoma State University Dietetic Internship
American Dietetic Association Student Member
Phi Kappa Phi Honor Society

Name: Caryn Bangs Date of Degree: May, 2012

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: QUANTITATIVE AND QUALITATIVE EVALUATION OF THE IMPACT AND ACCEPTABILITY OF CHOICE ARCHITECTURE STRATEGIES ON MIDDLE SCHOOL AGE STUDENTS' FRUIT AND VEGETABLE CHOICES

Pages in Study: 105 Candidate for the Degree of Master of Science

Major Field: Nutritional Sciences

Scope and Method of Study: Childhood obesity is a nationwide problem with serious future implications and is partly due to inadequate consumption of fruit and vegetables (FV). Choice architecture (CA) strategies, a principle of behavioral economics, have been shown to be an effective method to influence FV selection in the school environments. Objectives of the study were to 1) assess the impact of CA strategies, 2) conduct a plate waste study to evaluate consumption of self-served FV, and 3) assess the attitudes of school nutrition personnel regarding the use of CA strategies. Methods included implementation of a CA strategy in 3 middle school settings. Baseline and intervention data were collected using existing food production records. The plate waste study was conducted at 1 school using pre and post meal photos of students' trays. Six focus groups were conducted with 36 school nutrition professionals from various districts in Oklahoma to assess the clarity of the strategies, attitudes toward and feasibility of using the strategies.

Findings and Conclusions: Analysis of 2 CA strategy interventions at school 1 found increases of 1 cup servings of FV by 29% and 24% over baseline. Site 2 intervention showed a 15% increase 1 cup servings of FV with a significant increase in fresh fruit (P=0.015) over baseline. Site 3 increased 1 cup servings of FV by 9% and showed a significant decrease in fried white potatoes (P=0.041) compared to baseline. The 2 day plate waste study found on average, students consumed 92% of FV selected. Focus groups revealed that while certain strategies are more feasible than others, some strategies are already used and school nutrition professionals believe CA strategies can and should be implemented in schools. In conclusion, CA strategies appear to be a promising method to increase student FV selection and are considered as feasible and sustainable to school nutrition professionals in Oklahoma.

ADVISER'S APPROVAL: Dr. Deana Hildebrand