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**Changes in workload of staff and the consumption of fruits and vegetables amongst school-aged children as perceived by school food service providers after schools purchased a slicer and sectionizer**

Jayme Potts

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CHANGES IN WORKLOAD OF STAFF AND THE CONSUMPTION OF FRUITS  
AND VEGETABLES AMONGST SCHOOL-AGED CHILDREN AS PERCEIVED  
BY SCHOOL FOOD SERVICE PROVIDERS AFTER SCHOOLS PURCHASED  
A SLICER AND SECTIONIZER

By

Jayne Lauren Potts

A Thesis  
Submitted to the Faculty of  
Mississippi State University  
in Partial Fulfillment of the Requirements  
for the Degree of Master of Science  
in Food Science, Nutrition, and Health Promotion  
with a Concentration in Nutrition  
in the Department of Food Science, Nutrition, and Health Promotion

Mississippi State, Mississippi

May 2009

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Pages of Study: 78

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Over the past three decades, obesity rates for children ages 2-5 years have doubled from 5% to 10% and children ages 6-11 years have more than tripled from 4% to over 15%. Adequate amounts of fruits and vegetables in the diet are necessary to reduce increased risks associated with long term inadequate consumption of these foods. Grant recipients received funds to purchase a sectionizer and slicer to prepare more attractive fruits and vegetables for school food service lines. Through the use of a descriptive survey, recipients reported a significant reduction in workload on staff and an increase in the amounts of fruits and vegetables children took from service lines after these foods were prepared using this equipment. Using equipment designed to increase convenience or enhance appearance of fruits and vegetables in school food service operations may increase the consumption of fruits and vegetables provided to children through child nutrition programs.

## ACKNOWLEDGMENTS

The author would like to commend The Bower Foundation for providing the funds to help make purchasing of the slicer and sectionizer possible for the recipients of the 5\*\*\*\*\* Foods Grant. In addition, expressed appreciation is due to the Mississippi Office of Healthy Schools for their time and dedication towards survey evaluation and completion by grant recipients.

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## CHAPTER I

### INTRODUCTION

Many studies have shown that the consumption of fruits and vegetables is crucial to help prevent against chronic disease (Hung, 2004). Therefore, it is recommended that adults and children eat five or more servings of fruits and vegetables per day according to the Fruits & Veggies—More Matters national public health initiative. This initiative is directed towards eating a variety of colorful fruits and vegetables from foods, as opposed to obtaining valuable nutrients from supplements, to protect the body from the development of chronic disease (Wolf, 2008). Today, heart disease and cancer are the leading causes of death in the United States. Death from stroke and diabetes are also high contributors for premature death (CDC, 2005). Obesity is known as one of the top contributors to some of our nation’s leading causes of death and the risk of several comorbidities including: diabetes, stroke, heart disease, hypertension, obstructive sleep apnea, dyslipidemia, specific types of cancer and overall mortality (Must, 1999).

The term *obesity* is a label for ranges of weight that are greater than what is generally considered healthy for a given height. It identifies ranges of weight that have been shown to increase the likelihood of certain diseases and other health problems as stated by the Center for Disease Control and Prevention. Risks for comorbidities associated with obesity are highly correlated with excess fat located around the abdomen

(central obesity) rather than around the hips and thighs (peripheral obesity) (Kumanyika, 2002).

According to a recent survey conducted by the CDC, Mississippi is listed as the most obese state in the United States. In 2007, Mississippi was reported as one of three states that equaled or had a greater than thirty percent of the adult population who qualified as obese (CDC, 2007). Furthermore, the population of the Mississippi Delta is at an even greater risk for overweight or obesity due to lower education rates, lack of resources, and poverty (Smith, 1999). Identifying the prevention, treatment and intervention plans help health professionals combat this epidemic and decrease the increasing rates of obesity in this region.

The Behavior Risk Factor Surveillance System (BRFSS) is a large scale telephone survey used to track health risks among Americans by asking health related questions. From the results of the 2007 survey, the prevalence of obesity in Mississippi is at or above 30%. This excessively high occurrence of overweight and obesity in Mississippi is the main reason that identifying effective interventions and treatments is so critical.

The National Health and Nutrition Examination Survey (NHANES) is another survey that is used to measure the prevalence of obesity in the United States. Data is collected from subjects through a physical examination provided by a mobile examination center. From 2003 to 2004, NHANES found that 17.1% of children and adolescents were overweight while 32.2% of adults over the age of twenty were classified as obese. Also, the gender of the subjects did not heavily influence the likelihood of obesity. After conducting the survey, NHANES suggests while obesity rates for men,

children, and adolescents may be increasing, the obesity rate for women seems to remain constant (Ogden, 2006).

Body mass index or BMI is a measurement that most health professionals use to determine when extra pounds translate into health risks. Body mass index calculations are defined by taking a person's weight in kilograms divided by their height in meters squared. A body mass index of 18.5 to 25 is considered "optimal weight." If someone has a BMI less than 18.5, they are classified as underweight; whereas, a number greater than 25 is considered overweight. BMI of 30 indicates the person is obese and over 40 indicates the person is morbidly obese (Gallagher, 2000). However, fitness level, muscle mass, bone structure, gender and ethnicity are all factors that can alter the accuracy of BMI calculations.

So does this mean that an overweight person who has a BMI of 29 has a higher mortality rate than a person with a BMI of 19? The answer is no. The mortality rates for a person with a BMI between 19 and 21 and for a person with a BMI between 29 and 31 are equal to each other. Mortality rates tend to follow a U-shaped curve when plotted graphically. In fact, people who are underweight or undernourished have a higher mortality rate than do people who are overweight according to their BMI (Campos, 2006). Whether someone is of normal weight or overweight, according to your BMI, physical fitness is a key factor in lowering mortality rates as long as it is implemented over the course of a lifespan. To prove this fact, recent studies have shown that people who experienced undernourishment in the early years of their lives and then become obese in adulthood tend to develop the previously mentioned co-morbidities at an earlier

age and to a much greater extent than people who were never undernourished (Kumanyika, 2002).

Childhood and adolescent obesity is a growing epidemic in the United States. Today, there are over 9 million children and adolescents who are overweight in our nation alone (CDC, 2005). Over the past three decades, obesity rates for children ages 2-5 years have doubled from 5% to 10% and children ages 6-11 years have more than tripled from 4% to over 15% (Koplan, 2005). Obesity rates are even higher amongst minority children and children from low income families (Kumanyika, 2006). One in three African American adolescents living in Mississippi is at risk of being obese with highest prevalence seen in African American teenage females. African American adolescents who are overweight are also suffering from high cholesterol—a condition usually noted in middle-aged adults. Unfortunately, increased rates of childhood obesity have the potential to reduce the life expectancy rates of our nation (Fox, 2009). The rise in childhood obesity is significantly due to social and environmental aspects that influence dietary intake and physical activity (Cook, 2007).

Poverty is caused by interrelated factors: parental employment status and earnings, family structure, and parental education. In 2009, the poverty line in the United States is considered \$22,050 for a family of four (U.S. DHHS, 2009). Families experiencing poverty tend to purchase inexpensive foods, which are often processed, are high in fat, sugar and calories and offer little or no nutritional value (Drewnowski, 2004). Family structure and parental education are also important because most of these households are broken homes where education seems intangible and unrealistic. The family plays the central role and is the beginning of health beliefs and behaviors. In most

cases, children of poverty will achieve the same education level as their parents and; therefore, will only learn the habits that they are given to learn (Smith, 1999). If a child is used to overconsumption of high fat and sugary foods, the more likely he or she will be accustomed to keeping those types of foods which will increase their chance of becoming an obese adult.

One study has shown that children who weighted in at 58 pounds or more over their normal weight range are over consuming about 700 to 1,000 extra calories a day and that 350 of those calories are from sugary beverages like soda and juice (Cook, 2007). According to the Center for Disease Control and Prevention (CDC), over 60% of children tend to over-consume due to an increase in fat and saturated fat in their diets and only 39% of children eat enough fiber from fruits, vegetables, legumes and whole grains (CDC, 2005). Research shows that children, especially young children, tend to change their food preferences to match those of their peers (Davison, 2001).

There are several important questions in need of answers before the epidemic of overweight and obesity can be resolved. Understanding and knowledge are paramount in any reasonable effort to explain such a widespread problem. In this particular case, scientific study is crucial due to the fact that becoming overweight and in many cases subsequently obese, is such an apparent process, and yet it is occurring at rates never before seen. Neither of these conditions (overweight or obese) is desirable in the vast majority of cases, so the first step is to discover why this is happening. After gaining knowledge of the causes of overweight and obesity, you can begin to formulate treatments for this epidemic.

Currently, a multitude of research projects are being carried out to create and help implement effective interventions and treatments. Many of these projects are focused on increasing education and awareness. Others are working on coordination of community organizations and leaders to fix the problem from within, while still other groups are aimed at testing the validity of proposed treatments. The largest percentage of projects is a combination of several approaches.



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## CHAPTER II

### LITERATURE REVIEW

#### **Introduction**

Children who classify as being overweight or obese are considered to be at or above the 95<sup>th</sup> percentile on the sex-specific BMI-for-age growth charts. Those children who fall between the 85<sup>th</sup> and 95<sup>th</sup> percentiles are considered at risk for becoming overweight or obese (Hedley, 2004). Today, more than 9.8 million of American children between ages 6 and 19 years of age are reported to be overweight. According to Klein et al. (2008), at least 80% of children who are currently overweight or obese and are between ten and fifteen years of age will become overweight and obese adults by age 25. Also, many do not recognize the fact that risk factors such as high blood pressure, high cholesterol and type 2 diabetes can be experienced even in early childhood. Today, the rates for these symptoms are continuing to rise in overweight and obese children (Klein, 2008).

Consuming nutrient dense foods and beverages is crucial in the promotion of adequate nutrient intake within calorie needs. A well-balanced diet consists of choosing a variety of foods within each food group while limiting saturated fats, trans fats, cholesterol, salt and added sugars. There are many tools, including USDA's MyPyramid that can personalize nutrient needs according to an individual's specific anthropometrics.

Calories that children receive from food and beverages should not exceed the calories that they expend throughout the day. The *Dietary Guidelines for Americans* is a publication that is introduced every five years to provide tips for promoting health and reducing the risk for major chronic diseases (USDA, 2006). The *Dietary Guidelines for Americans 2005* recommends a balance of calories consumed and expended through dietary intake and physical exercise.

Adequate amounts of fruits and vegetables in the diet are necessary to reduce the risks for developing chronic disease (Hung, 2004). Vitamins, minerals and fiber can help to fight off illness along with the help of phytochemicals found in many fruits and vegetables. MyPyramid for Kids, a food guidance system designed for children ages 6-11, recommends at least 2 ½ cups of vegetables and 1 ½ cups of fruit everyday for children age six and over (USDA, 2009). Children should be encouraged to make healthy choices from each food group and exercise regularly to counteract calories consumed to meet the recommendations of the *Dietary Guidelines for Americans 2005*.

### **Home Environment and Parental Influences**

The risks for childhood overweight and obesity consist of a variety of factors. One of the risk factors contributing to this trend is the lack of nutrition knowledge of parents. Parents play a key role in the dietary intake of their children. A person's weight gain is directly associated with weight gain of those significant others around them including friends, siblings, spouse, and neighbors (Christakis, 2007). Children often only eat foods that are available to them. If parents provide foods, such as sweetened beverages and processed snack foods, then children only have such foods at their disposal to consume.

They begin to learn that such non-nutrient dense foods are appropriate because that is what they are provided to eat everyday. Also, when parents consume similar types of foods everyday, children will further imitate such behavior (Davison, 2001).

Parental control of foods goes hand in hand with those foods that are provided for their child's nutrition. There are two forms of parental control when food is involved: restriction of food and pressure to eat (Wardle, 2005). If a parent is controlling of food choices and telling the child when and how much to eat, it could negatively effect the selection of certain healthy foods or increase the levels of caloric intake (Davison, 2001). Children who are rewarded with food because of their behavior are affected by the controlling of food by parents. Parents who restrict the types of food that their children eat tend to have children with more healthful eating habits. Wardle et al. (2005) also found that parents who pressure their children to eat certain foods tend to consume less fruits and vegetables themselves.

Increased availability and accessibility to more fruits and vegetables in the home may increase the amount of these foods consumed in the home by children. If fruits and vegetables are not regularly provided at home and/or limited in their provision, the child is often unexposed to these types of foods which may cause the child to have a low taste preference for all fruits and vegetables (Blanchette, 2005). In fact, a low preference for fruits and vegetables causes a child to be 5.5 times more likely to be at risk for becoming overweight when compared to children who have a high preference for these types of foods (Lakkakula, 2008). However, purchasing practices will influence the availability of fruits and vegetables in the home. Purchasing practices that affect the amount of fruits and vegetables in the home may include: frequency of food shopping, fresh fruit and

vegetable purchase and comparative purchase, perceived benefits and costs of purchasing fruit, 100% juice, and vegetables, home food pantry management practices, family social support for purchasing and food shopping practices (Baranowski, 2008). Home fruit availability seems to be highly dependent upon social support for purchasing these types of food items. This may be due to the fact that fresh fruits are more expensive per unit than foods like potato chips or cookies. Baranowski et al. (2008) reports that children who have higher body mass indexes (BMIs) had less fruit available at home.

The observation of a parent eating more fruits and vegetables increases the likelihood that children will consume more of these types of foods. Wardle et al. (2005) explains that this approach is considered a learning tool for the child where the parent is asking the child to “do as I do” rather than simply “do as I say.” Children as early as three years of age can start to exhibit food preferences and multiple exposure to various foods will change these preferences as they continue to age (Lakkakula, 2008). Interestingly, research shows that mothers who are considered overweight tend to provide their children with more low nutrient-dense snacks, more fat as a proportion of overall food intake and have more controlling parenting techniques over food intake than do mothers who are not overweight. The types of foods prepared for children are also directly affected by the amount of time parents have to prepare meals. Today, many families have both a working father and mother. With little time to plan and prepare meals, many parents choose to serve foods that are quick and convenient. Unfortunately, quick and convenient is often synonymous with high fat, high sodium and excessive calories (Davison, 2001).

## **Health Education**

Another point to consider regarding fruit and vegetable consumption is that most rural schools do not require physical education and parents are not likely to allow physical activity outside of the home due to the perception of an unsafe neighborhood; therefore, increasing the likelihood of persistent overweight (Gable, 2007). Inactive lifestyles also contribute to obesity. Inactive children tend to consume more calories than they expend throughout the day. Studies show that 36% of white American adolescents spend extended periods of time watching television every day, and an alarming 74% of African American adolescents do every school day (Areghan, 2005). According to Gable et al. (2007), children who watch more television and have less family meals during kindergarten and first grade are more likely to be overweight by the third grade. The craze for children today seems to be staying indoors to watch television, exploring the internet, talking on the phone, and sitting around and playing video games for several hours a day (Davison, 2001).

Not only does television promote inactive lifestyles, but it also channels unhealthy marketing ads every second on just about any channel that you choose. But advertising does not stop there (Boynton-Jarrett, 2003). Children witness food advertisements on the internet, in magazines, in the supermarket, and even at school. About 20,000 advertisements that are seen on television per year are towards marketing food items, especially cereals and high-calorie snacks, to young children (Brody, 2006). That means that there are about ten food commercials aired per hour of television viewing time (Ebbeling, 2002). Also, about 20% of fast food chain advertisements present a toy that the child will get if he or she goes to that restaurant and orders a “kid’s meal.”

Unfortunately, according to Brody et al., only about 3% of food advertisements promote healthy food choices even when studies have shown that these ads actually increase wholesome eating in children 3 to 6 years of age. Simply stated, the amount of time a child spends watching television is directly correlated with requests for specific foods and overall caloric intake (Brody, 2006).

One study was performed on health care professionals in the form of a mailed questionnaire. The researchers used a random sample of 202 pediatricians, 293 pediatric nurse practitioners and 444 registered dietitians. The document was geared towards the attitudes of health care professionals, perceived barriers, perceived skill level, and training needs in the management of child and adolescent obesity. The researchers found that health care professionals believe childhood obesity is a condition that affects the risk of chronic disease and the future quality of life. They also believed that the widespread epidemic of the disease has come to a point where treatment of the disease may be necessary in the near future. This is evidence that health care professionals understand the need to address the growing overweight and obesity epidemic. In the course of reviewing the data, several barriers to treatment were listed. Lack of parent involvement, patient motivation and support services were among the most frequent barriers to obtaining treatment. Two out of the three barriers listed are left to the discretion of the client/patient. As this would indicate, the respondents were most interested in receiving training in order to improve their aptitudes in helping clients/patients to manage obesity (Story, 2002).

In another study, each of the three most common barriers was overcome by productive placement of the treatment. In Mississippi, a school based intervention



program was implemented to increase health knowledge of cardiovascular risk factors and the goal was to measure its effectiveness. The chosen method for this epidemiological study was a comparison of measurements. Health knowledge was assessed in 205 fifth grade students by measuring height, weight and BMI to increase the awareness of cardiovascular disease risk factors. The researchers took measurements, ran the health education program for 16 weeks, and returned to measure once more. The comparison of the two sets of data were the source of their results. The results of the research showed that health knowledge was increased and certain dietary behavior changes did improve at the end of the investigation. Additionally, they concluded that this type of approach could help with planning future versions of school based interventions and also increase health knowledge of participants. Perhaps even more important was the success in changing dietary habits (Harrell, 2004).

### **School Food Environment**

Another important factor to consider when assessing children's dietary options includes the school food environment. Food that is provided in public schools is sold in a variety of ways. The majority of food is sold through the national school meals program. Competitive foods are foods that are purchased by the school through contracts and are sold through a la carte, vending machines, school stores or fundraisers are another way children receive food within the school day. Many competitive foods are also provided at school parties or activities and in-school marketing or advertising where food samples may be provided as part of a learning experience (French, 2004).

In the year 2000, the Center for Disease Control conducted a nationwide surveillance study known as the School Health Policies and Programs Study (SHPPS) to monitor the amount of foods and beverages sold through fundraising activities. This study found that chocolate candy was sold in 76% of schools, cookies, crackers, cakes, pastries and other baked goods were sold in 67% of schools, candy other than chocolate candy was sold in 63% of schools, soft drinks, sports drinks, or fruit drinks were sold in 37% of schools and fruits or vegetables were sold in only 28% of schools (CDC, 2005). CDC recommended better ideas for fundraisers including: fresh and exotic fruit, nuts, popcorn, gift wrap, magazine subscriptions, garden seeds, candles, discount coupon books, raffles and gift baskets, temporary tattoos and plants. Also, it should be noted that parents are not the only ones who reward children with food in response to good behavior. According to the SHPPS, only 16% of schools and 23% of school districts forbid treating children to candy, pizza parties or food coupons according to good behavior or successful achievements such as reading a set amount of books by the end of the school year (CDC, 2005). Ideas for rewards included non-food rewards such as: magazines, word-play activity books, pencils, erasers, stickers or extra time to play outside.

Many school districts are limiting the access to competitive foods sold in their schools. However, others still have concerns for restricting these types of foods including: reduced revenues from food and beverage sales, the belief that children should be able to choose from a wide variety of foods and adjustments to meal programs that may be necessary to allow students an appropriate amount of time to eat at mealtimes (CDC, 2005).

Meals that are served in schools receiving funds from the National School Lunch Program and School Breakfast Program must meet specific standards that have been established by the federal government. These programs provide federal subsidies to schools who meet menu planning requirements. The requirements of the School Breakfast Program were based off of the recommendations set by the *Dietary Guidelines for Americans 1995*. Schools are to serve meals at breakfast that have no more than 30% of calories from fat (less than 10% from saturated fat) and should meet the Recommended Dietary Allowances of protein, Vitamin A, Vitamin C, iron, calcium and calories for one-fourth of children's nutrient requirements everyday. Today, 10.1 million children receive food provided by the School Breakfast Program which started and has been successful since 1975 (USDA, 2009).

The same dietary recommendations are requirements for the National School Lunch Program except this meal should provide for one-third of children's nutrient requirements everyday. The equivalent of 187 billion lunches has been served since the National School Lunch Program started in 1946. Today, the program serves lunch to more than 30.5 billion children daily in public schools across the nation (USDA, 2009). Research has shown that fruit and vegetable consumption is twice as likely to be reported in children who participate in the National School Lunch Program compared to those children who do not participate in the program (Cullen, 2004).

Most schools strive to provide five food choices from four food components including: 8 ounces of milk, 2 ounces of meat or meat substitute, one serving of bread or grain product and two (3/4 cup) or more servings of fruit, vegetables or both (French, 2004). However, the policy for this program is that children are only required to take

three of these items that are provided (Schwartz, 2007). A variety of these foods are purchasable through the United States Department of Agriculture (USDA). In fact, much of the fresh produce provided by USDA has been made available through the Department of Defense and through contracts with local farmers. However, even if fruits and vegetables become more available in the school food environment, this does not mean that children will pick more healthy food options when items that are high in fat or sugar are also available (French, 2004). One study looked at two Mississippi school districts for five days to evaluate the school lunch offerings. The study found that school lunch meals prepared in urban areas provided more energy dense foods than did those schools in rural areas (Nanney, 2008). Unfortunately, students rely heavily on a la carte and vending food items such as cookies, candy bars, pizza, soda, French fries, ice cream and potato chips for choices as their meals at school (French, 2004). These competitive foods are provided by contracts through food companies and are not purchased through USDA.

Research has shown that sugar consumption from competitive foods is reported three times more often in students who do not participate in the National School Lunch Program (Cullen, 2004). In fact, Cullen et. al (2004) reported that more children who were middle school students were accustomed to eating less healthy foods after they transitioned from their elementary school environment to their new middle school environment. This may be due to the fact that most elementary students are served at mealtime and middle school students have more freedom in their food selections at mealtimes. However, research shows that most children are aware of which foods are healthy but are often more concerned about choosing foods that are less healthy due to convenience and taste (Schwartz, 2007).

The School Nutrition Dietary Assessment Study (SNDA-III), sponsored by the Food and Nutrition Service of USDA, is a survey that assessed schools throughout the nation during the years 2004-2005 to provide the most recent updates related to school meal programs. This study included information such as: the food and nutrient content of meals offered to and selected by children, the contributions of school meals to children's diets, and the availability and consumption of competitive foods (Gordon, 2009). The results of this study found that 96% of schools offered one or more vegetable options on their daily menus. However, French fries or some potato product was found on the menus of half of the nations high schools compared to one fifth of our elementary schools. Canned fruits were provided more often than fresh fruits; but, fruits were on 94% of all menus. Fruit juices were more apparent on breakfast menus instead of canned or fresh fruits. The study did find that more fresh fruits were being offered in school years 2004-2005 than in school years 1998-1999. The study showed an increase from 17% to 26%. Gordon et al. reported that the availability of fresh fruit was still found to be relatively limited.

### **Prevention Techniques**

Obesity is a wide spread problem that is being reviewed from every direction. One area that is growing in popularity is the prevention of obesity. Prevention of obesity can be implemented at the community level through community programs, nutrition education in schools, and club and organizations that sponsor lectures. Some states have taken great steps toward fighting childhood obesity, by not allowing the sell of or serving of any foods in schools that will contribute to a child's obesity. The state of Virginia will

not allow any school cafeteria to serve “junk food” such as low-nutrient dense foods or allow any vending or soda machines. Another way schools are decreasing the purchase of low nutrient, high energy foods is by increasing taxes on any “junk food” children purchase. Recently, legislation has been passed in many states to limit the types of food that is sold in schools and the times that certain foods can be sold during school hours (Cook, 2007). For example, the West Virginia Board of Education has banned candy bars, food or drinks containing 40% or more sugar, juice products containing less than 20% real fruit juice, and foods with more than eight grams of fat per serving and prohibits the sale of these items on school campuses (French, 2004).

From the body of research directed at overweight, obesity and treating the condition, a few of the most successful methods can be isolated. Increasing health education may be the first step. Many studies support the method of raising awareness in combating the overweight and obesity epidemic and provide examples of successful intervention and treatment techniques. Many intervention methods can be replicated successfully; however, further investigation into refining existing techniques and new method discovery will be needed in the future if we hope to turn the tide of this epidemic.

A comprehensive approach to obesity prevention should address the following areas. First, it should cover dietary habits, physical activity, societal and individual level factors within target populations. It also needs to contain multiple focus points and levels of intervention at the national, regional, community, and individual level. Obesity prevention should include both policies and programs. Policy initiatives for food, nutrition, and physical activity are all central to obesity prevention.

To decrease the prevalence of obesity seen in children, the routine of the family and the child must be changed to make a difference (Blanchette, 2005). This involves commitment from the parents and the child. Some researchers suggest no more than two hours of television should be watched in the period of one day and families should attempt to eat every meal possible with each other to promote more healthy behavior habits (Gable, 2007). Health policy is also a necessity to the success of any prevention program. All programs should be well funded, address all people in the population, and should be monitored and evaluated. The goals of the programs should be to prevent increases in body mass, reduce new cases of obesity, lower the population body fat average, and to reduce obesity related health problems (Kumanyika, 2002).

Garden-based nutrition education programs are another way for children to learn about the importance of fruits and vegetables in their diets. Research shows that less than half of school-aged children consume the recommended five servings of fruit and vegetables daily (Robinson-O'Brien, 2009). Many educators are using school gardens as a teaching tool to go along with their current school wellness programs. This intervention has already been implemented in the Berkeley, California school district (French, 2004). There is limited information on the success of school gardens as it is a relatively new concept. However, it is believed that this type of intervention has the potential to increase the awareness of different types of fruits and vegetables and increase the consumption fruits and vegetables in those children who already have low taste preferences for them. Children who have the opportunity to plant, harvest and prepare different fruits and vegetables will see the work that they have done. It is expected that based on their involvement, the likelihood increases that children will try these foods because they

helped to grow and prepare them. School gardens may also be helpful for schools who find the availability and accessibility of certain fruits and vegetables to be difficult.

Free fruit distribution programs are emerging in school districts across the nation. As of 2003, four states have received funding to implement this intervention in a total of 100 schools. Each school is given fruit and vegetables from local farmers to distribute to the children anytime throughout the school day except for mealtimes (French, 2004). This program was implemented to increase the number of fruits and vegetables children received throughout the day to better reach the five recommended servings per day. The school administrators of these schools have reported an increase in participation in school meal programs and a decrease in sales of a la carte and vending machine food items.

A healthy school environment with supportive cafeteria directors and staff is also necessary for children to know the importance of fruit and vegetable consumption. One study found that presenting fruits and vegetables attractively, providing taste tests, maintaining a variety of options and a verbal prompt by cafeteria staff to encourage the children to try the fruits and vegetables proved highly successful (Schwartz, 2007). These researchers had the cafeteria staff ask the children, “Would you like fruit or juice?” as the children stood in line in front of the fruit servings. The students were not required to take a fruit, but were asked in such a way to seem like they were expected to pick an option. These researchers found that students in the intervention school group were four times more likely to take the fruit compared to the control school group and three and a half times more likely to eat it. Also, the availability of fruit or fruit juice in the intervention school group caused 60% of students to choose one or the other. With the addition of the verbal prompt, the number of students increased to over 90%. In terms of servings, 70%



of students in the intervention school group at one full serving of fruit compared to only 40% from the control school group (Schwartz, 2007). Schwartz suggests that the National School Lunch Program change its policies to include a verbal prompt from cafeteria staff to help increase the consumption of more fruits and vegetables and decrease the number of calories consumed through high fat and high sugar foods.

Another way to provide a positive school food environment is to train staff on how to make foods like fruits and vegetables more attractive and appealing to children. One study had cafeteria staff simply change the method of preparation and presentation of fruits and vegetables daily. Methods used included putting food choices in small cups or arranging foods by color. Over the course of two years, the researchers of this study also had the staff verbally prompt the children and encourage them to take more fruits and vegetables as they passed through the lunch line. In addition to the changes in the cafeteria, the school also provided a special event for the children including a two week campaign that promoted fruit and vegetable consumption through the use of “life-size” fruit and vegetable characters and posters hung around the school. Monthly samplings of a variety of exotic fruits and vegetables were also provided with the aid of randomly selected students that served as “helpers” to pass out the samples. After samples were provided, these food items were seen on the menu for lunch the next day. The school also initiated a “challenge week” that rewarded the children with frozen fruit yogurt if they could eat three servings of fruits and vegetables every day of the week at lunch. At the end of the two years, the students were provided a demonstration and final meal that showed them how to prepare several food items using grapes. The results of this study revealed significantly higher intakes among intervention students through the use of

several intervention strategies. The researchers of this study placed strong emphasis on the importance of verbal encouragement, the number of fruits and vegetables provided on the snack cart and the implementation of combined school and family based programs as indicators for increased fruit and vegetable consumption (Perry, 2004).

Many schools around the nation have used a variety of strategies to encourage consumption of fruits and vegetables including: establishing nutrition standards for competitive foods, influencing food and beverage contracts, making more healthful foods and beverages available, limiting student access to competitive foods and using fundraising activities and rewards that support student health (CDC, 2005). One study found that by lowering the prices of healthier options in vending machines by 10%, 25% and 50%, the sale of these items gradually increased by 9%, 39% and 93%, respectively (French, 2004).

Student involvement is another approach that has appeared to be highly successful. Asking children to identify foods that meet nutrition recommendations, allowing them to taste test fruit or vegetable samples, that could be offered in the cafeteria, discussing with them why they may or may not like certain foods that are sold and getting perception on appearance, placement and packaging of foods will allow children to help with decision making and help the cafeteria staff know what they can do to increase consumption of more fruits and vegetables (CDC, 2005).

Consumption of fruits and vegetables can be monitored in the school food environment by tracking sales of food items, asking for student opinions about food choices and evaluating participation in school meal programs such as the School Breakfast Program and the National School Lunch Program (CDC, 2005). If students are

encouraged to take and eat more fruits and vegetables at school, this may help to increase the prevention of obesity and other chronic diseases. This is why it is so important to create new and improved school intervention programs.

Interventions such as training of food service staff along with better food presentation techniques may have an impact on fruit and vegetable selection by students. Also, provisions for specific equipment, such as a slicer or sectionizer, may maximize staff productivity and increase staff creativity in preparation. Fruits and vegetables that are prepared with equipment like a slicer or sectionizer may appear more attractive to children. This, in turn, could increase the number of fruits and vegetables taken by children from the serving line to be consumed at school meal times. The purpose of this study was to evaluate the perception of school food service providers and the consumption of fruits and vegetables amongst school-aged children after schools purchased a slicer and a sectionizer as funded by the 5\*\*\*\*\* Foods Grant.

CHAPTER III  
METHODOLOGY

**Background: 5\*\*\*\*\* Foods Grant**

Grants offered through the Mississippi Department of Education are provided to assist public schools in complying with the Mississippi Healthy Students Act of 2007. This legislation focuses on the connection between health and academic success. The 5\*\*\*\*\* Foods Grant was offered from October 1, 2007 through June 30, 2008 by the Mississippi Department of Education as part of the “*Health is Academic*” initiative to increase the consumption of nutritious foods and promote physical activity in Mississippi public schools (MDE, 2008). The purpose of the 5\*\*\*\*\* Foods grant was to increase the consumption of fruits and vegetables by children through the provision of funds to schools with the intent to purchase a sectionizer and slicer to better prepare more attractive fruits and vegetables for service lines. Additional goals included increasing healthful choice offerings and selection along with improved child nutrition images related to fruits and vegetables. Funding through The Bower Foundation allowed recipients to purchase the Sunkist sectionizer 4-wedge and apple corer/wedger (Figure 3.1) and the Edlund slicer 350 Model with 3/16” and 3/8” blade assemblies (Figure 3.2) or like equipment. The Sunkist sectionizer can uniformly slice, wedge or halve a variety of fruits and vegetables. This equipment also has the capability to core and wedge fruits

such as apples or pears. The Edlund slicer 350 Model is an electric slicer with high-speed reciprocating stainless steel serrated blades that cut any fruits and vegetables cleanly with minimum pressure. If recipients had previously purchased this equipment prior to the application process for the grant, they were allowed to purchase other food service equipment as needed to fulfill the goal of the grant.



Figure 3.1

Sunkist sectionizer 4-wedge and apple corer/wedger



Figure 3.2

Edlund slicer 350 Model with 3/16" and 3/8" blade assemblies

The Mississippi Department of Education was prepared to award up to 100 grants or \$350,000 to all Mississippi public schools grades K-12 who applied and met specific benchmarks. Applications were disregarded for an assortment of reasons including: unauthorized amendments to requirements of the request for application, conditional reasons, incompleteness or irregularities that exist in the application, application is not signed by an authorized representative, false or misleading statements or references or does not meet all requirements. In addition to the application, recipients answered several questions in a two page summary pertaining to "school readiness" to ensure the staff understood the challenges they would face in meeting the goal of the 5\*\*\*\*\* Foods Grant (MDE, 2008).

Recipients were required to purchase the equipment, identify an intervention and submit a progress report by November 15, 2007 to receive partial funds. Grant recipients were required to submit at least one intervention that they would implement in their

school as a goal to help decrease the rising rates of childhood obesity in Mississippi. The intervention could not simply be a one day event but rather must be a change in a school policy that will be reflected in the school environment daily. All interventions had to be approved through the Mississippi Department of Education before implementation. The progress report was required to provide information including the intervention selected, equipment purchased and a starting date for implementation of the intervention. By June 2, 2008, recipients were to have submitted a final report and success story form to receive the remainder of funds. The final report included a description of the intervention implemented, use of funds and the short-term impact of the intervention.

In addition, grant recipients had the opportunity to receive training from a certified chef and Registered Dietitian on how to better prepare fruits and vegetables using the slicer and sectionizer with the goal to make these foods more appealing and acceptable to children who purchase school meals. During this training period, participants received helpful information on purchasing, storing and handling fruits and vegetables and techniques on slicing, dicing and serving specific food items to children of various ages. Onsite training was also provided to cafeteria staff by the Mississippi State University Extension Service Nutrition and Food Safety Agents.

### **Data Collection Procedures**

Data for this study were collected through the use of a descriptive survey prepared in collaboration with the graduate student and major professor. The survey was reviewed by the Bower Foundation, the Center for Mississippi Health Policy, the Mississippi Office of Healthy Schools staff and a Mississippi School District Child Nutrition

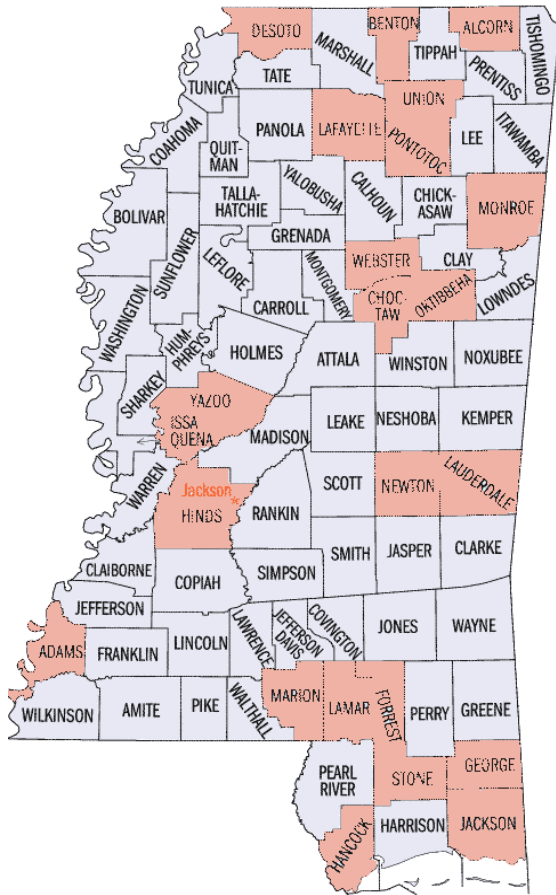
Director. Once comments were received changes were made to the survey and presented to the Institutional Review Board (IRB) of Mississippi State University for approval.

After approval was granted from the MSU IRB, the survey was returned to the Mississippi Office of Healthy Schools for distribution. The survey was distributed by email to all of the schools throughout Mississippi who were recipients of the grant. Recipients were asked to return the completed survey along with a signed form of consent to Mississippi State University to maintain confidentiality. Follow up calls were made by the Mississippi Office of Healthy Schools for surveys not received from recipients within a two week time period after initially receiving the survey. Follow-up calls continued until a survey and consent form had been received by each school or district participating in the grant.

### **Subjects**

There were 80 schools throughout the state of Mississippi who received funds from the 5\*\*\*\*\* Foods Grant (Figure 3.3). Surveys were to be completed for all grade levels of schools that were recipients of the 5\*\*\*\*\* Foods Grant. Various members of the school staff could complete and return the survey including: the cafeteria manager, food service administrator/manager/director, district child nutrition director, child nutrition program supervisor, federal program director, principal or assistant principal.





- Hinds County (4)\*- 53%\*\*
  - Jackson Public Schools (Hinds) (10)-85%
  - Stone County (3)-59%
  - Newton Municipal (3)-86%
  - Marion County (3)-86%
  - Monroe County (3)-52%
  - George County (8)-56%
  - Choctaw County (1)-68%
  - Union County (1)-58%
  - New Albany Public Schools (Union) (1) 55%
  - Corinth Public Schools (Alcorn) (5)-60%
  - Starkville Public Schools (Oktibbeha) (5) 66%
  - Lamar County (6) 42%
  - Natchez-Adams County (1) 93%
  - Benton County (3) 89%
  - Bay St. Louis-Waveland Public Schools (Hancock) (1) 90%
  - Oxford Public Schools (Lafayette) (1) 49%
  - Petal Public Schools (Forrest) (2) 50%
  - Jackson County (5) 49%
  - DeSoto County (3) 42%
  - Lauderdale County (1) 50%
  - Meridian Public Schools (Lauderdale) (3) 78%
  - Pontotoc County (2) 54%
  - Yazoo City Public Schools (Yazoo) (1) 83%
  - Webster County (4) 59%
- \*Number of schools within the school district receiving the 5\*\*\*\*\* Foods Grant.
- \*\*Percentage of Free and Reduced Lunch Enrollment-October 2007.
- Counties highlighted in peach indicate participation in the 5\*\*\*\*\* Foods Grant.

Figure 3.3

Distribution of Participants by County

## **Data Analysis**

Schools that completed and returned the survey were assigned a random number for confidentiality and data entry purposes. All information from the surveys is kept confidential and contained in a locked filing cabinet as verified through the form of consent and Institutional Review Board. Data were reviewed and compiled in the form of a spreadsheet using Microsoft Excel. All results and statistics were reported as a percentage based on the number of responses compared to the total number of surveys from recipients who provided consent.

## CHAPTER IV

### RESULTS

Of the eighty schools that received the 5\*\*\*\*\* Foods Grant, all were represented either by themselves or as a whole within their school district in seventy-one surveys that were received and analyzed. One survey was not included in the results of the research due to consent withdrawal. From the seventy surveys, only eighteen surveys (25.71%) reported the total number of students, faculty and staff separately. Of the eighteen surveys, there were 13,401 reported students and 1,493 reported faculty and staff. Because only eighteen surveys reported these values separately, it is difficult to tell the exact number of total students alone who were affected by the 5\*\*\*\*\* Foods Grant. However, after combining all surveys, 92,849 of combined students, faculty and staff were reported by the school districts involved to be impacted by the 5\*\*\*\*\* Foods Grant.

Schools and school districts reported their grade levels accordingly: 36 elementary schools (51.43%), 6 middle schools (8.57%), 11 high schools (15.71%), 4 elementary and middle schools (5.71%), 2 elementary and high schools (2.86%), 1 middle school and high school (1.43%), and 10 elementary, middle and high schools (14.29%) (Figure 4.1).

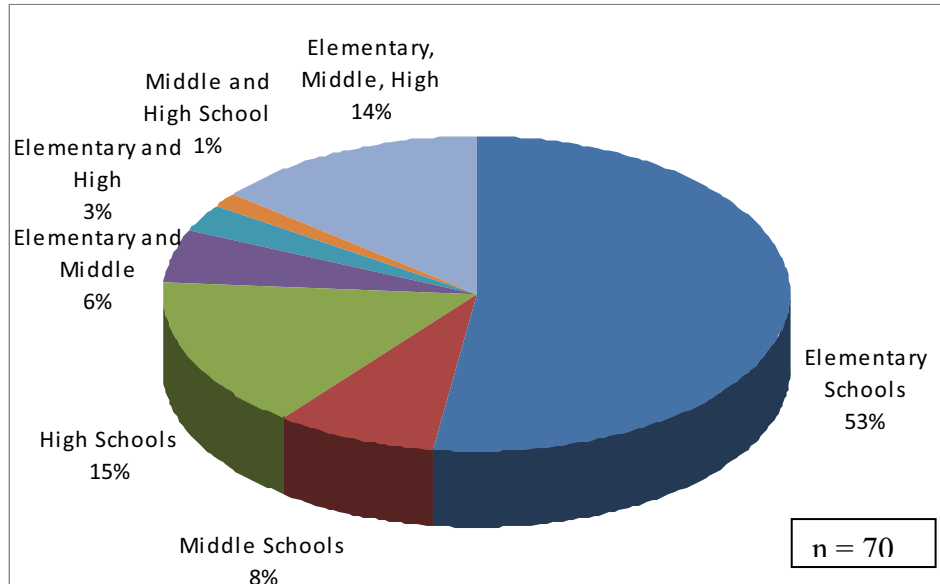


Figure 4.1

Distribution of Participants According to Schools by Grade

When asked what meals were typically served at their school through the cafeteria, there were 5 schools (7.14%) that reported serving breakfast only, 36 schools (51.43%) that serve breakfast and lunch, 7 schools (10.0%) serve breakfast, lunch and an after-school snack, 20 schools (28.57%) serve lunch only, 2 schools (2.86%) serve lunch and an after-school snack, and no schools reported serving only an after-school snack (Figure 4.2).

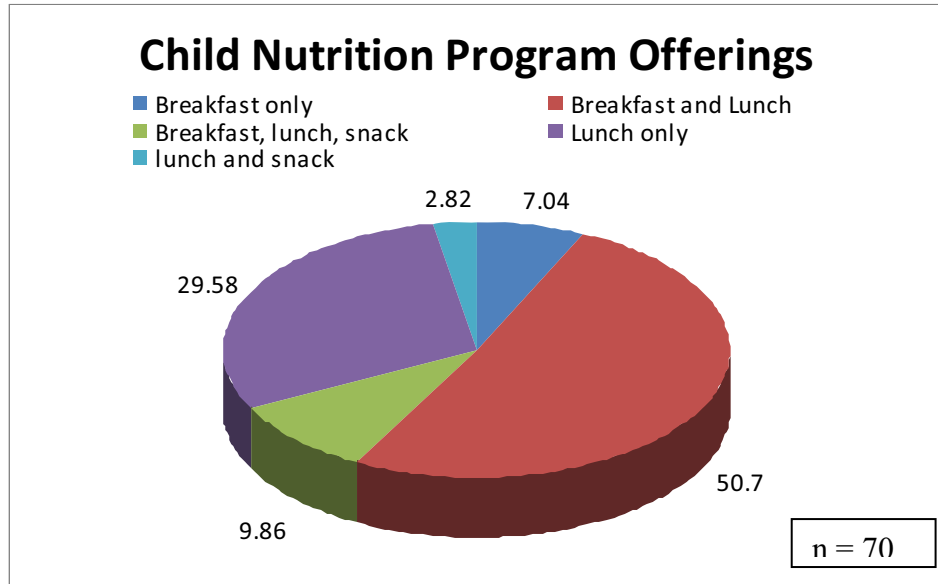


Figure 4.2

#### Child Nutrition Program Offerings amongst Participants

When surveyors were asked if they felt that their child nutrition office was limited in its ability to select a variety of fruits and vegetables, 31 surveyors (44.29%) said that they felt their ability was limited and 39 surveyors (55.71%) said that they did not feel that their ability was limited (Figure 4.3). Of those surveyors who felt limited in their ability to select a variety of fruits and vegetables, 15 participants (45.45%) felt that this was due solely to the fact that selecting a variety of fruits and vegetables is cost prohibitive. Other participants felt that selecting a variety of fruits and vegetables was difficult due to a combination of reasons. Limited selection and cost prohibitive was experienced by 7 participants (21.21%), 10 participants (30.30%) expressed limited selection, cost prohibitive and lack of approved vendors, and 1 (3.03%) participant expressed limited selection, concern about spoilage and concern about waste (Figure 4.4).

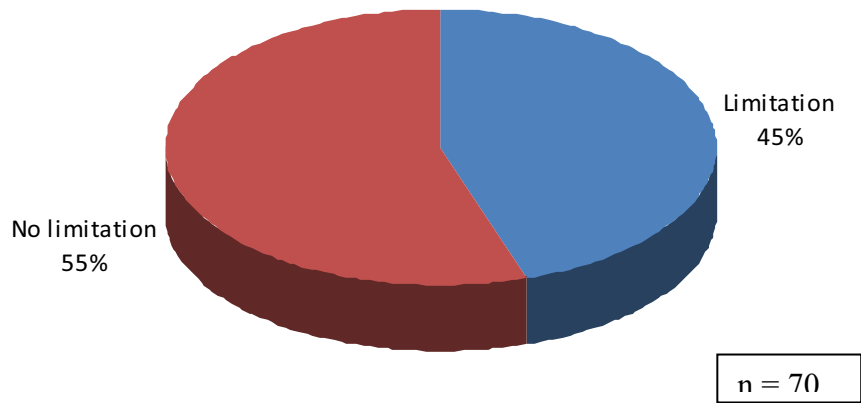


Figure 4.3

Perception of Limitation in Offering Fruits and Vegetables

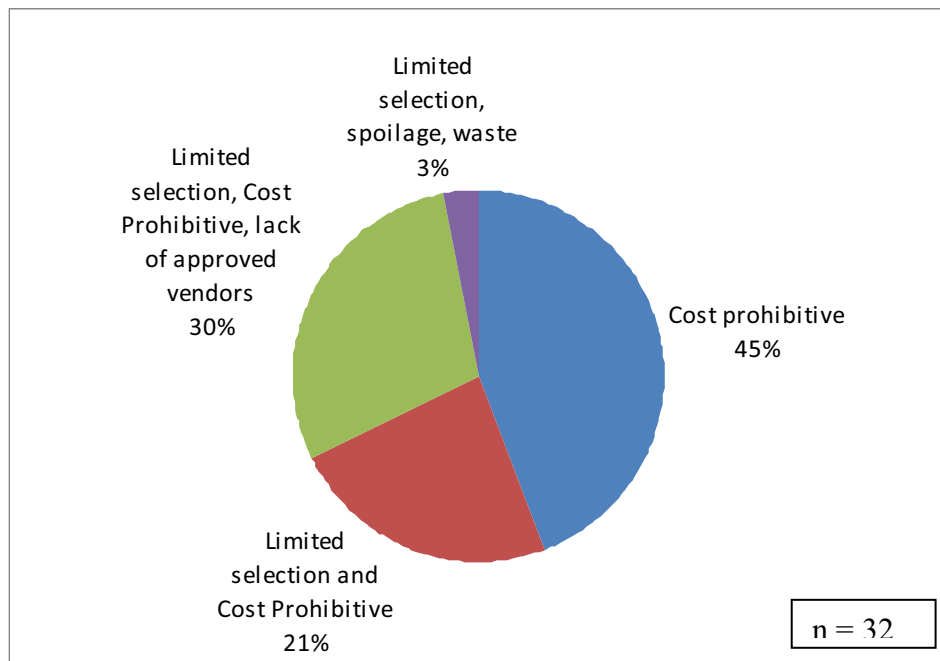


Figure 4.4

Reasons for Perceived Limitation in Offering Fruits and Vegetables

When surveyors were asked to describe any changes in purchasing patterns after the addition of the slicer and/or sectionizer to their facility, 33 surveyors (47.14%) reported that the addition increased the purchasing of both fruits and vegetables, 20 surveyors (28.57%) reported an increase in the purchasing of fruits only, no surveyors reported an increase in the purchasing of vegetables only and 17 surveyors (24.29%) reported that their purchasing patterns did not change (Figure 4.5). In addition, 51 surveyors (72.86%) stated that they were now offering new varieties of fruits and vegetables to their students that were not previously offered as a result of purchasing this new equipment. Only 19 surveyors (27.14%) reported that no new varieties of fruits and vegetables were being offered after purchasing the new equipment (Figure 4.6). One surveyor reported that this was due to the fact that their students were “already getting lots of fruits and vegetables.” Another surveyor stated their reason for not adding new varieties of fruits and vegetables was because the cafeteria “already offers three fruits and three vegetables daily on our lunch menu.”

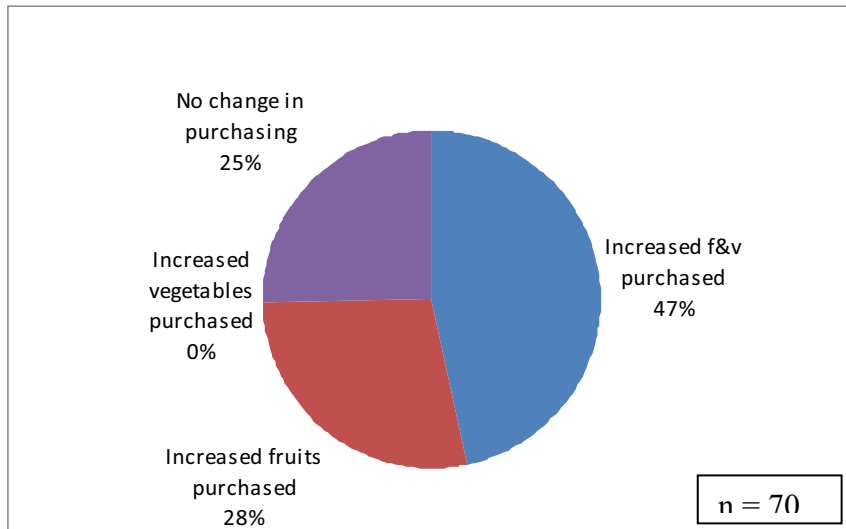


Figure 4.5

Purchasing Changes by Type

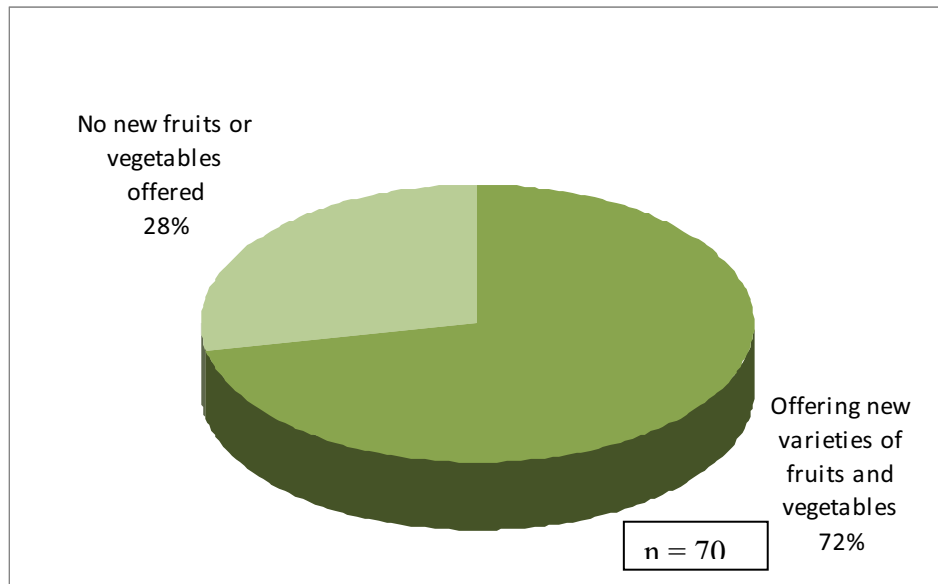


Figure 4.6

Post Equipment: Fruit and Vegetable Offerings



Of the surveyors who added new varieties of fruits and vegetables, 40 surveyors (78.43%) reported that their cafeteria added one to three different fruits and vegetables, 11 surveyors (21.57%) reported adding four to six different fruits and vegetables and no surveyors reported adding seven or more fruits and vegetables after the addition of the new equipment (Figure 4.7). All 71 surveyors (100%) replied that they would consider offering new fruit and vegetable selections to their menu if more selections were available. When asked if the addition of the new fruits and vegetables to their menu was a direct result of training provided by the 5\*\*\*\*\* Foods Grant, 51 surveyors (91.07%) said that the additional fruits and vegetables were a direct result of training while 5 surveyors (8.93%) felt that the training had no impact on the new fruits and vegetables added to their menu after purchasing the equipment (Figure 4.8).

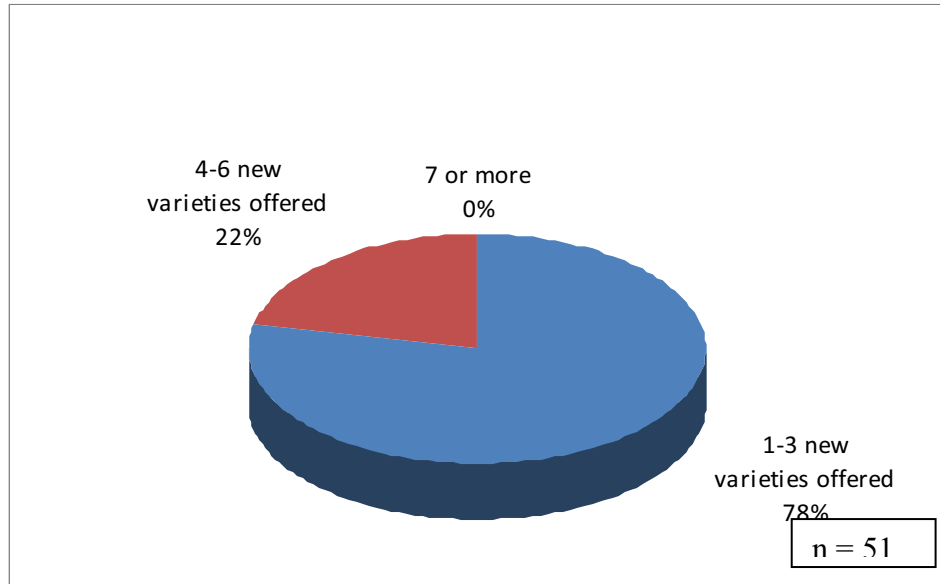


Figure 4.7

Post Equipment: New Varieties of Fruits and Vegetables Offered

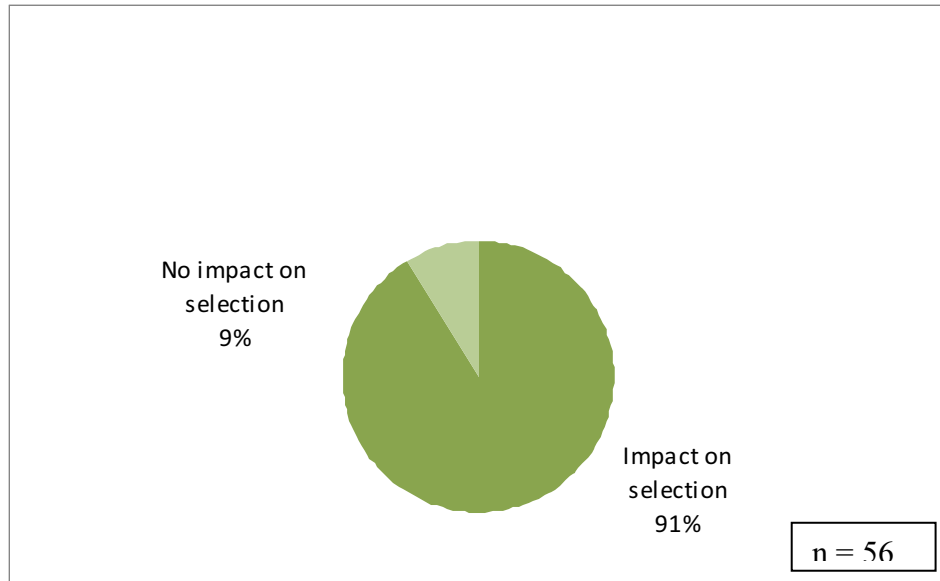


Figure 4.8

5\*\*\*\*\* Foods Grant Training Impact on Selection and Offering of New Fruits and Vegetables

When asked if surveyors were able to see an increase in fruits and vegetables selected by students after the addition of the new equipment to their facility, 63 surveyors (90.0%) reported an increase in student selection of fruits and vegetables, 7 surveyors (10.0%) reported the students selected the same number of servings as before and none of the surveyors reported students selecting less fruits and vegetables than before (Figure 4.9). One surveyor who noticed an increase in the amount of fruits and vegetables taken by the students also stated that “fruits and vegetables are now more appealing.” Of the 63 surveyors who reported an increase in student selection of fruits and vegetables, 5 surveyors (7.94%) noticed a 50% or greater increase in selection, 31 surveyors (49.21%) noticed a 25%-50% increase in selection, 25 surveyors (39.68%) noticed a 10%-25% increase in selection and 2 surveyors (3.17%) noticed a 10% or less increase in selection (Figure 4.10).

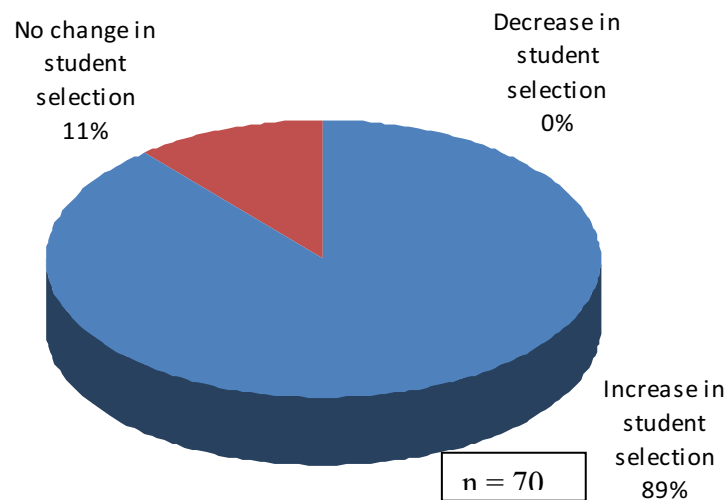


Figure 4.9

### Changes in Selection Patterns of Students

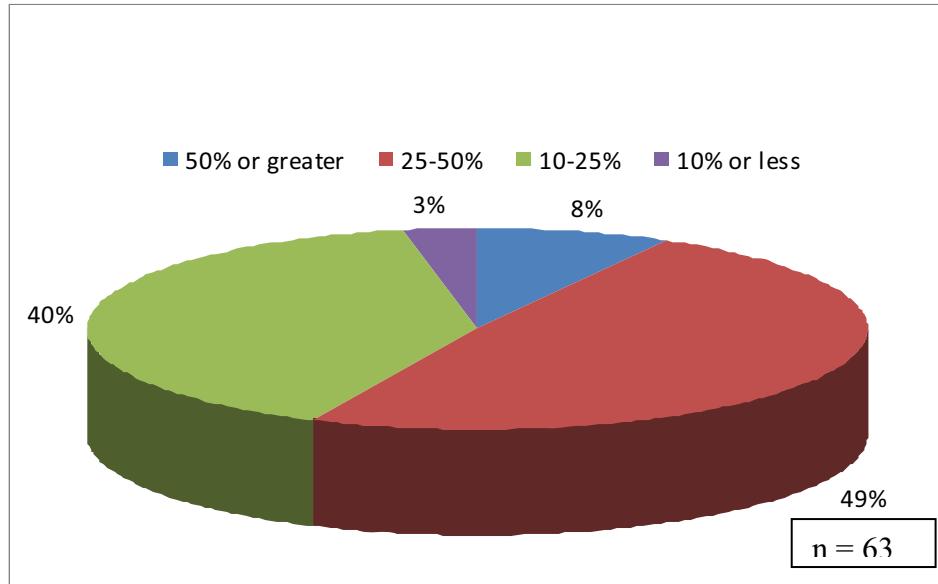


Figure 4.10

Percentage Increase of Fruits and Vegetables Selected

When asked if surveyors or any of the cafeteria staff used the tips or recipes introduced during the 5\*\*\*\*\* Foods Grant training, 68 surveyors (97.14%) replied yes and 2 surveyors (2.86%) replied no (Figure 4.11). All surveyors (100%) felt that the tips or recipes helped staff with the equipment and food production. When asked if surveyors felt that their staff was open to learning new techniques to improve fruit and vegetable consumption, 69 surveyors (98.57%) responded that their staff was open to learning and 1 surveyor (1.43%) responded that their staff would not be open to learn (Figure 4.12). Of the 69 surveyors who reported that their staff is open to learning new techniques to improve fruit and vegetable consumption, 13 surveyors (18.84%) felt that this was because their staff was only interested in new techniques, 2 surveyors (2.90%) felt that this was because their staff believes it is solely part of the job requirement, 1 surveyor

(1.45%) felt that this was because their staff strongly believes in the importance only, 3 surveyors (4.35%) felt that their staff was interested in new techniques and felt that it was part of the job requirement, 25 surveyors (36.23%) felt that their staff was interested in new techniques and have a strong belief of importance, 1 surveyor (1.45%) felt that their staff had a strong belief of importance and felt that it was part of the job requirement, 23 surveyors (33.33%) felt that their staff was interested in new techniques, had a strong belief of importance and felt that it was part of the job requirement, and 1 surveyor (1.45%) felt that their staff was interested in new techniques, had a strong belief of importance, part of job requirement and desired student acceptance (Figure 4.13). The 1 surveyor who responded that their staff would not be open to learning new techniques reported that this was because it would be time consuming and that their staff would have a fear of added responsibility. The issues that ranked of highest importance can be measured by the number of total responses (Figure 4.14).

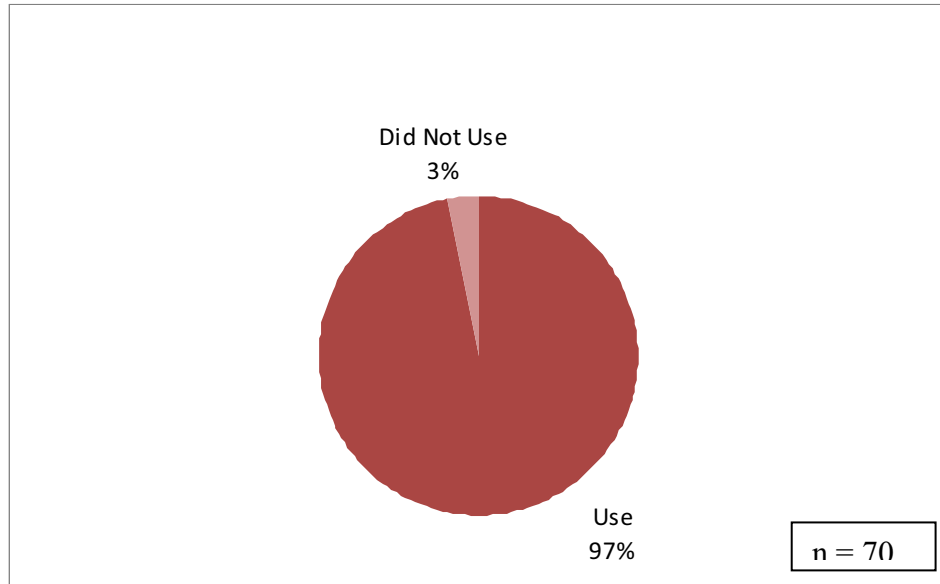


Figure 4.11

Child Nutrition Staff's Use of Recipes and Tips provided by 5\*\*\*\*\* Foods Grant Training

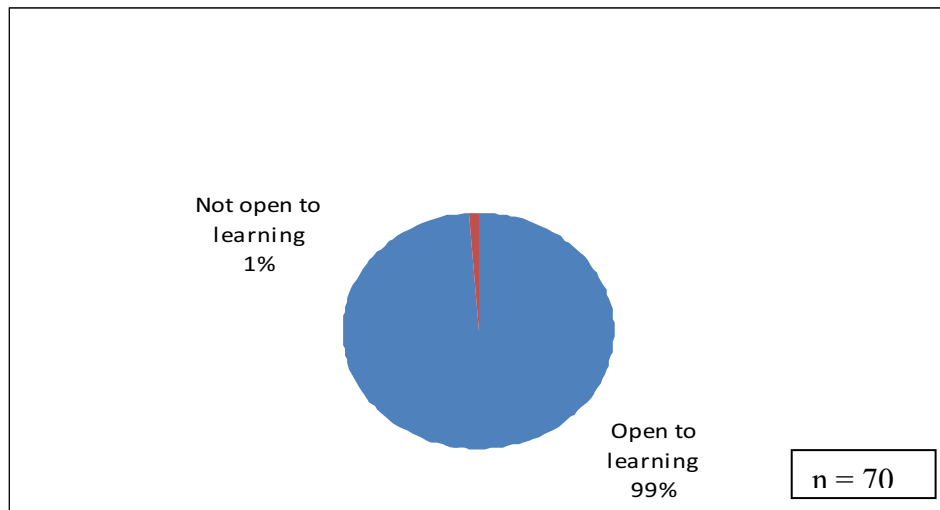


Figure 4.12

Child Nutrition Staff's Willingness to Learn New Techniques to Improve Consumption

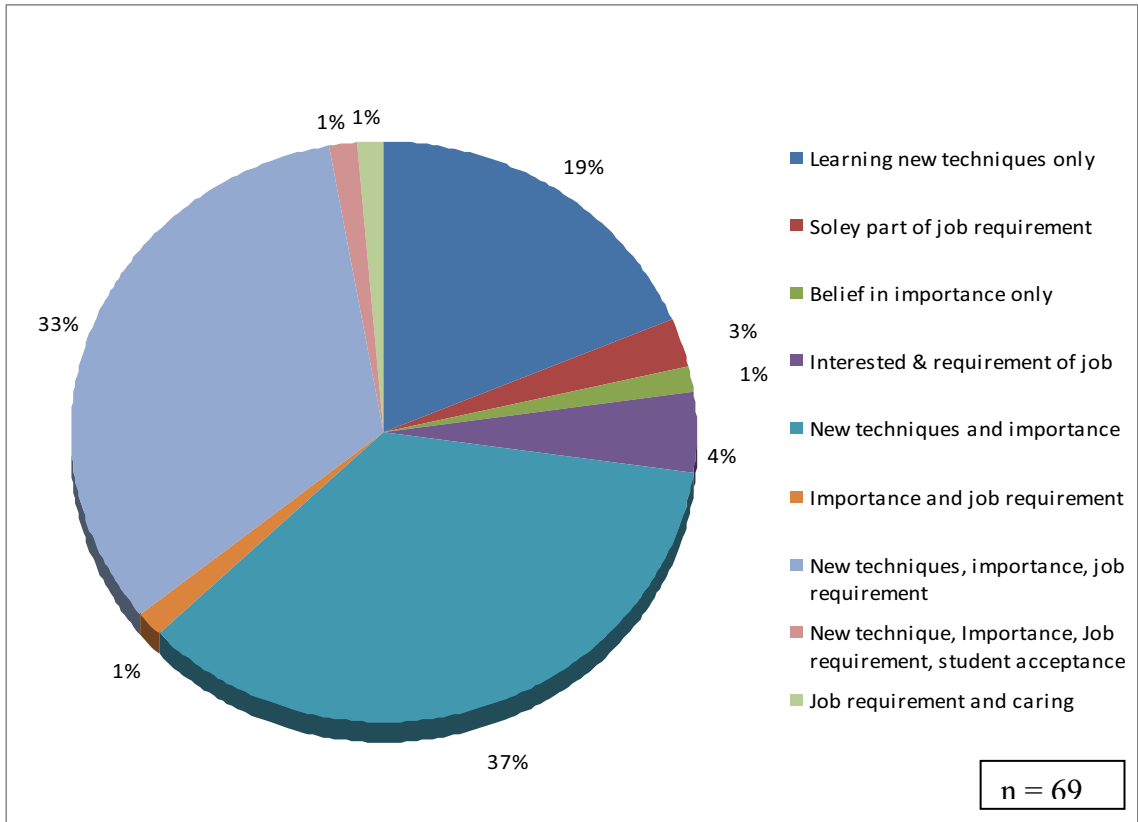


Figure 4.13

Staff Reasons for Open to New Techniques

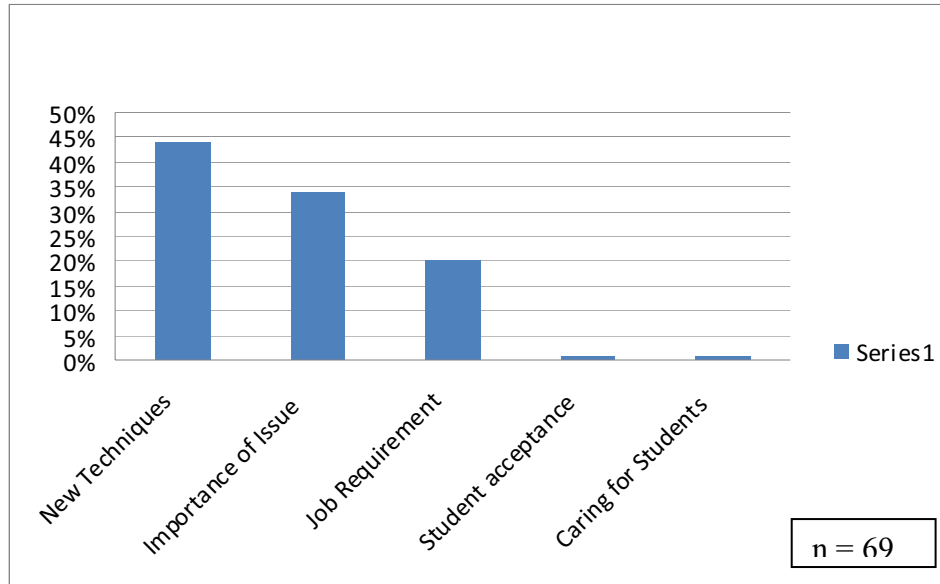


Figure 4.14

Issues by Number of Total Responses

When surveyors were asked, on average and prior to purchasing the slicer and/or sectionizer, how long it took their staff to prepare fruit and vegetable menu items for service, 5 surveyors (7.14%) responded less than thirty minutes, 31 surveyors (44.29%) responded between thirty minutes to one hour, 33 surveyors (47.14%) responded more than one hour, and 1 surveyor (1.43%) responded that their staff always served the fruit and vegetables whole in which they noticed decreased participation (Figure 4.15). When asked if the slicer and sectionizer reduced the work load on staff when preparing fruits and vegetables, 59 surveyors (84.29%) replied that the equipment did reduce work load and 11 surveyors (15.71%) replied that the equipment did not reduce work load (Figure 4.16). In turn, when asked how much time the equipment reduced when preparing fruit and vegetable menu items for services, 20 surveyors (33.33%) reported less than thirty



minutes, 38 surveyors (63.33%) reported greater than thirty minutes but less than one hour, and 2 surveyors (3.33%) reported greater than one hour (Figure 4.17).

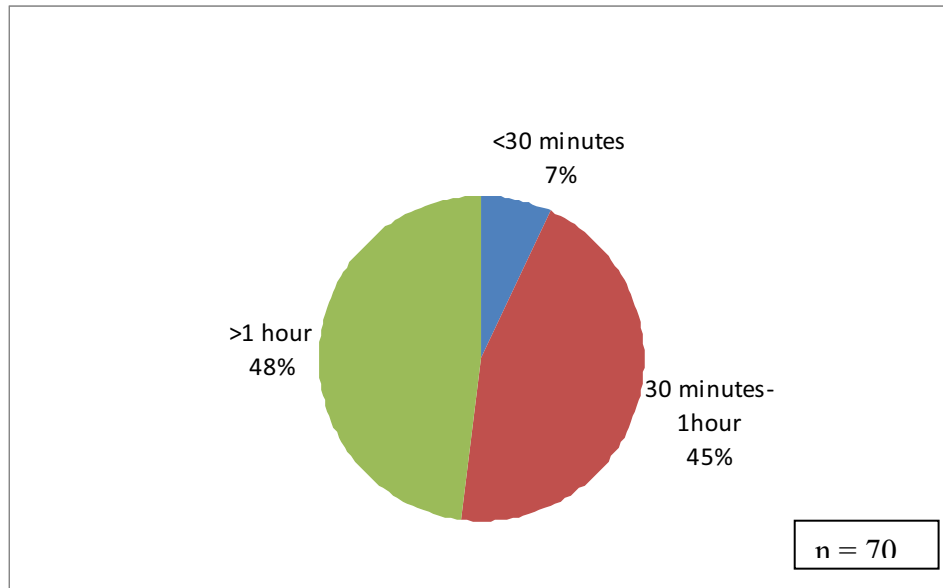


Figure 4.15

Average Reported Preparation Time Prior to Equipment

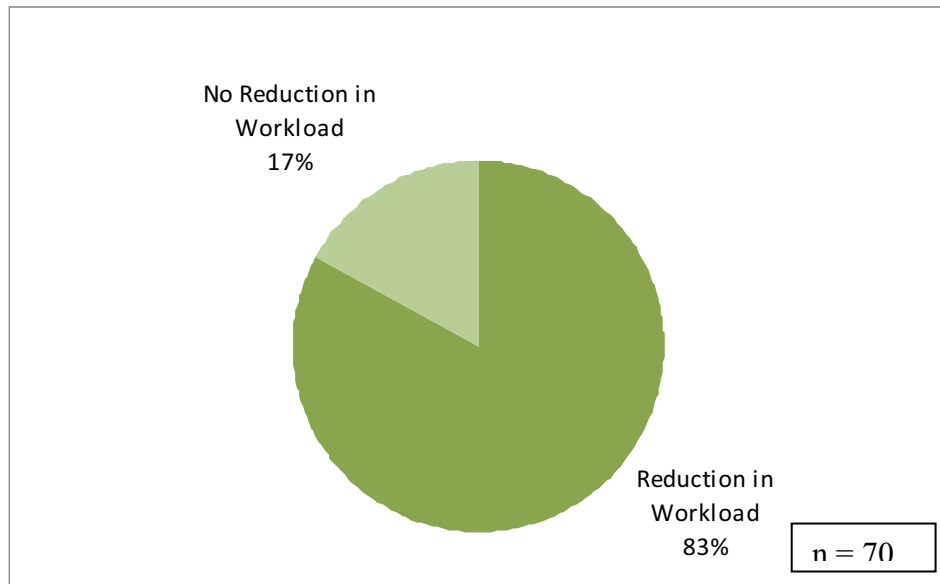


Figure 4.16

Change in Workload after Equipment

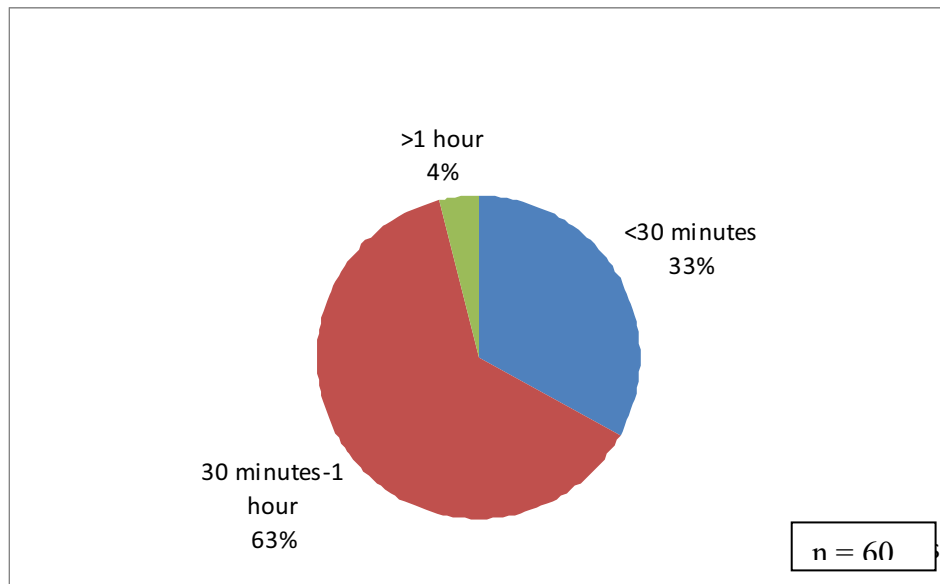


Figure 4.17

Average Reported Preparation Time after Equipment

When asked if the addition of the slicer or sectionizer increased the variety of fruits and vegetables the cafeteria is able to offer students, 51 surveyors (72.86%) replied that the equipment did increase the variety offered, 18 surveyors (25.71%) replied that the equipment did not increase the variety offered, and 1 surveyor (1.43%) had no response (Figure 4.18). Surveyors were asked to provide the types of fruits and vegetables that their cafeteria has prepared (Table 4.1).

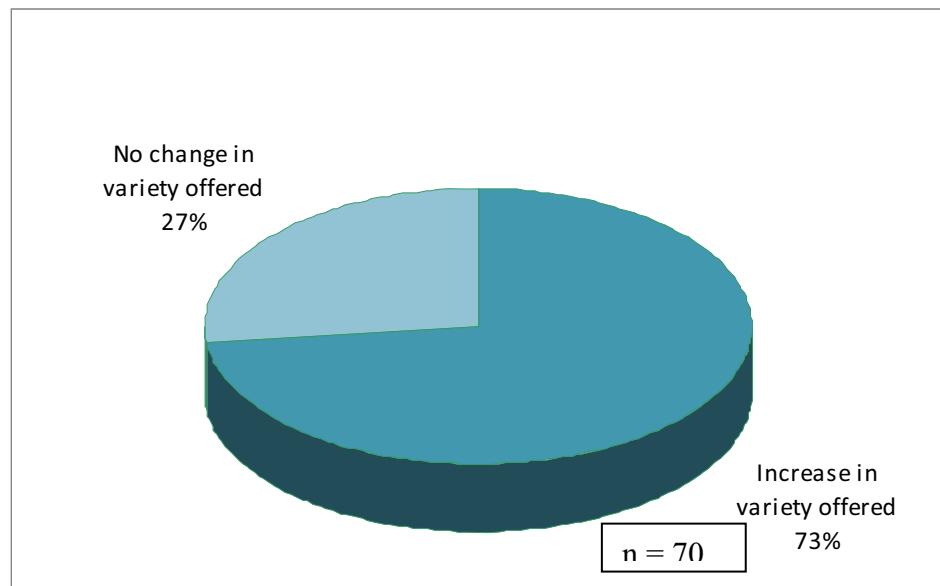


Figure 4.18

Post Equipment: Changes to Variety of Fruits and Vegetables Offered

Table 4.1

Fruits and Vegetables Reported to be prepared by the Slicer and/or Sectionizer

Apples: 68 (97.14%)	Lettuce: 18 (25.71%)
Pears: 46 (65.71%)	Pepper: 30 (42.86%)
Cantaloupe: 25 (35.71%)	Spinach: 0 (0%)
Avocados: 1 (1.43%)	Tomatoes: 62 (88.57%)
Carrots: 19 (27.14%)	Bananas: 17 (24.29%)
Ginger: 0 (0%)	Kiwi: 42 (60.0%)
Onion: 28 (40.0%)	Oranges: 65 (92.86%)
Potato: 13 (18.57%)	Cabbage: 8 (11.43%)
Zucchini: 7 (10.0%)	Cucumber: 55 (78.57%)
Strawberries: 42 (60.0%)	Mango: 1 (1.43%)
Peaches: 10 (14.29%)	Pineapple: 20 (28.57%)
Watermelon: 17 (24.29%)	Squash: 16 (22.86%)
Broccoli: 11 (15.71%)	Other: Starfruit 2 (2.86%), Honeydew 5 (7.14%)
Celery: 14 (20.0%)	Grapes 1 (1.43%), Bell Pepper 1 (1.43%)

When asked how often their staff used the slicer to prepare menu items, 3 surveyors (4.29%) responded more than once daily, 27 surveyors (38.57%) responded at least once daily, 32 surveyors (45.71%) responded two to three times per week, 5 surveyors (7.14%) responded once a week, 1 surveyor (1.43%) responded less than once a week, and 2 surveyors (2.86%) responded that they never use the slicer (Figure 4.19).

When asked how often their staff used the sectionizer to prepare menu items, no surveyors responded more than once daily, 25 surveyors (35.71%) responded at least once daily, 37 surveyors (52.86%) responded two to three times per week, 6 surveyors (8.57%) responded once a week, 1 surveyor (1.43%) responded less than once a week, no surveyors responded rarely or never, and 1 surveyor (1.43%) had no response (Figure 4.20). When asked if the slicer and/or sectionizer helped to promote creativity in fruit and vegetable presentation, 69 surveyors (98.57%) responded the equipment helped promote

creativity and 1 surveyor (1.43%) responded the equipment did not help promote creativity (Figure 4.21).

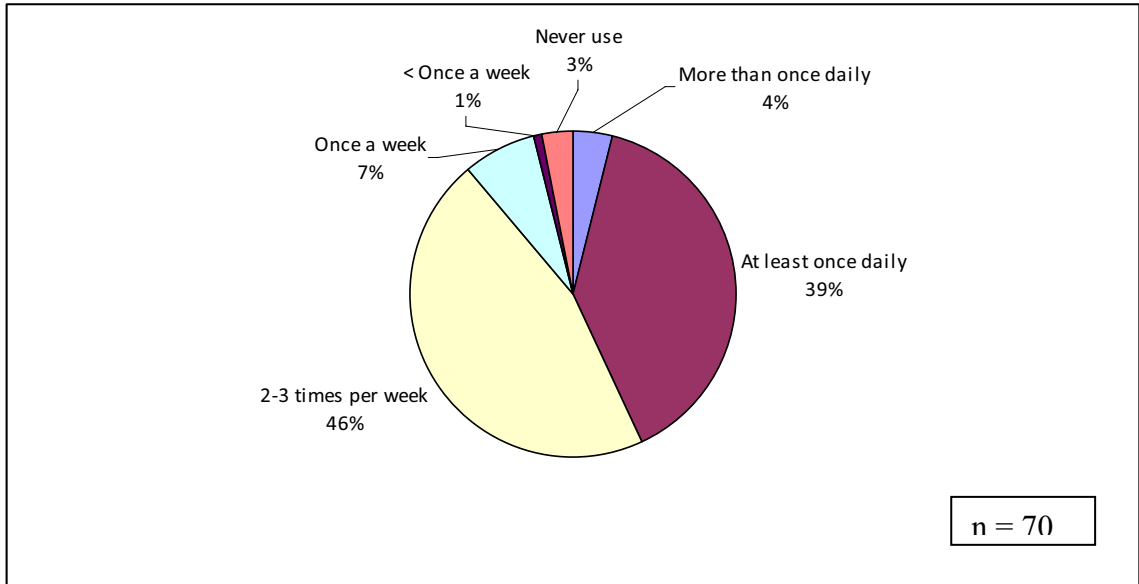


Figure 4.19

Frequency Use of Slicer to Prepare Menu Items

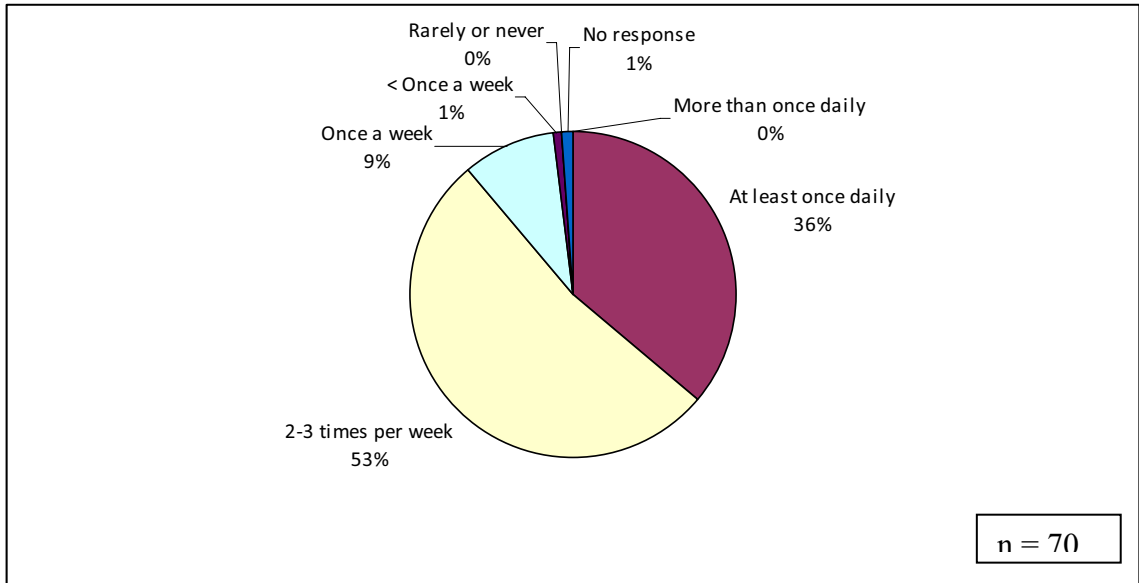


Figure 4.20

Frequency Use of Sectionizer to Prepare Menu Items

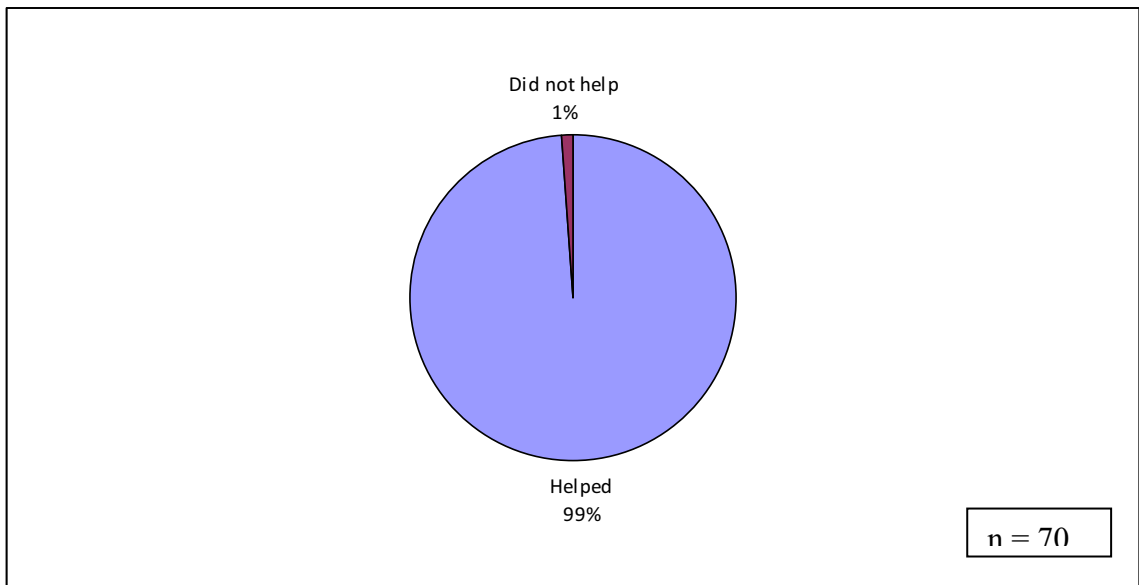


Figure 4.21

Help of Slicer and/or Sectionizer to Promote Creativity

When asked if, after receiving the slicer and/or sectionizer, any preparation and presentation changes made a difference in menu choices or preferences during the school year, 61 surveyors (87.14%) reported a difference in menu choices or preferences and 9 surveyors (12.86%) reported that there was no difference in menu choices or preferences (Figure 4.22). When asked if students were more likely to choose fruits and vegetables that had been prepared with the slicer and/or sectionizer, 67 surveyors (95.71%) felt that there was a noticeable difference in the choices made by students, 1 surveyor (1.43%) felt that there was no difference, and 2 surveyors (2.86%) did not respond (Figure 4.23). Surveyors were then asked if they would recommend the slicer and/or sectionizer to other child nutrition operations to help with the preparation of fruits and vegetables. There were 68 surveyors (97.14%) who would recommend this equipment, 1 surveyor (1.43%) who does not recommend this equipment, and 1 surveyor (1.43%) who would recommend the sectionizer and not the slicer (Figure 4.24). This surveyor responded that the slicer “needs to be more heavy duty, the blades bent easily, and it only works well on very soft skinned fruits and vegetables.”

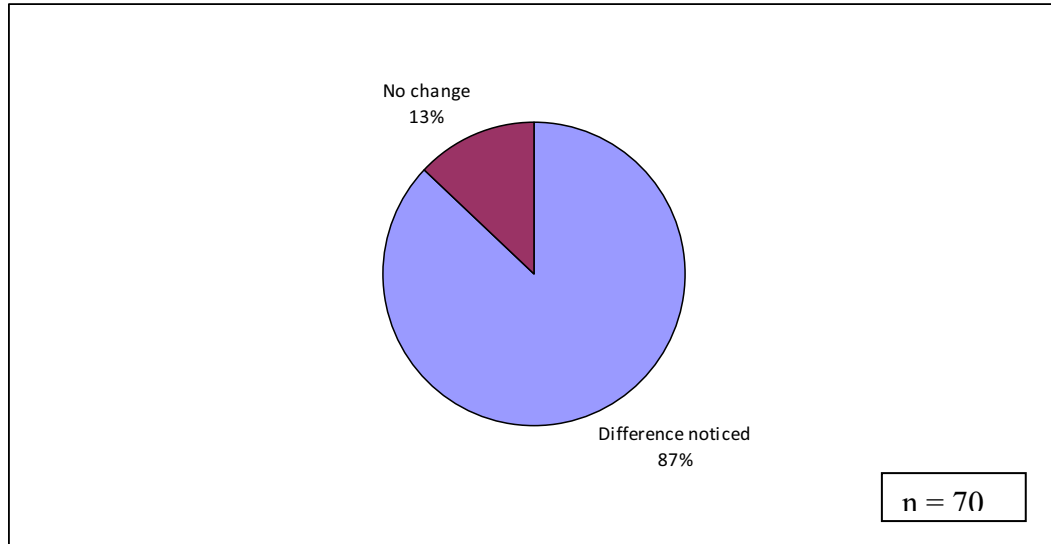


Figure 4.22

Difference in Menu Choices or Preferences due to Preparation and Presentation Changes

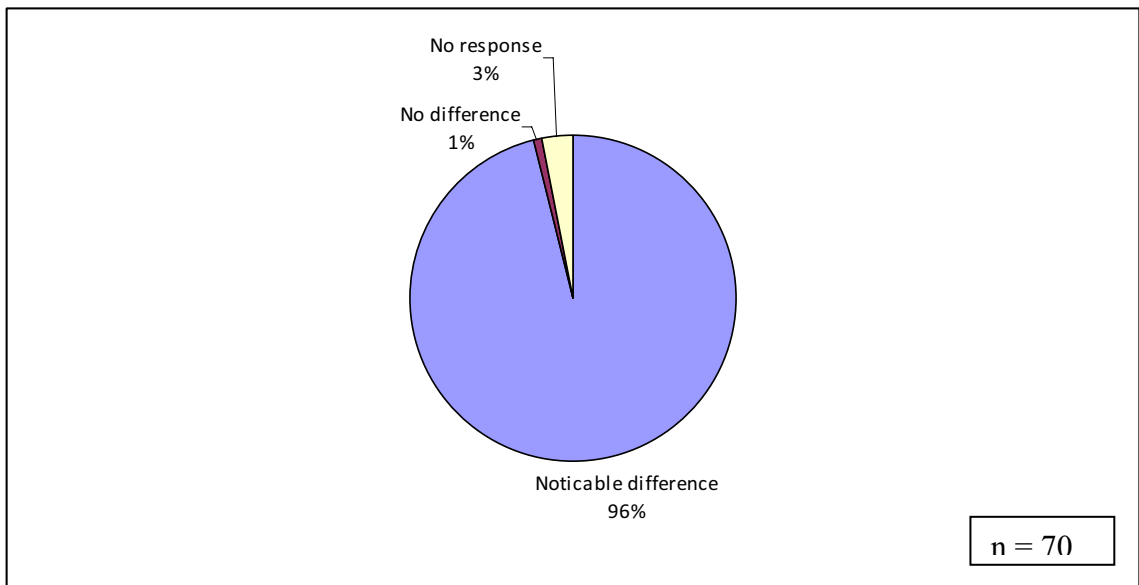


Figure 4.23

Differences Noted in Increased Likelihood of More Fruits and Vegetables Taken by Students as Prepared by the Slicer and/or Sectionizer



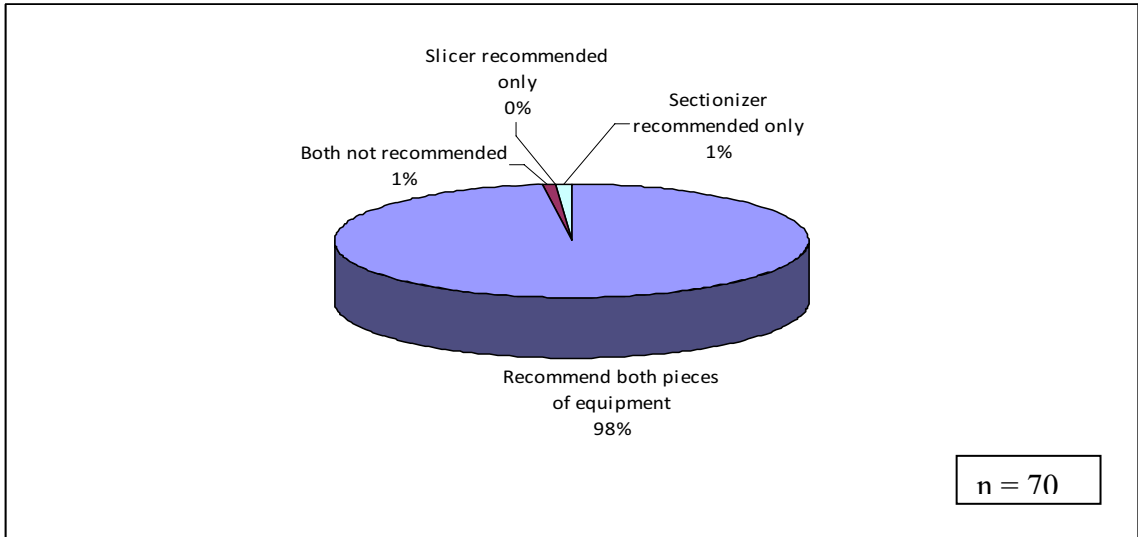


Figure 4.24

Recommendations for Equipment

## CHAPTER V

### DISCUSSION

The results of this study indicates that elementary schools were the majority of applicants for the 5\*\*\*\*\* Foods Grant. This may be due to the fact that most elementary schools are more strictly limited to the access of competitive foods compared to middle and high schools (Cullen, 2004). Therefore, their need for additional food preparation equipment may be higher as the majority of the foods served come from school meal programs. Also, the majority of schools reported that they participated in both the School Breakfast Program and the National School Lunch Program. Many of the foods provided for these programs are distributed through the U.S. Department of Agriculture and are not always ready to serve.

Several surveyors felt limited in their ability to select a variety of fruits and vegetables. The most frequent response for this was that fruits and vegetables are cost prohibitive. For many schools, buying food items in bulk from the U.S. Department of Agriculture is the best way to conserve the food budget of the school. In most cases, this is true. However, several schools do not realize that they can utilize other vendors through food contracts. Vendors such as local farmers may be available in most rural areas of the state and many fruits and vegetables that are purchasable through the U.S. Department of Agriculture may be cheaper in bulk if purchased locally. Also, fruits and

vegetables do not always have to be purchased fresh but can be just as healthful if purchased canned in water or light syrup. The most important point is that they are available to increase the likelihood of increased servings in the diets of school-aged children. Vendors interested in providing foods must also become approved vendors to bid. This may be a hindrance to some and might be why they are not providing foods to schools. Investigating ways to make this process easier, while still keeping food safe, is important and may require further investigation.

Other concerns such as limited selection and the lack of approved vendors were also important to many surveyors when providing their reasons for limited ability in selecting a variety of fruits and vegetables. These concerns could be preventable with the incorporation of a school garden. A school garden could be initiated by involving several teachers, parents and children within the school. Schools can request for parents to donate garden supplies or purchase them through local yard sales or discount stores. Seeds to grow the fresh fruits and vegetables are very inexpensive and can be purchased or donated by low income families. Teachers would be involved by educating children on the importance of fruits and vegetables while helping the children plant, fertilize and water many varieties of plants that can later be consumed during school meals.

The majority of surveyors reported that the number of fruits and vegetables purchased to serve during school mealtimes increased after purchasing the slicer and/or sectionizer. This could be due to the fact that the equipment that was purchased allowed the cafeteria workers to prepare a variety of foods that were not easy to prepare before the equipment was purchased. However, other factors must be considered. An increase in fruits and vegetables purchased may have been noticed depending on the time of year the

schools received their new equipment. Fruits and vegetables tend to be purchased more heavily during the summer months due to increased availability through vendors and a decrease in bulk cost. Also, more fruits or vegetables may have been purchased due to a price reduction due to overstock at a distribution center of the U.S. Department of Agriculture. The increase in purchased fruits and vegetables may be due to a combination of reasons. Another reason may be that once the non-edible portion of foods has been thrown away; there is a need to have more of the edible portion of foods available to meet the serving requirement.

A large number of surveyors reported that new varieties of fruits and vegetables are now offered on the serving line as a result of purchasing the slicer and/or sectionizer. Of these surveyors, most added one to three different fruits or vegetables on their school's purchase list. However, it must be noted that all surveyors reported that they would purchase a wider variety of fruits and vegetables if more options were available. Many of the surveyors who began to provide new and different varieties of fruits and vegetables shared that this was a direct result of the training they received through the requirements of the 5\*\*\*\*\* Foods Grant. The type of training provided by the grant that seemed most helpful was not reported. Therefore, it is regarded that a combination of training techniques, provided by the chef and Registered Dietitian and the Mississippi State University Extension Service Nutrition and Food Safety Agents, were helpful in this aspect.

The majority of surveyors reported that there was a noticeable increase in the amounts of fruits and vegetables selected by the students after the addition of the new equipment to their facility. However, this is where the research has several limitations.

When the survey was created and distributed, there were no requirements as to who would be expected to make reports on the changes made in the schools after the equipment was purchased and used. Several surveys were completed and returned by someone other than a food service manager, such as an assistant principal or school district food service coordinator, who may not have had direct contact with the students at mealtimes. Students should also be monitored over the course of months or years to properly evaluate the number of fruits or vegetables selected by children. This survey was distributed and asked to be returned to the researchers in a limited amount of time; therefore, not allowing time to accurately assess all of the changes that may have occurred.

The tips and recipes introduced during the 5\*\*\*\*\* Foods Grant training were used by all but two of the school's food service staff. Also, all of the staff felt that the tips and recipes became very useful when learning how to use the new equipment and maximize food production. This could be due to the fact that the food service staff was provided samples of the recipes at the training session which may have influenced their opinion on the tastefulness and ease of the techniques learned. Also, the food service staff of all but one survey reported to be open to new techniques to improve fruit and vegetable consumption. Although the reasons for this were varied, the majority of surveyors reported that their food service staff was interested in learning new techniques and that they had a strong belief that providing more fruit and vegetable options was of high importance. Responses may have been varied for a couple of reasons. The surveyor may not have had a close connection with the food service staff and responded in some way without asking for the opinions of those who work with the new equipment on a daily

basis. Also, the working conditions and environment of the food service staff may meet low standards causing the staff to have little concern over the food production in their school. Some school food service staff members have worked the same job for several years and may not prefer changes to their work schedule; even if it is a change that is implemented for the benefit of the students.

Another concern for the food service staff is the amount of time that will be spent using the slicer and/or sectionizer. This is why surveyors were asked to report the amount of time it took them to prepare fruits and vegetables before they purchased the new equipment compared to how much time it takes them to prepare these items now. The majority of surveyors reported that work load was reduced after the equipment was purchased and utilized. Before the equipment was used, the majority of surveyors reported it taking over an hour to prepare certain foods compared to only thirty minutes to an hour after the equipment was used. This is a reduction of at least thirty minutes per food item prepared for production.

According to the majority of the surveyors, the addition of the slicer and/or sectionizer did increase the variety of fruits and vegetables the cafeteria were able to offer to the students. These responses may be directly related to the number of fruits and vegetables purchased to serve during school mealtimes. Amongst various fruits and vegetables reported to be prepared by the slicer and/or sectionizer, apples were at the top of the list. This may be due to the fact that the sectionizer comes with an apple corer attachment. The corer, along with the sectionizer, make food production very easy allowing apple sections to be produced in a matter of seconds if fruit options get low on the serving line at mealtimes.

Use of the slicer and the sectionizer to prepare menu items was reported to be at least two to three times a week, according to the majority. This response could be explained with several reasons. First, the size of the school, number of students attending the school and amount of food produced daily is directly associated with the amount any piece of food service equipment is used. Small schools may only need to use this equipment once for each menu item that requires slicing or to be sectionized. However, a large school may need to use the equipment several times throughout the day according to the number of breakfast or lunch periods there are in the school day. Also, some schools who do not serve breakfast may use the equipment less than those who serve both breakfast and lunch. Whatever the case, the use of a slicer and/or sectionizer is accountable for any school that serves meals to children as a way to meet school nutrition standards.

All but one of the surveyors reported that the use of the slicer and/or sectionizer helped to promote creativity in fruit and vegetable presentation. There were many presentation styles and techniques that were provided during the training with the certified chef and registered dietitian. This training session may have been the motivation the food service staff needed to get excited about the new equipment their school was purchasing. Also, the food service staff may have become more creative to see the response of the students and to form a challenge in their workday. Both of these factors would be aimed at increasing their job satisfaction which is crucial for a healthy school food environment.

A large number of surveyors also reported that after receiving the slicer and/or sectionizer, there was a difference in menu choices or preferences. With the increased

amount of fruits and vegetables selected and purchased, along with the increase seen in creativity of these food items, it is possible that some food service staff added new recipes to the menu for their school. The majority of surveyors also reported that the change in menu choices established a change in the choices that the students made at mealtimes. Both the slicer and sectionizer were highly recommended by the majority of surveyors as equipment that would help to increase the consumption of fruits and vegetables.

There are certain limitations to this research study that needs to be defined. All reported data related to dietary-intake data were reported in a single questionnaire and it is not defined if levels of intake by students were reported during the survey period only or provided based on long time inspection. Certainly possible memory and recording errors could have occurred. Second, this is not a randomly assigned experiment and there was no control group. Factors not measured in this study, such as nutrition education interventions, may have influenced the changes in food consumption noted by the surveyors. Also, plate waste was not taken into account for the amount of fruits and vegetables actually consumed. Students may have taken more fruit from the serving line; however, this does not indicate that the fruits or vegetables were actually consumed. More research is needed to identify the amounts of fruits and vegetables students take from the serving line at mealtimes compared to the amount that is consumed and not regarded as plate waste. If students are encouraged to take and eat more fruits and vegetables at school, this may help to increase the prevention of obesity and other chronic diseases. Training of food service staff along with better food presentation techniques may have an impact on fruit and vegetable selection by students. Provisions for specific



equipment, such as a slicer or sectionizer, in preparing fruits and vegetables may maximize staff productivity and increase staff creativity in preparation. Using equipment designed to enhance the appearance of fruits and vegetables or increase convenience of these types of foods in school food service operations may increase consumption of fruits and vegetables provided to children through child nutrition programs.

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APPENDIX A

5\*\*\*\*\* FOODS GRANT FINAL EVALUATION SURVEY

5\*\*\*\*\* Foods Grant

**Mississippi Department of Education**  
**The Bower Foundation**  
**Health is Academic**  
**5\*\*\*\*\* Foods Grant**  
**Final Evaluation Survey**

**(Your participation in this survey helps researchers to better understand the impact of certain projects and grants and your input may be used to strengthen the importance of other future grant opportunities. We appreciate your time and input as this survey fulfills part of your 5\*\*\*\*\* Foods Grant obligation.)**

**I. Demographic Information**

(please complete)

Your Name: \_\_\_\_\_

Your Title: \_\_\_\_\_

Phone Number \_\_\_\_\_ Fax Number \_\_\_\_\_

School District \_\_\_\_\_

Intervention School \_\_\_\_\_

(If more than one was awarded for your district and equipment was placed in multiple schools, please have each school awarded complete a separate form.)

Number of students, faculty, and staff in your school(s): \_\_\_\_\_

**II. Questionnaire**

(Please answer each of the following questions as they apply to you or your facility.)

**A. Cafeteria Demographics**

1. What grade levels does the cafeteria that received the grant currently serve? (If your school covers more than one answer please circle all that apply.)

Elementary

Middle

High

2. At which of the following times during the school day do you utilize equipment purchased from the 5\*\*\*\*\* grant in your food service operation: (Please circle all that apply.)

Breakfast

Lunch

After-school snacks

None

**B. Purchasing of Fruits and Vegetables**

3. Do you or your staff feel that currently your child nutrition office is limited in your ability to select a variety of fruits and/or vegetables to offer your students?

Yes

No

If yes, what barriers have you encountered regarding selecting fruits and vegetables to offer? (please circle all that apply)

Limited selection

Cost Prohibitive

Lack of approved vendors

Lack of preparation knowledge

Concern about spoilage

Concern of unnecessary waste due to non-selection

Other



5\*\*\*\*\* Foods Grant

4. On average, how would you describe your purchasing patterns of fruits and vegetables as a result of adding the slicer and sectionizer to your facility?

Increased purchasing of both fruits and vegetables

Increased purchasing of fruits only

Increased purchasing of vegetables only

Did not change purchasing patterns

5. Have you offered any NEW varieties of fruits or vegetables to your students that you had not previously offered prior to adding this equipment to your facility?

Yes, we have added new varieties of fruits and/or vegetables to our menu

No, we have not added new varieties of fruits and/or vegetables to our menu

If you answered yes, how many different varieties of fruits or vegetables did you add to your menu?

7 or more fruits and vegetables

4-6 fruits and vegetables

1-3 fruits and vegetables

Was the addition of these NEW fruits and vegetables a result of the training you received as part of the 5\*\*\*\*\* grant?

Yes

No

6. If available, would you consider offering new fruit and vegetable selections to your menu?

Yes

No

5\*\*\*\*\* Foods Grant

7. On average, were you able to see an increase in fruits and vegetables selected by students after adding this equipment to your facility?

Yes, students selected more fruits and vegetables

No, students selected the same number of servings as before

No, students selected less fruits and vegetables than before

If you answered yes, could you quantify the percentage increase in fruits and vegetables you observed after receiving the equipment?

50% or greater

25%-50% increase

10%-25% increase

10% or less

**C. Training and Delivery**

8. Have you or any of your staff used the tips or recipes introduced during the training?

Yes

No

9. Do you feel that the tips or recipes helped you or your staff with your equipment and food production?

Yes

No

5\*\*\*\*\* Foods Grant

10. Do you feel that your staff members are open to learning new techniques to help improve fruit and vegetable consumption?

Yes

No

If yes, why? (Please circle all that apply.)

Interested in new techniques

Strong belief of importance

Part of job requirements

Other: \_\_\_\_\_

If no, why not? (Please circle all that apply.)

Lack of interest in learning

Don't believe in importance

Time consuming

Fear of added responsibility

Other: \_\_\_\_\_

**D. Equipment Use and Food Preparation (only answer if you purchased the Edlund Slicer and Sunkist Sectionizer or similar equipment)**

11. On average, prior to having the slicer and sectionizer, how long did it take your staff to prepare fruit and vegetable menu items for service?

Less than 30 minutes

Between 30 minutes to 1 hour

More than 1 hour

12. Has the slicer and sectionizer reduced the work load on your staff when preparing fruits and vegetables?

Yes

No

13. If yes, on average how much has this equipment reduced the time it takes your staff to prepare fruit and vegetable menu items for service?

Less than 30 minutes

Greater than 30 minutes but less than 1 hour

Greater than 1 hour

5\*\*\*\*\* Foods Grant

14. Has the addition of the slicer or sectionizer increased the variety of fruits and vegetables (ie. new products or new preparation techniques) your cafeteria staff is able to offer students?

Yes

No

15. What fruits and/or vegetables have you prepared with the slicer and sectionizer? (Please circle all that apply.)

Apples

Strawberries

Bananas

Pears

Peaches

Kiwi

Cantaloupe

Watermelon

Oranges

Avocados

Broccoli

Cabbage

Carrots

Celery

Cucumber

Ginger

Lettuce

Mango

Onion

Pepper

Pineapple

Potato

Spinach

Squash

Zucchini

Tomatoes

Other: \_\_\_\_\_

16. How often do you or your staff use the slicer? (circle one)

More than once daily

At least once daily

2-3 times per week

Once a week

Less than once a week

Rarely

Never

5\*\*\*\*\* Foods Grant

17. How often do you or your staff use the sectionizer? (circle one)

More than once daily

At least once daily

2-3 times per week

Once a week

Less than once a week

Rarely

Never

18. Did the slicer and/or sectionizer help to promote creativity in fruit and vegetable presentation in your facility?

Yes

No

**F. Equipment Evaluation**

19. Once you received the slicer and sectionizer, did preparation and presentation changes make a difference in the menu choices or preferences during the school year?

Yes

No

20. Did you notice if students were more likely to choose fruits and vegetables that had been prepared with either the sectionizer or slicer?

Yes

No

21. Would you recommend this equipment to other Child Nutrition operations to help with the preparation of fruits and/or vegetables?

Yes

No

**This completes the survey for the 5\*\*\*\*\* Foods Grant. We sincerely thank you for your time and completion of the survey. The information you have provided will strengthen our research and knowledge.**

APPENDIX B

5\*\*\*\*\* FOODS GRANT FORM OF CONSENT

Dear 5\*\*\*\*\* Grant Participants:

The Mississippi State University Department of Food Science, Nutrition and Health Promotion along with the Mississippi Department of Education Office of Healthy Schools and The Bower Foundation are working together to determine the impact the 5\*\*\*\*\* grant had on you, your staff, and your students. We are requesting your input to help us understand how this equipment changed production and selection of fruit and vegetables in your school and how acceptance of fruit and vegetables were changed as a result of the equipment.

We would greatly appreciate your participation by completing the attached survey and returning it within ten days to Brent Fountain. To expedite return of your information, you may send your survey results as an attachment via email to [bjf2@msstate.edu](mailto:bjf2@msstate.edu). If you desire not to email your information, you may print the survey and mail it to:

Brent Fountain, PhD, RD, LD  
Assistant Extension Professor  
Department of FSNHP  
PO Box 9805  
Mississippi State, MS 39762

This survey serves as part of the evaluation for the 5\*\*\*\*\* grant. We estimate that the approximate time to complete this evaluation to be thirty minutes or less. Completion of the survey is required as a component of the grant. In addition to using the responses from this survey to evaluate the 5\*\*\*\*\* grant, we'd also like to use the results for research purposes. Although your participation in the evaluation is a required component of the grant, it is your choice whether to have your data included in the research component of the project. Neither you nor your school will be penalized for declining use of your information for research.

Please be assured that your responses will be held in the strictest confidence. We expect any risks or discomfort of completing the survey to be minimal; however depending on your responses, there could be some risk to your reputation if there were a breach of confidentiality. In an attempt to prevent that risk, we will take the following steps to protect the confidentiality of your responses. Once received, your survey will be compiled with the surveys from other respondents to perform a combined statistical analysis of results. All surveys will be stored in a locked file cabinet and destroyed immediately after the data are recorded and the results are verified. Results of this study written for publication will offer no identifying information of those completing the survey.

By participating in this study, you are providing information that will be beneficial to potential funders regarding the possibility of new grants in this and similar areas. The study may also be helpful in increasing our understanding of the importance of such grants in providing food to children, through programs such as yours.

If you have any questions about this study, you can contact the person(s) below:

Principal Investigator:  
Brent Fountain, PhD, RD, LD  
Department of Food Science,  
Nutrition and Health Promotion  
Mississippi State University  
(662) 325-0849  
[bjf2@msstate.edu](mailto:bjf2@msstate.edu)

Graduate Student:  
Jayme Potts, Dietetic Intern  
Department of Food Science,  
Nutrition and Health Promotion  
Mississippi State University  
(478) 731-2042  
[jlp498@msstate.edu](mailto:jlp498@msstate.edu)

This study has been reviewed and approved by Mississippi State University's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Graduate Student listed above. If you have any questions regarding your rights as a research subject, please contact the IRB at 662-325-2238.

MSU IRB  
Approved: 09/09/08  
Expires: 08/15/09

Please initial your choice and sign below to indicate whether we may use your survey responses for research purposes:

\_\_\_\_ I give permission for my survey information to be included in any research related to this evaluation.

\_\_\_\_ I do not give permission for my survey information to be included in the research related to this evaluation.

Printed name: \_\_\_\_\_

Participant signature: \_\_\_\_\_

Date: \_\_\_\_\_

Sincerely,



Brent J. Fountain, PhD, RD, LD  
Assistant Extension Professor, Nutrition  
Department of Food Science, Nutrition, and Health Promotion