**A Study of the Impact of the Fresh Fruit and Vegetable Program in Alabama Schools**

by

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Abstract

This study examined the fruit and vegetable intake of a large sample of Alabama school children in elementary schools receiving fifty percent or more free or reduced priced lunch who qualify for the Fresh Fruit and Vegetable Program. The results of this study provide insight as to whether access to a variety of fresh produce, in additional to nutrition education during the school day, affects students' food choices.

The investigator sought to answer the following questions: (1) What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools? (2) Does school involvement with the FFVP significantly increase student's nutrition knowledge? (3) Are students in FFVP schools more likely to try new foods when they are offered at school? (4) Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

Findings revealed that students at FFVP (intervention) schools appear to have sampled a greater variety of fruits and vegetables and were slightly more likely to report consuming healthier snacks compared to students in non-FFVP (control) schools. However, there was no difference in the types of fruits or vegetables students reported consuming over the course of one week. Neither group reported consuming more than five different types of fruits or vegetables in one week.

Students in both groups appear to be receiving nutrition education during the school day. The results suggest that the majority of students in both groups are knowledgeable about which foods are healthier than others and can use that knowledge to make healthy food choices when presented with healthy options.

The majority of students in both groups reported that they liked trying new foods at school; however, FFVP participants were slightly more likely to report that they enjoy trying new foods when offered at school. There appears to be no difference in the types of fruits or vegetables consumed at home by treatment or control groups. Control group students were more likely to report wanting to try a greater variety of fruits and vegetables at home.

The investigator concluded that there is a need for further examination of Alabama's Fresh Fruit and Vegetable Program. Student food preferences, nutrition knowledge, and the types of foods consumed at school and at home were similar between groups. The questionnaire produced consistent answers from students in study and control groups providing insight into the eating habits and behaviors of third and fourth grade students across Alabama. Student responses recorded in this study can be incorporated into planning future Fresh Fruit and Vegetable Programs.

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| | |
|---|---|
| FFVP | Fresh Fruit and Vegetable Program |
| FFV | Fresh Fruit and Vegetable Program (Study Group) |
| Non-FFV | Non-Fresh Fruit and Vegetable Group (Control Group) |
| MS | Maria Sanchez School Lunch Survey |
| TAF | Thinking about Food Survey |
| EM | Eater Meter Survey |

## Chapter I: Introduction

In an effort to improve the diet of the nation's most impoverished children, the USDA created the Fresh Fruit and Vegetable Program (FFVP). The goal of this program is to boost fruit and vegetable intake among elementary students by providing free fresh fruits and vegetables to children in addition to their normal school meals. The FFVP was tested as a trial program in 2002. Its success lead to the creation of a nationwide program initiated by the Food, Conservation, and Energy Act of 2008 (PL 110-234).

By directive of the FFVP's authorizing legislation (National School Lunch Act, section 19, 42 U.S.C. 1769a), FFVP funds are given "to schools with the highest percentages of low-income students, to the maximum extent practicable (Sec. 19, 3-110)." This mandate was imperative to develop an impact analysis of the program. Qualifying school systems are to receive $50 to $75 per student per school year, or between $1 and $2 per week. Since the inception of the program, funding levels have increased, permitting additional schools to join. Funding has grown from $40 million for the 2008–2009 school year to $65 million, $101 million, and $150 million, respectively, in the following three school years. Funding is expected to continue at the current level with increases reflecting inflation expenses.

The USDA recommends that school-age children consume six to thirteen serving of fruits and vegetables each day. The average child in the U.S. consumes three and a half servings of fruits and vegetables per day (Jamelske et al., 2008). Children of low socioeconomic status

consume less produce than children of higher socioeconomic status. In addition, low socioeconomic status is linked to obesity in children (McLaren, 2007). Currently, thirteen million children and teens are considered obese (Ogden et al., 2010). Obese teens are 80% more likely to become obese adults than their normal weight peers. Obese adults are at greater risk for developing chronic illnesses such as diabetes and heart disease (Guo et al., 1999).

Limited income families tend to replace fruits and vegetables with less expensive high-fat, high-starch foods, which in turn leads to weight gain and obesity. A study by Epstein et al. (2001) found that increasing fruit and vegetable intake decreased the fat and sugar intake of children and their parents. The public health issue of childhood obesity has forced policy makers to impose healthier diets on children in public schools. Since low income children consume most of their foods at school, it is the most likely place to reach the masses. The Fresh Fruit and Vegetable Program is the government's answer to the healthy eating issue. If children are exposed to a variety of fruits and vegetables in their early years, hopefully they will develop a taste for more nutrient-rich foods.

The goal of the FFVP (USDA, FNS, 2010) is to:

- Create healthier school environments by providing healthier food choices.
- Expand the variety of fruits and vegetables children experience.
- Increase children's fruit and vegetable consumption.
- Make a difference in children's diets to impact their present and future health.

This program is crucial to tackling childhood obesity by modeling positive behavior changes while teaching children healthy eating habits. The FFVP is an instrumental force to familiarize students with a larger selection of produce than they may ever have the chance to sample without the FFVP's assistance. By tasting different foods and by being educated about

the nutritional benefits of these foods, students will begin to make healthier food choices at home, as well as, in school (USDA, FNS, 2010).

To be selected for the Program schools must:

- Agree to make free fresh fruits and vegetables available to all enrolled children
- Provide fresh fruits and vegetables during the school day
- Widely publicize within the school the availability of free fresh fruits and vegetables
- Have documented support of the food service manager, principal, and district superintendent
- Serve a high number of low-income children. The schools selected must have a high percentage of low-income children as determined by approved free and reduced price meal applications (at least 50% free and reduced) (USDA, FNS, 2010).

**Statement of the Problem**

Healthy People 2020 set a goal to decrease the incidence of obesity among children and adolescents in the U.S. by ten percent (DHHS, 2011). Figures from the ongoing National Health and Nutrition Examination Surveys (NHANES) show no improvement in obesity rates among U.S. children and adolescents from 1999-2000 through the most recent time period for which data are available (2007-2008). The statistics from 2007-2008 reveal an obesity rate of 16.9 percent among children and adolescents. Their findings were significant in identifying lower socioeconomic children and adolescents as the most likely individuals to be overweight or obese (Gordon-Larsen et al., 2003; Ogden et al., 2010; Wang & Zhang, 2006). Earlier studies on school-based interventions can be narrowed to moderately small, random-assignment investigations and controlled clinical trials. Data from these studies primarily examines local or regional interventions with reasonably small sample sizes.

This study examines the fruit and vegetable intake of a large sample of Alabama school

children in elementary schools receiving fifty percent or more free or reduced priced lunch who qualify for the Fresh Fruit and Vegetable Program. The results of this study provide insight as to whether access to a variety of fresh produce, in additional to nutrition education during the school day, increases children's intake of fruits and vegetables after program completion.

Epidemiologic studies indicate that greater consumption of fruits and vegetables is connected with a decline in long-term obesity risk (He et al., 2004). The water and fiber content of fruits and vegetables is thought to contribute to lower overall dietary energy density and total energy intake, especially when additional fruits and vegetables are incorporated into the diet. In agreement with this hypothesis, experimental interventions supplementing fruits and vegetable intake have verified short-term success in reducing body weight in some cases. This was particularly true when participants were encouraged to reduce dietary fat and/or overall energy intake (Carlton-Tohill, 2007; Jebb, 2005; Rolls et al., 2004). Furthermore, epidemiologic and cohort studies have without fail shown an association between increased fruit and vegetable intake and decreased risk of heart disease and some cancers (Dauchet et al., 2006; Riboli & Norat, 2003; Steinmetz & Potter, 1996).

In spite of documented health benefits associated with eating fruits and vegetables, alarmingly few children and adolescents consume five or more servings a day. Under-consumption is most prevalent among younger children (Guenther et al., 2006).

The majority of a low-income child's waking hours are spent in school. Therefore, the meals and snacks they are served during the school day comprise the bulk of their daily consumption of food and nutrients (DHHS, 2007; Lin et al., 1999). Schools have the burden of providing students the healthiest diet possible, which includes seeing that children receive boosted amounts of fruits and vegetables (French, 2005; Kubik et al., 2003; Wechsler et al.,

2000).

Through the School Breakfast Program and the National School Lunch Program, the federal government has long had a major role in school nutrition policy and child food consumption. The Healthy, Hunger-Free Kids Act of 2010 (P.L. 111-296) seeks to improve the nutritional content of school meals through performance-based reimbursement rates and simplified eligibility criteria, as well as by providing additional funding for Farm to School and school garden programs.

**Purpose of the Study**

The purpose of this study was to assess the Fresh Fruit and Vegetable Program (FFVP), a federal intervention program designed to increase consumption of fresh fruits and vegetables among school-aged children. Elementary schools in Alabama that participate in the FFVP will be matched with schools that did not participate in the 2013-2014 and 2014-2015 school years. This study assessed the impact of the program on students' fruit and vegetable intake.

**Research Questions**

The following research questions were used in the study:

1. What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools?
2. Does school involvement with the FFVP significantly increase student’s nutrition knowledge?
3. Are students in FFVP schools more likely to try new foods when they are offered at school?

4. Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

**Significance of the Study**

The measurement of fruit and vegetable consumption in the FFVP is important because population dietary changes are generally small and incremental. While there is no consensus as to what constitutes a meaningful change in fruit and vegetable intake, it is generally accepted that children with the lowest intakes are at greatest risk of poor health outcomes, and that the greatest benefit would be conferred by increasing intakes of fruits and vegetables among this group (USDA & DHHS, 2010).

Further, children from socioeconomically disadvantaged families tend to have the lowest intakes of fruits and vegetables (Darmon and Drewnowski, 2008; Dubowitz et al., 2008; Krebs-Smith et al., 1996; Lorson et al., 2009). By targeting poorer schools, the FFVP specifically targets this at-risk group. Thus, increasing fruit and vegetable intakes in this population even by small amounts is likely to confer a health benefit.

**Limitations**

1. This study is limited to elementary school students who participate in the USDA National School Lunch Program in the state of Alabama.
2. The results of this study may not be representative of students in other regions of the United States.
3. Only children who choose to participate in the survey will be included in the sample. These children may be more inclined to participate in school activities.
4. Some limitations of impact estimates are inherent both in the evaluation design and in features of FFVP, as legislatively mandated and implemented in

participating schools.

5. There may be differences in student characteristics across treatment and comparison schools.
6. It is conceivable that there is strong variation of food consumption among elementary school children.

**Assumptions**

1. The students involved in this study are representative of students in low-income areas of the Southeastern United States.
2. Students will answer survey questions honestly and consistently.
3. Fresh fruit and vegetable distribution programs provide the opportunity for students to taste a variety of fruits and vegetables, and improve consumption of these foods by adolescents.

**Definitions**

Child Nutrition and WIC Reauthorization Act of 2004: The success of the pilot led to the enactment of legislation in 2004 to expand the Fresh Fruit and Vegetable Program and to make it a permanent program under the National School Lunch Act. The law added four additional states (Washington, North Carolina, Mississippi Pennsylvania and two ITOs (one in Arizona and one is South Dakota) for School Year 2004- 2005.

Consolidated Appropriations Act of 2008: The Consolidated Appropriations Act of 2008 expanded the FFVP nationwide and provided approximately $9.9 million to begin program operations for School Year 2008- 2009.

Farm Security and Rural Investment Act of 2002: The Fresh Fruit and Vegetable Program began as a pilot project authorized by Congress in 2002. The pilot provided funds to

purchase fresh fruits and vegetables in four States (Indiana, Ohio, Michigan and Iowa) and an Indian Tribal Organization (ITO) (New Mexico) for School Year 2002- 2003. The purpose of the pilot was to determine the best practices for increasing fruit (both fresh and dried) and fresh vegetable consumption.

Fresh Fruit and Vegetable Program (FFVP): The Fresh Fruit and Vegetable Program (FFVP) provides all enrolled students in participating elementary schools with a variety of free fresh fruits and vegetables throughout the school day—separate from the lunch or breakfast meal in one or more areas of the school. The program's main goal is to combat childhood obesity by helping students learn more about healthful eating habits.

Healthy, Hunger-Free Kids Act of 2010 (HHFKA**)** authorizes funding and sets policy for USDA's core child nutrition programs: The National School Lunch Program, the School Breakfast Program, the Special Supplemental Nutrition Program for Women, Infants and children (WIC), the Summer Food Service Program, and the Child and Adult Care Food Program. The Healthy, Hunger-Free Kids Act allows USDA, for the first time in over 30 years, opportunity to make real reforms to the school lunch and breakfast programs by improving the critical nutrition and hunger safety net for millions of children.

National School Lunch Act (79 P.L. 396, 60 Stat. 230) is a United States federal law signed by President Harry S. Truman in 1946. The act created the National School Lunch Program (NSLP), a program to provide low-cost or free school lunch meals to qualified students through subsidies to schools. The program was established as a way to prop up food prices by absorbing farm surpluses, while at the same time providing food to school age children.

The Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2006: This Act appropriated one- time funding of $6 million to further expand the Fresh Fruit and Vegetable Program in six additional States.

The Food, Conservation, and Energy Act of 2008 (Farm Bill): The Food, Conservation and Energy Act of 2008 amended the Richard B. Russell National School Lunch Act by adding section 19, *the Fresh Fruit and Vegetable Program*. Section 19 permanently authorizes the program nationwide, and provides significant funding increases, beginning with $40 million in FY 2009 and growing to $150 million and adjusted by annual changes in the Consumer Price Index (CPI).

United States Department of Agriculture (USDA): The United States Department of Agriculture (USDA), also known as the Agriculture Department, is the U.S. federal executive department responsible for developing and executing federal government policy on farming, agriculture, forestry, and food. It aims to meet the needs of farmers and ranchers, promote agricultural trade and production, work to assure food safety, protect natural resources, foster rural communities and end hunger in the United States and internationally.

**Organization of the Study**

Chapter 1 provided the introduction of the study, discussed the research problem, described the purpose of the study, explained the significance of the study, listed the primary research questions, detailed the limitations and assumptions of the study, and defined key terms. Chapter 2 includes a review of literature concerning the background and history of the Fresh Fruit and Vegetable Program, Fresh Fruit and Vegetable Program studies, related programs, and supporting articles.

Chapter 3 describes the design of the study, which includes the population and sample,

instrumentation, data collection, and data analysis. Chapter 4 discusses the research findings. Chapter 5 summarizes the study and provides conclusions, implications, and areas for further research.

## Chapter II: Review of Literature

In an effort to improve the diet of the nation's most impoverished children, the USDA created the Fresh Fruit and Vegetable Program (FFVP). The goal of this program is to boost fruit and vegetable intake among elementary students by providing free fresh fruits and vegetables to children in addition to their normal school meals. Chapter 2 will explore the background and history of the program, funding and regulations, existing FFVP studies, and related fruit and vegetable promotion programs.

### Purpose of the Study

The purpose of this study was to assess the Fresh Fruit and Vegetable Program (FFVP), a federal intervention program designed to increase consumption of fresh fruits and vegetables among school-aged children. Elementary schools in Alabama that participate in the FFVP will be matched with schools that do not participate in the 2013-2014 and 2014-2015 school years. This study assessed the impact of the program on students' fruit and vegetable intake.

### Research Questions

The following research questions were used in the study:

1. What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools?
2. Does school involvement with the FFVP significantly increase student's nutrition knowledge?

3. Are students in FFVP schools more likely to try new foods when they are offered at school?
4. Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

**Background and History of the Program**

Congress originally created the Fresh Fruit and Vegetable Program through the 2002 Farm Bill as a time-limited pilot project in 25 schools in four states (Indiana, Iowa, Michigan, and Ohio) and in seven schools of the Zuni Indian Tribal Organization (ITO) in New Mexico (USDA, FNS, 2010). An evaluation report of the pilot program issued in May 2003 showed positive reactions to the program by both students and teachers. Participating students consumed a larger variety of fresh fruits and vegetables than students who were not participating in the program, and began to positively influence their families' eating habits. Schools reported that students were eating more fruits and vegetables, had better thinking skills, could concentrate longer, were not as famished, had fewer visits to the health room, and were much better behaved (Olsho, et al., 2011).

The 2004 Child Nutrition and WIC Reauthorization Act made the program permanent and expanded it to include 25 schools in four additional states and two more Indian Tribal Organizations. The four additional states were: Mississippi, Pennsylvania, North Carolina, and Washington. The two additional ITO's were the Inter Tribal Councils of Arizona (representing the Pima and Tohono O'odham communities) and South Dakota (the Oglala Sioux Tribe of the Pine Ridge Reservation) (USDA, FNS, 2010).

The Fiscal Year 2006 Agriculture Appropriations Act broadened the program by adding six new states: (Connecticut, Idaho, New Mexico, Texas, Utah, and Wisconsin), bringing the

total number of states in the program to 14. The Fiscal Year 2008 Omnibus Spending Bill expanded the program to all states, the District of Columbia, Guam, Puerto Rico and the Virgin Islands beginning in the 2008-2009 school year (USDA, FNS, 2010).

The 2008 Farm Bill made it possible to offer the FFVP nationwide, addressing the nutritional needs of low-income children. The program was revised to target elementary schools with at least 50 percent of their students eligible for free and reduced-price meals, with high priority given to the schools with the highest proportion of free and reduced-price eligible students. Also, funding reached a generous level of $150 million per year in 2011 (USDA, FNS, 2010).

**Funding and Regulations**

The Fresh Fruit and Vegetable Program (FFVP) is a federally assisted program providing free fresh fruits and vegetables to students in participating elementary schools during the school day. The goal of the FFVP is to improve children's overall diet and create healthier eating habits to impact their present and future health. The FFVP will help schools create healthier school environments by providing healthier food choices; expanding the variety of fruits and vegetables children experience; and increasing children's fruit and vegetable consumption (Olsho, et al., 2011).

The FFVP began as the Fresh Fruit and Vegetable Pilot Program, authorized by Congress under the Farm Security and Rural Investment Act of 2002 (P.L. 107-171) in a limited number of States and schools. The purpose of the pilot was to identify best practices for increasing fresh fruit and vegetable consumption among students, and to determine the feasibility and students' interest. In 2008, the Food, Conservation and Energy Act of 2008 established the FFVP as a permanent program under section 19 of the National School Lunch Act. This law also expanded

the FFVP nationwide to 50 States, the District of Columbia, and the territories of Guam, Puerto Rico and the Virgin Islands and substantially increased the funding level (Olsho, et al., 2011).

The Food and Nutrition Service (FNS) that administers all the Child Nutrition Programs at the Federal level also administers the FFVP. At the State level, the FFVP is usually administered by the State education agency, which operates the program through agreements with school food authorities (SFAs) (USDA, FNS, 2010).

Elementary schools participating in the program receive between $50.00 - $75.00 per student for the school year. The State agency decides the per-student funding amount based on total funds allocated to the State and the enrollment of applicant schools. With these funds, schools purchase additional fresh fruits and vegetables to serve free to students during the school day. They must be served outside of the normal time frames for the National School Lunch (NSLP) and School Breakfast Program (SBP). The State agency or SFAs determines the best method to obtain and serve the additional fresh produce. Schools participating in the FFVP submit monthly claims for reimbursement which are reviewed by the school food authority before payment is processed to the State agency. Schools are reimbursed for the cost of fresh fruits and vegetables and limited non-food costs. State agencies are provided funds for administration of the program according to federal requirements (USDA, FNS, 2010).

Schools have the flexibility to develop their own implementation plan, choose the type of produce, number of days a week and times during the day (outside of NSLP and SBP operation) to provide free fresh fruits and vegetables to their students. The number of times the program can be offered during a school week is dependent on the level of funds a school receives. The Food and Nutrition Service strongly encourages schools, whenever feasible, to offer the FFVP no less than two days a week. Schools must agree to widely publicize the availability of the program.

Schools must follow all food safety requirements and HACCP guidance. Schools are encouraged to develop partnerships to help implement the program, such as with local universities, extension services and local grocers (USDA, FNS, 2010).

Schools may purchase their fruits and vegetables through the same system they make purchases for the NSLP and SBP. They may acquire produce through the Department of Defense (DOD) Fresh program, or they may purchase locally. In all cases, schools must follow proper procurement procedures and produce must be purchased according to existing local, State and Federal guidelines (USDA, FNS, 2010). Congress established the funding amount and cycle for the FFVP as follows:

October 1, 2008: $40 million

July 1, 2009: $65 million

July 1, 2010: $101 million

July 1, 2011: $150 million

July 1, 2012 and each July1 thereafter, the amount made available is adjusted to reflect changes for the 12-month period ending the preceding April 30 in the Consumer Price Index. The funding level per state is determined through a formula allocation and provided through the States' Letter of Credit (USDA, FNS, 2010).

**Farm Bill**

The Food, Conservation and Energy Act of 2008, better known as the "Farm Bill," endorsed the FFVP as an on-going, nationwide program. Federal funds require accountability, so the USDA Food and Nutrition Service mandated a thorough nationwide evaluation of the FFVP to verify the effectiveness of the program. Results showed that students enrolled in FFVP ate one-fourth of a cup more fruits and vegetables on the days that they participated in the

program. Even though that seems to be a meager amount, it is actually fifteen percent higher than the national average of fruit and vegetable consumption as compared to children not participating in the program. A notable result of the evaluation was that students did not increase their total calorie intake for the day. The Food and Nutrition Service believes that the fruit or vegetable snack became a substitute for empty, calorie laden snacks (Olsho, et al., 2011).

## Fresh Fruit and Vegetable Studies

The National School Lunch Program feeds close to 28 million students each school day. The program is the single largest entity reaching the lives of our nation's children. School lunches hold the potential to change the country's health for the better. There have been several school-based grants aimed at boosting fruits and vegetables in the diet. The short-term effects of these programs are small and the long-term results are not yet known. More standardized evaluations of a single intervention program would provide specific data that would aid in follow-up studies (Hoffman, et al., 2010).

### Mississippi FFVP Pilot Evaluation.

The Mississippi Department of Education conducted a pilot evaluation of the Mississippi Fresh Fruit and Vegetable Program. The study investigated behavior changes in students' attitudes toward consumption of fruits and vegetables during the school year. The evaluation also questioned the children's familiarity with different fruits and vegetables, and asked their preferences based on items offered through the Fresh Fruit and Vegetable Program. The study selected 725 students in grades five, eight and ten from five of the twenty-five participating sites in the FFVP pilot program during the 2004-2005 school year (CDC, 2006).

Mississippi educators employed a one-group pretest/posttest evaluation and surveyed elementary, middle and high school students. The schools were chosen because of their differing

geographic regions and encompassed rural, suburban and urban campuses serving a student population where 57-99 percent of students received free or reduced price lunch (CDC, 2006).

An effort was made to collect pre and post surveys from every student in grades five, eight and ten in the five schools. A group of students in grades eight and ten were asked to participate in specific dietary recall interviews. Students were instructed to list the foods they had eaten in the last twenty-four hours. Interviewers guided the process to gain more accurate information. Dietary recalls are reliable with children age eight and older, and may be used to estimate group dietary intake (CDC, 2006).

Feedback was pilot tested with a selection of twenty-one fifth, eighth and tenth grade students. Cronbach's alpha coefficients were calculated for each scale and divided for each grade. The survey included questions related to attitudes toward eating fruits and vegetables, perceived self-efficacy to eat more fruits and vegetables, willingness to try new fruits and vegetables, familiarity with fruits and vegetables, preferences for fruits or vegetables, intentions to eat more fruits or vegetables, and frequency of eating fruits and vegetables (CDC, 2006).

The researchers examined pretest/posttest differences in student questionnaire data by each grade level. The baseline and follow-up information was evaluated using paired t-tests with statistical significance at $p \leq 0.05$. The Mississippi study found mixed results across age groups for changes in attitudes toward, self-efficacy, and willingness to eat fruits and vegetables (CDC, 2006).

The results of the Mississippi pilot evaluation suggest that the program may have helped to increase students' exposure to fruits and vegetables across all grade groups. Students' familiarity with fruits and vegetables increased across all grade levels. Eighth and tenth graders increased their intake of fruit during the year. However, there were no significant differences in

their attitudes toward or preferences for fruit. Intentions to eat more fruit were slightly higher (CDC, 2006).

The program did not increase vegetable intake. However, tenth grade students reported that they were more likely to eat the vegetables offered at school. According to the 24-hr dietary recall interviews, students' total intake of vegetables (even fried or starchy vegetables) in school decreased significantly ($p=0.05$), but average daily intake of vegetables overall did not change. When all types of potatoes were dropped from vegetable listings, students ate more of other types of vegetables, although total vegetable consumption remained the same as baseline (CDC, 2006).

A negative effect was found with the younger fifth grade group. Preferences for fruit decreased significantly ($p=0.03$), as well as, preferences for vegetables ($p<0.01$). There were also significant decreases in fifth grade students' willingness to try new fruits and vegetables, and beliefs that they could eat more vegetables (CDC, 2006).

The program was better received among the older students. Younger children may be more likely to reject new foods unless the foods are offered repeatedly and decide that they do not like the new fruits and vegetables they have only tasted a few times. Studies indicate that it takes eight to fifteen times of eating a particular food before an individual decides whether or not he or she likes the food. Repeated tastings and exposure to new fruits and vegetables has been shown to increase children's preferences and consumption (Krebs-Smith, et al., 1996). Due to the prevention of excess food waste and to encourage interest in the program, school staff in this study did not continue to purchase vegetables that were, on first try, not popular with students (CDC, 2006).

It is possible that the younger students may have not understood the questionnaire items as well as older children. Limitations of the study were lack of a comparison group, possible biases resulting from seasonal availability of produce, small sample size that did not support tests of subgroup differences (gender or grade-level), and first-year implementation challenges (CDC, 2006).

Strengths of the study included high participation and retention rates, the inclusion of both elementary and secondary students, survey data differentiated by grade group, and separate examination of fruit and vegetable intake (CDC, 2006).

Researchers recommend further evaluation to study the effects of this program under a randomized, controlled design. They also suggested that the program should examine the effects of nutrition education; and a comprehensive program to involve students and their families in and outside of school should be considered (CDC, 2006).

**Wisconsin FFVP Evaluation.**

The Wisconsin Department of Public Instruction evaluated their FFVP in 2006, one year after implementation, to see whether or not the program positively impacted children's attitudes and behavior related to fruit and vegetable consumption. Pre and post-test surveys were distributed to 1127 students in grades four, seven and nine at ten intervention schools and ten control schools. The surveys contained items related to students' motivation to try new fruits and vegetables at home and at school, the regularity with which they ate the fruit or vegetable offered at school, and how self-directed they were to choose fruits and vegetables as snacks rather than processed snack items. The survey further examined the students' demographics, lifestyle, fast food consumption, physical activity level, screen time, and family dinner habits (Jamelske, et al., 2008).

Students were also given pictures of fruits and vegetables and asked to correctly identify the items as well as state whether or not they had ever tasted the items and their willingness to try new items. In addition, students were given a list of various food items including fruits and vegetables, and asked to indicate how many times they had eaten each item in the last 24 hours. This dietary recall interview was repeated over three consecutive days to determine an average daily consumption of fruits and vegetables (Jamelske, et al., 2008).

The post-test was given twice, once after three months of the program and again one year after program completion. Pre-test data reported that forty percent of students would choose a fruit as a snack over a processed snack item, and twenty-one percent would choose a vegetable as a snack over a processed snack item. Thirty-four percent said they would try a new fruit offered at school, and twenty-one percent said they would try a new vegetable offered at school. Students also preferred to try new fruits and vegetables at home rather than school (Jamelske, et al., 2008).

There were significant differences between intervention and control schools when post-test surveys were analyzed. Significant differences were seen between intervention school students' willingness to try a new fruit at school ($p<0.01$), as well as willingness to try a new vegetable at school ($p<0.01$). Interestingly, there was more positive change among the younger fourth grade students than older seventh and ninth grade students. Fourth graders in intervention schools were more likely to choose a vegetable as a snack over chips/candy than control students ($p=0.02$). The results were not significant with older students in intervention schools (Jamelske, et al., 2008).

Positive findings relating to the willingness of students with low initial fruit and vegetable consumption to increase their intake of fruits and vegetables was reported ($p=0.03$ and

p=0.04). Only fourth grade students in intervention schools were more likely than control students to have increased their average daily fruit and vegetable intake (p=0.05) (Jamelske, et al., 2008).

The Wisconsin FFVP study found that students in FFVP intervention sites were more than twice as likely as the control schools to try new fruits and vegetables at school. While there were short term changes in attitude and behavior related to fruit and vegetable consumption following three months of program implementation, students did not increase their willingness to try more fruits and vegetables at home. Researchers predicted that longer exposure to the program, nutrition education targeting parents, or greater after-school involvement with students and parents is needed to reach beyond school into the home. Strengths of this study included a large sample size, pre-test/post-test design, and use of control schools (Jamelske, et al., 2008).

**Texas Schools FFVP Evaluation.**

Boukris' research, "A Public Response to Childhood Obesity: Evaluating the Fresh Fruit and Vegetable Program in Texas Schools," is a well-investigated study of obesity. Using a quasi-experimental design, twenty-one Texas schools were selected for data collection during school years 2005-2006 and 2006-2007. FFVP grant schools and FFVP non-grant schools were compared in order to document the success of the fruit and vegetable program (Boukhris, 2007).

Approaching the Fresh Fruit and Vegetable Program as an avenue of decreasing obesity, Boukris noted that an objective of the FFVP is to "make a positive difference in children's diets to impact their present and future health" (Boukhris, 2007, 4). Detailed in his obesity research is the fact that obesity is not equal to all people. Race, ethnicity, gender and socioeconomic status play an important role in who becomes obese. African Americans, Hispanics, Native Americans and low-income children appear to be most at risk (Gordon-Larsen, et al., 2003). In Texas, 40%

of fourth graders are overweight as compared to 39% of eighth graders and 36% of eleventh graders (Boukhris, 2007). These children are prone to become obese and it is projected that 70% of all obese children will become obese adults (Lin, et al., 1999). Childhood obesity has risen steadily from a rate of four to five percent of children between 1963 and 1974 to a staggering fifteen percent in 2000 (Gordon-Larsen, et al., 2003). Girls tend to be more obese than boys, but the margin is less than a five percent difference. Blacks are about ten percent more likely to be obese than whites (Gordon-Larsen, et al., 2003). Each study unfailingly cited that African American girls, Hispanic girls and boys, and American Indian girls and boys are prone to obesity (Dubowitz, et al., 2008).

Five biological components are associated with obesity. They are: 1) appetite, 2) the endocrine system, 3) genetics, 4) fat cell development and 5) prenatal development (Rolls, et al., 2004). The body has the natural ability to know when it is hungry and to know when hunger has been satisfied. The body's ability to control appetite is controlled by nerve signals in the brain. If the nervous system sustains damage, it is possible for mechanisms to malfunction leading to obesity (Steinmetz, K. A., & Potter, J. D., 1996). The endocrine system is made up of hormones that send information through body cells. When a person becomes overweight, growth hormones slow down leading to obesity (Riboli, E, & Norat, T, 2003). As much as 40% of obesity can be tied to heredity. Thirty-nine genes within the body are markers for body fat. The children of obese parents are five times more likely to become obese (Carlton-Tohill, 2007). Fat cell development, known as adipocyte development, is the process a newborn uses to increase size. The process usually ends by age two, but if it continues, large amounts of fat cells develop and can lead to obesity (Jebb, 2005). Prenatal development may also spur obesity. Mothers who

starve themselves during pregnancy may predispose their children to obesity in adulthood. Likewise, a diabetic mother may deliver a child susceptible to obesity (He, et al., 2004).

Obesity is an epidemic, but why is there so much concern about a supersized society? Health issues and medical costs are staggering and affect the nation in a number of ways. Medical care for obesity related health problems accounts for about six percent of all health costs, which is approximately 54 billion dollars annually. Medical care for obese patients is 36% higher than for non-obese patients. Insurance companies estimate that over 50% of their claims are related to obesity (Dauchet et al., 2006). Obesity in children is especially alarming to the medical community. Diseases that were once only found in adults are now prevalent in children. High blood pressure, high cholesterol, type II diabetes, stroke, heart disease, certain cancers, esophageal disorders, arthritis and depression have been identified in obese children (French, 2005). In addition, obesity can lead to extreme conditions such as soft bones producing bowed legs, neurological disorders leading to brain tumors, abnormal menstrual cycles in girls, and social isolation and bullying from peers (Lorson, et al., 2009).

The school environment is the greatest influence in children's lives. School is where children spend most of their time; it is where they learn life-long behaviors; and it is where they eat their meals. School staff members serve as role models for students. Teachers' habits and enthusiasm are eagerly mimicked by their students. Teachers also have the power to influence their students through health and nutrition education. School lunches can serve as examples of balanced meals and develop children's eating patterns. However, ninety percent of Texas schools have á la carte food items, vending machines, school stores and snack canteens (Boukhris, 2007). Each of these competitive food items undermines the school lunch program.

Once children consume salty, sugary, fatty food alternatives, they reject cafeteria food (Wechsler, et al., 2000).

The FFVP intervention was a good way to combat competitive food choices in schools. Funding for fresh fruits and vegetables was a concern for Texas schools and the FFVP grant provided a variety of fresh foods to qualifying schools. The next step was to evaluate its success. This was done by using a quasi-experimental design. Twenty-one Texas schools were selected for data collection during school years 2005-2006 and 2006-2007. Two hypotheses were made: 1) If schools are enrolled in the FFVP they will provide more fruits and vegetables and 2) adequate varieties of fruits and vegetables will decrease plate waste. The first hypothesis addressed the cost of serving fresh fruits and vegetables and the second assumed that the free food would be eaten and that there would be less food thrown away. This study differed from previous studies in that it measured consumption. Plate waste of 12% was the study's benchmark. Any plate waste above 12% was high, and any plate waste below 12% was acceptable. A paired t-test was used to show the difference between the control and intervention schools. Paired t-test results showed no significant differences of expenditures on fruits and vegetables and no significant differences in plate waste for 2006, but did show a significant difference for 2007 (Boukhris, 2007).

Limitations of the study are that neither expenditures nor plate waste were accurate measures of the amount of fruits and vegetables consumed. Second, measurement procedures were inconsistent. Third, inventory waste was not considered. An alternative research design should be made to accurately measure fruit and vegetable consumption and body mass index (BMI) measurement should be made to determine the effects of fruits and vegetables on obesity.

Even though the findings of this research were inconclusive, there were many positive success stories to come from the Fresh Fruit and Vegetable Program (Boukhris, 2007).

**New England FFVP Longitudinal Study.**

An interesting school-based fruit and vegetable study focusing on kindergarten and first grade students in four urban New England schools used a variety of techniques to motivate students to choose more fruits and vegetables. The intervention design was based upon Bandura's Social Learning Theory. Researchers combined school-wide, classroom, lunchroom and family focused interventions with a focus on increasing fruits and vegetables consumed as part of school lunch (Hoffman, et al., 2010).

Influential role models were chosen to convey nutrition education messages. Live and symbolic role models included the school principal, coaches, teachers, lunch aides, cartoon characters and videos of same age peers (Hoffman, et al., 2010).

The school-wide component involved the school principal or coach making intercom announcements about the fruit or vegetable of the day. The classroom component involved the use of a free interactive computer program supplied by Dole Food Company which featured appealing cartoon characters and videos of same age peers. The lunchroom component involved the daily use of cafeteria posters denoting the fruit and vegetable of the day as well as a reinforcement based intervention in which lunch aides would "catch" students eating fruits and vegetables and offer verbal praise and a sticker. Students were praised for trying at least one bite of a new food. Lastly, the family component involved the use of interactive children's books with positive nutrition messages which were taken home by students and assigned to be read as homework. A school cookbook was developed by school staff, parents and children. The cookbook was sold as a school fundraiser (Hoffman, et al., 2010).

Data was collected over a two year period during 2006 and 2007. Researchers conducted unannounced "fidelity checks" in which they monitored to see if morning "fruit and vegetable of the day" announcements and lunchtime intervention components were being implemented. Lunch aides and classroom teachers completed acceptability questionnaires that asked questions related to how fair, appropriate and reasonable the interventions were. Children completed a questionnaire with open and closed-ended responses. A pictorial rating scale was used to answer closed-ended questions which assessed how children felt about the program, while open-ended questions were used to assess which types of reinforcements motivated children to consume more fruits and vegetables (Hoffman, et al., 2010).

The primary dependent variable in the fruit and vegetable intake study was plate waste. Plate waste studies were conducted for 36 days during the two implementation years. Sample trays were weighed as references so that accurate sample sizes of fruits and vegetables could be recorded. The uneaten food left on students' trays was weighed at the end of the lunch period and subtracted from the total weight of the food items to determine how much of the fruit or vegetable was consumed (Hoffman, et al., 2010).

Overall, children's concept of the intervention program was positive. Seventy-eight percent of students liked the morning fruit and vegetable of the day announcements "a lot," while 94% of students said that they received lunchtime reinforcement stickers and praise in the cafeteria. All students reported that they had to eat a fruit or vegetable in order to receive a sticker. Eighty-seven percent said that the stickers encouraged them to eat more fruits and vegetables and 73% said they like receiving stickers "a lot" (Hoffman, et al., 2010). Lunch aides rated the program as highly acceptable and 100% reported that they strongly agreed that stickers encouraged students to consume more fruits and vegetables offered in the school

lunch. Teachers also rated the program as highly acceptable; but there were some concerns that stressing a rewards system for consuming fruits and vegetables sent the message to students that other food such as whole grains, lean meats and milk was less important (Hoffman, et al., 2010).

As in similar studies, fruit preferences were higher than vegetable preferences throughout program implementation. In both years, students in intervention schools consumed significantly more fruit than students in control schools. In the first year, intervention school students consumed six grams more vegetables than control school students ($p<.01$). However, the effect did not carry over to year two in which there were no differences in vegetable consumption between groups (Hoffman, et al., 2010).

This study is consistent with other FFVP studies, in that there were positive outcomes related to fruit consumption, but no sustained increase in vegetable consumption. The multi-faceted components of this study incorporated positive nutrition messages into the school, classroom, cafeteria and home environments, which is more far-reaching than other study attempts. The school announcements and cafeteria posters made students more aware of the importance of choosing fruits and vegetables; the positive reinforcement offered by lunch aids motivated students to at least try the fruits and vegetables offered as part of the school lunch; and the family reading component helped to bring the messages home. The program created a system of role models for the students, making them want to imitate good nutritional practices (Hoffman, et al., 2010).

Researchers concluded that future studies should focus on addressing barriers to school lunch vegetable consumption. Efforts should focus on improving the palatability of vegetables served as well as incorporating more vegetables into meat and grain dishes. Repeated taste testing of new recipes by students in which they are allowed to rate their preferences on a scale

would provide a framework to improve school recipes as well as reduce plate waste (Hoffman, et al., 2010).

This study was unique because it examined kindergarten and first grade students. It is difficult to complete surveys and questionnaires with children younger than eight years of age due to their low language ability and writing comprehension. The simple reinforcements used in this study could be easily replicated. The incentives appear to convey a positive effect on fruit consumption and student perception of the school lunch environment in general. Most students reported that they were still motivated by the program at the end of year two. This study involved the entire school staff in the intervention, which helped to reinforce the message throughout the school environment (Hoffman, et al., 2010).

**St. Paul Minnesota 5-a-Day Power-Plus Program.**

The 5-a Day Power Plus program was designed to increase fruit and vegetable consumption among fourth and fifth grade students in St. Paul Minnesota. The randomized field trial examined 680 students in twenty elementary schools. Nearly half of the students participating in the trial were of non-Caucasian ethnic backgrounds. Over sixty percent of the students enrolled in the schools were eligible for free or reduced price lunches. Social Learning Theory provided the basis for the 5-a-Day intervention design which consisted of behavior-based classroom learning, parental involvement and education, school food service promotion, and food industry involvement and support. The eight week classroom intervention involved cognitive and motor development, snack preparation and taste-testing, role modeling, and team competitions. The team that ate the most fruits and vegetables each day at lunch was rewarded with incentive prizes and encouragement from school staff (Perry, et al., 1998).

The parental intervention involved an interesting mix of information and activity packets that were sent home with students, as well as, "snack packs" prepared by school food service staff that contained fruits and vegetables for students to take home and prepare as snacks for their families. A return card was included with the activity and snack packs to be signed and returned by the parent for a chance at winning a classroom drawing (Perry, et al., 1998). School food service staff promoted fruits and vegetables around the serving line and point of sale through characters and messages from the classroom lessons, by preparing and arranging more attractive fruit and vegetable dishes, supplying a wider variety of fruit and vegetable options, providing a fruit option in place of a baked dessert, and through the use of sample trays and signs which made students more aware of their fruit and vegetable choices (Perry, et al., 1998).

The food industry intervention involved support from the seventy-two member Minnesota 5-a-Day Coalition. A well-known local produce supplier provided fruits and vegetables for classroom taste testing, home snack packs, and school lunch. The local produce company executives gave presentations to the students and Dole Food Company provided educational packets and food related incentives (Perry, et al., 1998).

Thirty-four fourth and fifth graders from each school were chosen by random sample to be interviewed for 24-hour recalls. The students were also observed in the cafeteria to see if they accurately reported their lunch intake. The dietary recalls were modified from those used in the Child and Adolescent Trial for Cardiovascular Health. Students' responses were entered directly into the Nutrition Coding Center's software and database. This process provides interviewers valid estimates of group intake even though some students tend to exaggerate their fruit intake. Telephone surveys were made to parents of students who completed the 24-hour recalls. The

survey asked questions related to meal preparation in the home and fruit and vegetable intake of the family (Perry, et al., 1998).

Two-thirds of parents reported that they had completed at least one of the home team and snack pack lessons during the school year. The school food service employees consistently promoted the Power Plus program in the school cafeteria. Detailed cafeteria observations of foods selected by students in conjunction with plate waste studies concluded that there was a positive effect among girls for vegetable consumption, but not for boys. There were no differences in the amount of fruits and vegetables eaten by various racial and ethnic subgroups (Perry, et al., 1998).

Twenty-four hour food recalls revealed that servings of fruits and vegetables per 1000 kilocalories consumed by students were significant. Calories consumed from fat were significantly less. Girls showed an increased intake of vitamin C, which is found in fruits and vegetables. However, boys exhibited no changes in vitamin C consumption. Fat consumption varied by ethnic groups: Asians and African Americans showed less fat intake; Whites showed no change; and a small percentage of Hispanics showed an increase. Overall, the study exhibited that fat consumption was now showing a favorable downward trend (Perry, et al., 1998). Health behavior questionnaires divulged four significant responses: 1) students felt that teachers had promoted eating fruits and vegetables, while family, friends and food-service personnel had not been as supportive, 2) students recognized a need to eat fruits and vegetables, 3) more students were requesting fruits and vegetables, and 4) daily servings of fruits and vegetables were becoming the norm (Perry, et al., 1998).

The 5-a-Day Power-Plus Program demonstrates that nutrition intervention programs can improve health behavior of diverse school-age children from different socioeconomic

backgrounds. Outcomes of the study were: fruit consumption was increased more than vegetable consumption; best results for consuming more fruits and vegetables were during school lunch periods; and girls were more engaged than boys. In addition to fruit being served as a meal item, it was also served as a dessert substitute. Thus, fruit availability was increased. Children were also more attracted to fruits because of their "grab and go" accessibility and fruits were more pleasing because of their sweet, juicy flavor. Students probably ate more fruits and vegetables at lunch during the invention program because of the availably. Girls' interest was likely peeked due to body image concerns coupled with their receptiveness to health and physical education. Further studies should address how to involve parents more fully and how to engage boys in nutrition interventions (Perry, et al., 1998).

**Outcomes of the TACOS Study.**

TACOS is an acronym for Trying Alternative Cafeteria Options in Schools. The TACOS study is yet another school intervention program aimed at obesity. Competitive foods sold in schools deter students from eating school lunches. Sugar laden drinks and high-fat foods sold from vending machines, á la carte cafeteria items and school stores cause students, especially in secondary schools, to fill up on empty calories. Replacing meals with high fat/sugar snack foods has been linked to obesity (French, et al., 2004).

TACOS was a randomized trial study evaluating environmental intervention sales of á la carte foods in twenty suburban secondary schools in St Paul, Minnesota. Researchers hypothesized that promotion and increased availability of healthier, low-fat á la carte items would offset higher fat/calorie alternative food purchases and lower student's caloric intake. The promotion aspect of the intervention was dependent on the persuasiveness of peer messages. Drawing from the success of alcohol and tobacco campaigns to reach youth, the TACOS staff

trained students for specific promotions. The students also worked in conjunction with the child nutrition staff. Student groups were offered financial incentives for completing each promotion. The baseline inventory of á la carte foods showed 30% as low-fat choices. The goal was to increase that amount to 50%. TACOS staff trained school cafeteria staff to record á la carte sales and offered financial incentives to schools with 90% accuracy. TACOS employees meet with the cafeteria staff quarterly and visited the schools every three weeks (French, et al., 2004).

Data collection was determined by á la carte sales of low-fat foods and by student self-reporting. A random selection of seventy-five students per school was made using the Dilliman method. A mail survey was then sent to the student subgroup in order to investigate their food choices. The forty-eight item questionnaire compared their food choices, plus their attitudes and perceptions of all foods sold at school (French, et al., 2004).

Treatment schools produced a significantly higher mean percentage of sales of lower-fat foods in the first year (27.5% vs. 19.6%, *P*=.096) and a significantly higher mean percentage of sales of lower-fat foods in the second year (33.6% vs. 22.1%, *P*=.042). There was an increased rate of low-fat snack sales in the first year (10% intervention vs. –2.8% control, *P*=.002). The second year showed an even higher percentage of low-fat snack sales (33.6% intervention vs 22.1% control, *P*=.04). However, there were no significant changes in student self-reported food choices. This study concluded that school-based environmental interventions to increase availability and promotion of lower-fat foods can increase purchase of these foods among adolescents (French, et al., 2004).

**High 5 Alabama Project.**

The University of Alabama in Birmingham conducted a school-based dietary intervention program with fourth grade students in twenty-eight schools. The purpose of the program was to

increase fruit and vegetable consumption. The High 5 Alabama project incorporated a multi-disciplinary approach using social cognitive theory. The schools were randomly selected with half being intervention schools and half being control schools receiving no intervention. The assessment took place over a two-year period with 1,698 students participating. The High 5 curriculum was administered by trained High 5 staff members. The intervention was taught in fourteen lessons over a seven week period and three follow-up sessions were held in the fifth grade as researchers continued their review. The focal point of the curricula was to teach the importance of eating fruits and vegetables. The interactive 30-45 minute lessons involved modeling nutrition behavior, problem solving tasks, incentives, self-reporting, and inclusion homework with the family (Reynolds, et al., 2000).

On the day of delivery, students were encouraged to eat five servings of fruits and vegetables and fill out their food records. High 5 included information sessions with parents urging them to reinforce the program at home. Once a week, parents were sent packets of educational materials and activities that they could use with their child. Subsets of 475 children were observed eating in the cafeteria so that researchers could more accurately measure their consumption of fruits and vegetables. The subgroup was selected to match the profile of the entire group. Therefore, meal observations could be generalized to match the group as a whole. School child nutrition employees were trained on purchasing, preparing, and advertising fruits and vegetables. High 5 staffers regularly monitored school cafeterias to see if they were in compliance with the program. Baseline assessments were made at the end of the students' third grade year and follow-up assessments were made at the end of the fourth and fifth grade school years. Parents also completed questionnaires at each assessment point. All children gave 24-hour food recalls at each assessment (Reynolds, et al., 2000).

Results showed that students in intervention schools consumed significantly more fruits and vegetables at the end of both their fourth and fifth grade years. Dietary food recalls revealed that treatment schools reported a lower intake of sugary, fatty foods, and a greater intake of mineral and vitamin rich foods. However, cafeteria observations did not reveal a difference in lunchtime consumption of fruits and vegetables between control and intervention schools. Future study is needed to test teacher and parent based nutrition interventions (Reynolds, et al., 2000).

**Salad Bars and Fruit and Vegetable Consumption in Elementary Schools.**

Nutrient dense fruits and vegetables are believed to help prevent a number of chronic diseases. Adding self-serve salad bars to school lunch programs is a way to boost fruit and vegetable consumption. A small, one day study was conducted in schools with salad bars to see if fruit and vegetable consumption is really increased (Adams, et al., 2005).

Four elementary schools in San Diego, California were selected for study. The majority of students in these schools were minorities, mostly Hispanic, and most of the children received free or reduced price lunches. Two salad bar schools were paired with two non-salad bar schools. Calculations were made on 294 students in grades one through five. Previous studies used 24-hour food recalls to measure students' intake of foods. However, errors with children self-reporting their intakes are well known. Other studies used cafeteria observations to document eating patterns. Researchers in this study felt that cafeteria observers tend to overestimate consumption. The most accurate way to measure consumption is pre and post plate weight, but the process is time consuming. This study chose plate waste as the criteria for deriving actual consumption. Using a cross sectional design, students were randomly selected. Data collection was made by six trained university graduate assistants. Small gifts were given to students for

completing the program. Students first selected their fruits and vegetables from the serving line and had program assistants weigh them. When students were ready to dispose of the food tray, assistants scraped the leftover fruits and vegetables onto a paper plate and re-weighed them. In comparison schools, plates were served premeasured and brought to the assistant for leftover measurements. The differences between salad bar and non-salad bar consumption were not significant. The mean consumption was not significant between pairings (47±60 g vs. 43±58 g). Salad bar schools did serve a greater variety of fruit and vegetables ($F=2.83$, $p<.05$) (Adams, et al., 2005).

Limitations included the size and the length of the study. The study did find that the more food students put on their plate, the more food they wasted. When a variety was offered, students ate more fruits and vegetables. Whites consumed more fruits and vegetables than their minority counterparts, suggesting ethic and socioeconomic preferences for foods (Adams, et al., 2005).

**Nutrition Education Intervention with Primary School Children.**

The need for school-based nutrition education interventions to battle obesity and health concerns are not limited to developed nations. Developing countries are also seeing an increase in overweight children. Malaysia designed a concentrated, multifaceted nutrition module for eight year old, second grade students. The study tested 325 students in four urban schools. Two schools were intervention and two schools were control. The program was implemented in health and physical education class. Duration of the intervention was one hour a week for six weeks (Shariff, et al., 2008).

The program design was based on the Social Cognitive Theory. Teachers were trained on how to carry out the teaching activities, both in and out of the classroom. Nutrition concepts

were taught in six areas: 1) Food Pyramid, 2) functions of food, 3) food choices, 4) breakfast, 5) snacks and 6) food safety. Instruction was reinforced by bulletin boards, videos, hands-on projects, exhibits and cafeteria promotion. Comparison schools taught their regular curricula. Data collection was gathered via pre and post tests, which were previously validated on a test group. The intervention and comparison schools were compared using t-test and chi square statistics (Shariff, et al., 2008).

The results of the study show significant change in nutrition knowledge ($F=17.72$, $p<0.001$); attitudes ($F=6.41$, $p<0.05$); and practice ($F=15.49$, $p<0.001$), of second grade intervention students. One limitation of the study is that the study was not long enough to assess behavior change. The School Health Education report states that 10-15 hours of training is required to produce notable changes in knowledge, and a minimum of 50 hours is needed to make behavioral changes. However, other studies suggest that five to thirteen weeks is needed to observe changes in nutrition knowledge. Another limitation of the study involved differing nutrition education delivery methods in the classroom which lead to some inconsistencies. More studies are needed to address food marketing and the health and nutrition of children (Shariff, et al., 2008).

**Free School Fruit—Sustained Effect Three Years Later.**

A Norwegian study closely paralleled the Fresh Fruit and Vegetable Program in the United States. Norway shares the same children's health and nutrition concerns as the United States. Norwegian youth also consume too much added sugar, too many highly saturated fats and not enough fruits and vegetables. Most of the nutrition interventions they examined took multiple approaches to altering children's eating habits. The Norwegian study narrowed its

focus to just one component, which was researching the long-term effects of their free fruit program (Bere, et al., 2007).

In Norway, children do not have cafeterias in their schools to provide lunch. Most children simply bring a sandwich for lunch. In this study, schools decided to offer fruit on a 2 to 1 cost-share program to students in elementary and junior high schools in 38 schools in two counties. The parents of the students were required to pay twice as much as the school did for the fruit at lunchtime. Only 12% of the children in elementary school participated the first year, and it was noted that these children were from more affluent families and had better than average diets at the onset of the program. After rethinking the program, the schools started offering a free fruit or vegetable for lunch. The logic was that if free fruits and vegetables were served all ten years that a child attended elementary and junior high school, the health results would be cost effective in chronic disease prevention (Bere, et al., 2007).

Nine schools were randomly chosen to be intervention schools. The other 29 schools in the study were control schools. The free fruit and vegetable program lasted one year, from October 2001 to June 2002. Baseline surveys were conducted with all sixth and seventh graders in September 2001. Follow-up studies were conducted in May 2002 and May 2005. A total of 1950 students participated. About half of participants were girls and about half were boys. 975 students were in the control group leaving another 975 in the intervention group. The May 2002 follow-up group dropped to 1794 and decreased by 192 in the May 2005 group. Trained program staff interviewed students using 24-hour food recalls and survey questionnaires. Food frequency questions addressed both fruits and vegetables and unhealthy snacks. Parents were surveyed at baseline in order to gather demographic information (Bere, et al., 2007).

Data was tabulated using a linear mixed model for repeated measures using R-software. The paid fruit and vegetable program was not effective in meeting its goals, however, the free fruit and vegetable program significantly increased fruit and vegetable intake during the first year. In the three year follow-up, less dramatic effects were noticed in fruit and vegetable intake and no significant effects were seen in reduction of soda, candy and chips intake. The long term effects of the Norway study are comparable to a British study that reported a short term advantage of a fruit and vegetable program, but noted there are no long term effects (Bere, et al., 2007).

**Novel School-Based Intervention to Improve Nutrition: Top Grub.**

British educators made an innovative effort to socially market nutrition education through a fun and engaging card game called, "Top Grub". The purpose of the program was simply to improve student's nutritional knowledge. As with the United States, Britain faces the health challenge of an overweight society. Presently, ten percent of the United Kingdom's children are obese, and approximately one quarter of their children are overweight. It is predicted that by 2050 the country will be predominately obese. The Food and Health Action plan listed problematic ingredients in foods that contribute to health disorders. Foods high in fat, salt, and sugar, but low in fiber tend to add calories to the diet. Identifying the nutrient content of common foods would enable students to make better food choices. Thus, the Top Grub card game was invented to identify food substance. Cards were assigned dots representing traffic light colors: green, yellow and red. Each card contained a picture of a food, a fun fact about the food, and its nutrient content. The object of the game was to acquire nutrient rich food cards and discard nutrient poor cards. To test the validity of the program, a research study was conducted (Lakshman, et al., 2010).

The 2007 study was made up of 1,133 fifth and sixth graders whose ages were nine to eleven years. Twenty-five schools, 12 intervention and 13 control, were examined using a pragmatic cluster randomized controlled trial during the nine-week summer term (Lakshman, et al., 2010).

Overall nutrition knowledge gained in exit scores was compared to baseline scores showing a jump from 28.3 to 29.2 in intervention schools; control schools displayed only a slight increase from 27.3 to 27.6. Exit scores reflected a mean difference = 1.1; 95% CI: 0.05 to 2.16; p=0.042. More children in intervention schools claimed to eat a healthy diet than those in control schools (39.6% compared to 34.4% respectively). When asked if they would try healthier foods, 35.7% of the intervention group responded positively as compared to 31.7% of the control group. The chi-square test yielded $p < 0.001$. More than three quarters of the children who played the card game found it to be an enjoyable way to learn. Seventy percent reported that the game enabled them to make better food choices. Conclusions from the study suggest future interventions should be long term and multifaceted in order to determine behavior change (Lakshman, et al., 2010).

**Food and Nutrition Service Evaluation of the Fresh Fruit and Vegetable Program.**

Abt Associates Inc. and its partner, the Dr. Robert C. and Veronica Atkins Center for Weight and Health at the University of California, Berkeley, conducted the evaluation for the Food and Nutrition Service during the 2010-2011 school year. Section 4304, 19(h) of the FFVP authorizing legislation required the Secretary of Agriculture to conduct an evaluation of the program. The results presented in this interim report address the key objectives of the Congressionally-mandated evaluation.

The study estimates the impact of the FFVP on two focal outcomes among students in participating schools on days when FFVP fruits and/or vegetables were distributed: Total quantity of fruits and vegetables consumed, and Total Energy Intake (also referred to as total caloric intake). These two outcomes allowed researchers to assess whether any additional fruit and vegetable consumption was in addition to or in place of other foods consumed. This interim report additionally describes characteristics of students according to students' self-reported frequency of participation in the program (Olsho, et al., 2011).

This evaluation estimates the impact of the FFVP using regression discontinuity (RD), which is considered the strongest possible design when random assignment is not feasible. The RD approach leverages the procedure by which schools are assigned to participate in FFVP. Specifically, as noted above, the FFVP legislation and FNS guidance requires that available FFVP funding be allocated in each state to low income schools, where poverty is defined by the percent of students eligible for free or reduced price school lunch (FRPSL) in the previous school year. The RD design estimates impacts by comparing schools immediately above and below the funding cutoffs in each of the sampled states. Those schools differ in whether or not they receive FFVP funding, but are likely to be otherwise similar. The final full analytic sample included 5,560 students in 252 schools—2,903 students in FFVP schools just above the funding cutoff, and 2,657 students in schools just below the funding cutoff that did not participate in FFVP. The final preferred analytic specification, which is presented in the report, is a restricted subsample of 4,696 students in 214 schools within two and a half percentage points of the funding cutoff in each state. Information on student food intake was collected using diary-assisted 24-hour recall interviews, which have been widely and successfully used with elementary school aged children. In FFVP schools, the diary was completed on a day in which

FFVP fruits and/or vegetables were offered to students, allowing researchers to estimate the impact of the FFVP on total food intake on FFVP days (Olsho, et al., 2011).

Interim results indicate that the FFVP increased average fruit and vegetable consumption among students in participating schools on FFVP days by approximately one-quarter of a cup per day ($p<0.001$). In addition, the results show no significant increase in total energy intake. This represents an increase of 14.6 percent over fruit and vegetable consumption levels in the absence of FFVP. Increased fruit and vegetable consumption appears to have replaced consumption of other foods (Olsho, et al., 2011).

Previous evidence on school-based interventions is largely limited to relatively small random-assignment studies and controlled clinical trials, mostly focused on local or regional interventions with relatively small sample sizes. Knai et al. (2006) found positive effects on fruit and vegetable intake of 0.3 to 0.9 servings per day in ten of the fifteen studies included in their review. A recent systematic review of interventions to promote fruit and vegetable consumption among elementary school children also reported several effect sizes between 0.2 and 0.35 servings per day (Delgado-Noguera et al., 2011). The interventions reviewed in these studies were primarily school-based, extended over months or years, and included one or more of the following components: integration of nutrition education on fruits and vegetables into the school curriculum; computer-based programs for child learning and goal-setting related to fruits and vegetables; school meal and other food service changes; free or subsidized fruits and vegetables offered at school; promotional campaigns such as posters and videos; teacher training; and parent involvement (Olsho, et al., 2011).

Data collection was restricted in FFVP schools to days on which fruits and vegetables were scheduled to be offered to students. Therefore, the analysis could not be extrapolated to

describe impacts on intake on days in which the program was not offered. Understanding the extent to which food intake on non-FFVP days is influenced by spillover or substitution effects of the program is an important direction for future research (Olsho, et al., 2011).

**Obesity and Socioeconomic Status in Children**

The U.S. Department of Health and Human Services' data from the National Health and Nutrition Examination Survey, 2005-2008, examined the relationship between childhood obesity, poverty income ratio (PIR), and parental education (DHHS, 2011).

Surprisingly, most obese children and adolescents are not low income (below 130% of the poverty level). Of the 12 million children and adolescents in the U.S. who are considered obese, only 38% or 4.5 million, live below 130% of the poverty level (Ogden, et al., 2010). Overall findings concluded that low-income children are more likely than higher income children to be obese, but the relationship is not consistent across race and ethnic groups. Most obese children were not low income (below 130% of the poverty level). Children living in households where the head of the household had a college degree were less likely to be obese compared to households with less education; however, the relationship was not consistent across race and ethnic groups. Between 1988-1994 and 2007-2008, the prevalence of childhood obesity increased at all income and education levels (Ogden, et al., 2010).

**Dietary Behaviors of Young Adolescents**

In addition to government-regulated child nutrition programs, which include the National School Lunch and Breakfast Programs, students may purchase single á la carte items in the school cafeteria as well as foods from vending machines and school stores on many school campuses. A study of 16 schools in the St. Paul Minnesota metropolitan area found that 90% of schools sold á la carte items in addition to school meals, 76% of high schools, 55% of middle

schools, and 15% of elementary schools had vending machines available for students to use; and 41% of high schools, 35% of middle schools, and 9% of elementary schools had school stores, snack bars, or canteens that sold food or drinks (Kubik, et al., 2003).

The nutritional quality of these additional food items available during the school day leads many to question the school food environment's role in the childhood obesity epidemic. The nation's schools, with their access to 95% of children and adolescents, are regarded as the prime setting for nutrition intervention efforts with the assumption that the school food environment influences dietary behavior beyond the school day. Indeed, 24 hour food recalls suggest that students who make poor food choices at school, do not compensate by making more healthful choices away from school. Poor food choices at school lead to poor food choices at home, which may lead students to make poor food choices as adults (Kubik, et al., 2003).

The St. Paul study surveyed a sample of seventh-grade students. School á la carte sales were significantly and negatively associated with total intake of fruits, and fruits and vegetables combined. Students from schools without á la carte options consumed more than half a serving more of fruits per day. Students not exposed to á la carte programs consumed on average nearly an entire serving more of fruits and vegetables than students with á la carte programs. As should be expected, school á la carte programs were positively associated with students' mean percentage of daily calories obtained from total and saturated fat. Notably, youths from schools without á la carte programs reported a mean percentage of calories from total fat that met the USDA dietary recommendations, whereas those from schools with these programs exceeded the recommendations (Kubik, et al., 2003).

As with á la carte sales, school-based snack vending machines were negatively related to average daily servings of fruit consumed by students in the sample. With each snack vending

machine present in the school, students' mean intake of fruit servings declined by 11% (p=.03). Interestingly, beverage vending machines were not associated with fruit or vegetable consumption (Kubik, et al., 2003).

In conclusion, results of this study suggest that the primarily high-fat snacks offered and sold to students via á la carte programs and vending machine sales are displacing fruits and vegetables in the diets of young teens and contributing to total and saturated fat intakes that exceed recommended levels. This finding is compounded by the likelihood that such programs will likely continue given the increasing financial dependence of school food service on revenues generated by á la carte sales, as well as students' preference for convenient, tasty fast foods (Kubik, et al., 2003).

Policy initiatives such as the Healthy Hunger Free Kids Act of 2010, which enacted new meal pattern guidelines to ensure that the National School Lunch Program offers a variety of nutrient dense fruits and vegetables, are designed to increase availability of fruits and vegetables to students participating in federal child nutrition programs. Pricing strategies to promote healthy á la carte choices, as well as limiting the availability of high fat snack items available at school are a few ways to effect change across the school environment (Kubik, et al., 2003).

**The CATCH Collaborative Group.**

Although intra-individual variability in diet precludes use of a single recall as an accurate representation of individual dietary intake, recalls provide a valid assessment of group-level mean intake. Numerous studies support the validity of this methodology in school-aged children. Recall interviews should be conducted by trained, certified interviewers following a standardized protocol. The best design for dietary recalls involving children involves observational data as well as the child's recall. In the case of school food consumption studies, trained staff observes

children during mealtime at school, and parents observe and record what the child ate in their presence. The next day, children participate in the 24-hour recall interview. The child's ability to recall what he or she consumed during the 24-hour period is compared with observational data (Lytle, et al., 1993).

Paired t tests, Pearson and Spearman correlations, and classification analysis are used to compare recalled and observed data. The 24-hour recall assisted by food records is a valid method for assessing the dietary intake of children as young as eight years old for the purpose of group comparison (Lytle, et al., 1993).

**The Role of Schools in Obesity Prevention**

On average, 60% of children in schools offering the National School Lunch Program eat lunch at school, and 37% of children in schools with the School Breakfast Program eat school breakfast. School meal programs significantly improve the diets of school-age children. Children who eat school breakfast and lunch have higher mean intakes of micronutrients. For the 59% of children eating school meals who come from low-income families, the meals provide a necessary safeguard against hunger. Unfortunately, participation in school lunch programs declines with age. It also declines as competing foods become available (Harnack, et al., 2000).

Schools can increase revenues in three ways: 1) by increasing the number of students who eat federally funded meals, 2) by increasing prices for full-price meals, and 3) by expanding á la carte and catering sales. In order to compete with school stores and vending machines, many food service directors choose to sell popular, but nutritionally poor á la carte items. One solution is to limit competitive foods during school mealtimes and offer more healthful á la carte items at reasonable prices. Fruits and vegetables are available as á la carte items in 85% of schools, but make up only four percent of total á la carte purchases. The availability, promotion, and pricing

of foods in schools can be changed to support better food choices. In addition, Farm-to-School Programs and school gardens offer hands-on activities combined with nutrition education that may encourage children to consume foods they normally would decline (Harnack, et al., 2000).

**Social Class and Diet Quality**

Investigations into the question, "Does social class predict diet quality?" are prevalent. World-wide research studies reveal the same consensus that socioeconomic status does determine the types of food purchased and consumed. Generally, the rich have higher quality diets and the less affluent have poor quality diets. The only exceptions to socioeconomic status not affecting diet quality are in some underdeveloped countries and among a few ethnic groups. Underdeveloped countries usually eat the crops that they grow and purchase few refined foods. Diets are also influenced by age, sex, gender, education and occupation. Higher education has a direct correlation with increased nutrition knowledge and higher income (Darmon, N, & Drewnowski, A, 2008).

The most distinguishable difference between high income and low income dietary habits is that poorer people consume larger portions of high calorie foods. The high income populace tends to consume more whole grains, while the less privileged consume more refined breads and cereals, pasta and rice. Economically stable individuals choose a variety of fresh fruits and vegetables as compared to indigent people who eat mostly a limited variety of canned fruits and vegetables. Milk consumption is basically the same regardless of economic standing, but the more affluent consumed more cheese. However, higher income individuals chose fat-free and low-fat milk products. Wealthier people ate more lean meats, fish and seafood, while the poor ate more canned meats or fried and fatty meats (Wang, Y, & Zhang, Q, 2006).

Diet quality directly transmits to greater vitamin, mineral and fiber intake. There was no significant difference in carbohydrate and fat intake between socioeconomic groups. However, there was a disparity between the types of carbohydrates and fats consumed.
Impoverished people select food based on cost and shelf life which limits fresh food choices. Supermarkets and grocery stores are located in more affluent sections of town. Persons with limited transportation may buy from neighborhood markets and convenience stores. These stores have less selection from which to choose. Poverty compounds food preparation problems. Availability of refrigerators, stoves, ovens and microwaves in low income households are taken for granted. Poor people may become disheartened which could lead to unhealthful eating habits. Improving a person's diet may be more of a matter of economics than it is a matter of nutrition knowledge (Wang, Y, & Zhang, Q, 2006).

**Related Fruit and Vegetable Promotion Programs**

Measurable data on the impact of children eating healthy is not readily available. The far reaching scale of the FFVP evaluation has captured the attention of many agencies, such as, the Public Department of Health, the Center for Disease Control, and the Food Research Action Committee. If FFVP's data were combined with other nutrition intervention programs such as SNAP, EFNEP, Team Nutrition and state and community efforts; the programs could act together as reinforcement in promoting a healthier lifestyle (NCI, 2012). Instructional materials have been designed for nutrition invention in these programs: (Coordinated Approach to School Health (CATCH), Eat Well and Keep Moving, Generation Fit, SPARK Middle School Physical Activity and Nutrition (MSPAN), Planet Health, Teens Eating for Energy and Nutrition in Schools (TEENS), The Power of Choice: Helping Youth Make Healthy Eating and Fitness Decisions, and Ways to Enhance Children's Activity & **N**utrition (We Can!).

The CATCH Program is a healthy lifestyle initiative developed by the Center for Disease Control. The school health teaching module addresses physical activity, diet, and tobacco prevention. Nutrition is one of eight topics taught by CATCH. The program educates students on community health resources and promotes family and community involvement in attaining a healthy future (NCI, 2012).

Generation Fit is similar to CATCH in that its curriculum includes physical activity, healthy eating and community involvement. The American Cancer Society produces this program targeting youth ages 11 to 18. This model differs from other programs to reduce the risk of chronic diseases by encouraging students to become engaged in community service projects (NCI, 2012). Examples of service activities include preparing food for the homeless or organizing community walks to become more physically fit. By letting students choose their projects and by letting them take leadership in carrying out the activities, the Cancer Society hopes to enable students to continue healthy habits throughout life (NCI, 2012).

The SPARK program also aims at reducing chronic diseases. It is a physical education and nutrition module intended for middle school students. The highlight of this module is to increase physical activity throughout the school day, not just during physical education class time. School employees are urged to incorporate physical activity in class projects (NCI, 2012).

Eat Well and Keep Moving is an inclusive program stressing healthy eating and physical activity. It is a pocket curriculum sewn into the fabric of standard school curricula. It can be included as a non-traditional component in math, language arts, social studies and sciences. As with some of the other intervention programs, it encompasses promotional campaigns, classroom education, and involvement from school staff, cafeteria workers and parents (NCI, 2012).

Planet Health is very similar to Eat Well & Keep Moving. Even though its lesson plans are somewhat different from the Eat Well & Keep Moving syllabus, Planet Health captures the same audience with the same multiplicity as the Eat Well lessons. The plus for this program is its research base, being developed by the Harvard School of Public Health. The self-assessment forms and evaluation reports of this model are well structured (NCI, 2012).

TEENS is a third middle school health intervention program. The focal point of this course is the promotion of fruits and vegetables and lower fat foods in schools. Based on the Social Cognitive Theory, TEENS urges peer teaching and peer food campaigns at school. The program has shown success in adding a more appealing variety of fruits and vegetables to cafeteria choices and in adding more low-fat foods to menu selections (NCI, 2012).

The Power of Choice is the product of the U.S. Department of Health and Human Services' Food and Drug Administration and the USDA's Food and Nutrition Service. It is a pre-packaged after-school program on selecting healthy food choices (NCI, 2012).

We Can! is not a school-based program. It is aimed towards parents and caregivers. The program identifies the family as the most influential role model for children 8 to 13 years. The primary goal is to teach children to maintain a healthy weight (NCI, 2012).

**Summary**

Overall, the FFVP increases availability and accessibility and provides repeated exposure to a variety of fruit and vegetables for participating students resulting in positive changes in intake as well as other behaviors related to fruit and vegetable consumption. Further advances in the study of the FFVP will require collaborative partnerships between researchers and school staff to design more thorough evaluations.

The research literature examining the effectiveness of the FFVP is small and still developing. Given the sizeable resources committed to funding the FFVP, more information is needed to understand the successes, limitations, and potential in meeting its stated goals. The studies that produced the best results consulted professional research businesses that were adept at designing research instruments and training preceptors to administer those instruments with consistency. Choosing the correct research design is critical to evaluating outcomes. The curriculum models were not as closely aligned to this research study as the investigation of other studies. Yet, the value of exploring these teaching models aid in identification of previously developed documentation data for the purpose of research evaluations.

## Chapter III: Methods

The investigator's primary focus was to survey students' food preferences, knowledge about healthy food choices, to better understand what children eat at home, and to identify opportunities for improving nutrition in Alabama schools. Chapter 3 will outline the methods, sample, instrumentation, data collection and analysis used to answer the research questions.

### Purpose of the Study

The purpose of this study was to assess the Fresh Fruit and Vegetable Program (FFVP), a federal intervention program designed to increase consumption of fresh fruits and vegetables among school-aged children. Elementary schools in Alabama that participate in the FFVP will be matched with schools that did not participate in the 2013-2014 and 2014-2015 school years. This study assessed the impact of the program on students' fruit and vegetable intake.

### Research Questions

The following research questions were used in the study:

1. What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools?
2. Does school involvement with the FFVP significantly increase students' nutrition knowledge?

3. Are students in FFVP schools more likely to try new foods when they are offered at school?
4. Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

**Methods**

Elementary schools in Alabama that participate in the FFVP were matched with schools that did not participate in the 2013-2014 and 2014-2015 school years. This study assessed the impact of the program on students' fruit and vegetable intake. Fruit and vegetable surveys were distributed to students at intervention schools as well as control schools that did not receive the program.

**Sample**

A sample of intervention schools were matched with control schools using Alabama Department of Education data. Intervention schools were selected based on interest in the FFVP, geographic location, and number of students qualifying for free or reduced lunches. Control schools were selected based on characteristics similar to those of the intervention schools, including school size, geographic location, ethnic composition, and number of students qualifying for free or reduced lunches. Although these selection processes were not random, both the intervention and control schools were geographically diverse and, in general, reflected the characteristics of students in the state.

The size of the school/student sample affects the precision with which impacts can be estimated. The sample size was large enough to allow the researcher to detect differences in mean fruit and vegetable intake. Approval to conduct the study was received by the Institutional

Review Board (IRB) at Auburn University (see Appendix A).

Selected Child Nutrition Directors (those participating in the FFVP) from each geographic region of Alabama were invited to participate in the study. Each Child Nutrition Director provided his or her consent, as well as a consent letter from the Superintendent or school board. Once consent was given, Child Nutrition Directors confirmed which schools would participate in the study.

Letters of consent were provided to 3rd and 4th grade teachers to send home to each student's parent or guardian (see Appendix C). Additionally, students had to sign a letter of assent (see Appendix C). Children who did not wish to participate in the study did not have to answer survey questions and could go to the library when surveys were administered.

**Instrumentation**

After approximately three months of FFVP participation, starting in August 2014, Child Nutrition Directors at selected school districts (FFVP participating) administered three, short pictorial surveys to 3rd and 4th graders in selected schools (one FFVP participating school and one non-participating low income school) in order to collect data. Surveys measured consumption of fruits and vegetables, student food preferences, general nutrition knowledge, self-efficacy toward trying new fruits and vegetables, and availability of foods at school and home.

Consent and assent forms were completed by parents and students before participation. Teachers allowed students' time during the school day to complete the surveys with instruction and supervision from the school district's Child Nutrition Director. Detailed instructions were given by the district Child Nutrition Director to students as to how to complete the surveys honestly and accurately.

The following three surveys were administered:

- Maria Sanchez Elementary- School Lunch Survey: Measures nutrition knowledge, preference for vegetables, availability of foods consumed at home, and self-efficacy towards trying new foods at school (Hartford Childhood Wellness Alliance, 2013).
- Thinking About Food Survey: Measures student preferences for fruits and vegetables, general nutrition knowledge, and self-efficacy towards making healthy food choices Schagen, et al., 2005).
- Eater Meter- Fruits and Veggies- More Matters: Measures average number of fruits and vegetables consumed over one week as well as fruits and vegetables the student wishes to try at home (Produce for Better Health Foundation, 2009).

**Maria Sanchez Elementary (MSE) School Lunch Survey**

***Background.*** The survey was developed by the Maria Sanchez Elementary Health and Wellness Committee in 2013. A total of 53 first grade students and 65 second grade students anonymously completed the survey (Hartford Childhood Wellness Alliance, 2013).

The survey was developed to evaluate students' knowledge about healthy food choices, to better understand what children eat at home, and to identify opportunities for improving student nutrition. The survey was designed to be short and easy to understand. Five questions were included in the survey, and pictures were used for the answer options to make it easier for the children to understand and respond to the questions (Hartford Childhood Wellness Alliance, 2013).

It should be noted that the accuracy of survey results are limited because responses were self-reported and young children have age-related limits to their capacity to understand the survey questions and the provided response options; therefore, results should not be interpreted

as fact, but as an estimate of the students' healthy eating knowledge, food choices, and behaviors. The pictures used for the response options were carefully chosen to reflect what foods are served for lunch and how foods are commonly prepared; the survey was reviewed by a committee; and color copies of the survey were provided to teachers to clarify what each picture showed, because copies of the surveys given to the students were black and white. The pictures used in the survey could have biased the responses of the children if the pictures didn't look exactly like what is served in school or at home; for example, a picture of spaghetti and meatballs was shown to represent pasta; however, children may eat pasta in the form of elbow or spiral noodles more often. The number of response options was limited to keep the survey brief.

The first question of the survey asked students to choose the three healthiest lunch foods out of six response options. The three healthiest foods were broccoli, strawberries, and brown rice and beans, while the three less healthy lunch foods were pizza, hamburgers, and tacos. The goal of this question was to evaluate whether the students could compare food options and make healthy food choices.

The second question of the survey asked students to circle their most favorite vegetables served for lunch. The goal of this question was to identify which vegetables children like that could be served more often knowing that children are likely to eat them and which vegetables children like the least that could be offered in different ways to increase consumption and opportunities to try new or unfamiliar vegetables.

The third question asked students to identify foods that they commonly eat at home. The goal of this question was to evaluate whether the children are served healthy foods at home, similar to what they would eat in school, or if they are served less healthy foods.

The fourth question in the survey asked students whether school lunches are the same or different than what they eat at home. The goal of this question was to better understand whether children perceive that they are eating healthy, balanced meals at home like what they are served in school.

The last question in the survey asked whether the students like trying new foods at school.

**Thinking About Food.**

***Background.*** In 2003, the Big Lottery Fund (United Kingdom) commissioned the National Foundation for Educational Research (NFER), in partnership with nutritionists from the University of Leeds, to evaluate the impact of the SFVS (School Fruit and Vegetable Scheme) pilot by monitoring changes in consumption and in attitudes to healthy eating in children before and after they receive free fruit or vegetables (Schagen, et al., 2005).

The Thinking About Food (2004) questionnaire was administered in 92 schools in England and 2,495 students responded. The pictorial survey was composed of structured response questions and presented respondents with a series of color photographs in all but one question, where numbers were used. The first part of the questionnaire assessed student attitudes towards fruit and vegetables and snack foods. The second part focused on assessing the children's knowledge of healthy eating and balanced diet, and their awareness of the '5 A DAY' message about fruit and vegetable consumption (Schagen, et al., 2005).

***Fruit tried and liked (Question 1).*** Question 1 presented students with pictures of 12 different fruits and asked them to indicate which fruits they had tried and which they liked or disliked.

***Vegetables tried and liked (Question 2).*** Question 2 followed the same format as Question 1 but this time students were presented with 12 vegetables.

***Fruit and preferences for snack foods (Question 3).*** Question 3 asked students to select their preferred snack from a selection of foods grouped in five pairs, each consisting of one fruit and one other option.

***Choosing a healthy snack (Question 4). Q***uestion 4 is the first of the questions that aims to 'test' students' knowledge and awareness of healthy eating. For this question the children were again presented with five items, but in this case they were asked to choose the 'healthiest' snack from a selection of three different food combinations.

***A balanced and healthy diet (Question 5).*** Question 5 is based on 'The Balance of Good Health' model (BNF, 2003). The children were asked to indicate whether they should eat lots, some, or a small amount of ten different foods/drinks. Students were given one mark (out of ten) for each correct answer.

***Selecting a healthy balanced packed lunch (Question 6).*** Question 6 presented students with ten food items and they were asked to choose four items to make up a healthy balanced packed lunch. Students were given a score in the range of 0-3.

Question 7 followed the same format as Question 6 but this time students were asked to choose four items to make up a healthy balanced hot lunch. Students were given a score in the range of 0-3.

***What counts as a portion of fruit? (Question 8).*** Question 8 asked students to decide from a selection of nine foods/drinks which items counted as a portion of fruit.

***Awareness of '5 A DAY' (Question 9).*** The final question aimed to test students' awareness of the '5 A DAY' message by asking then to indicate how many portions of fruit and/or vegetables they should eat each day. Students were provided with a series of individual numbers, in the range 0-8, from which to select their desired response.

**Eater Meter**.

The Eater Meter (2009) was developed by Fruits & Veggies–More Matters, a health initiative focused on helping Americans increase fruit & vegetable consumption for better health. The program was spearheaded by Produce for Better Health (PBH), a 501(c)(3) nonprofit organization that has partnered with the Centers for Disease Control & Prevention (CDC) to help spread the word about the health benefits of adding MORE fruits & veggies to your diet. In this survey students are asked to check the items he or she consumed last week using fruit and vegetable pictures. In addition, students are asked to select pictures of the fruits and vegetables he or she wishes to try at home in the coming week (Produce for Better Health Foundation, 2009).

**Data Collection**

Consent and assent forms were distributed to teachers to send home to be completed by the student and his or her guardian. After consent and assent forms were returned, the district Child Nutrition Director scheduled a time to administer the surveys. During survey administration, the Child Nutrition Director advised students to code their surveys only by school and age/grade group. Questions were read aloud to students and instructions were given as to how to record their selections. Students were asked to answer questions honestly and accurately without input from peers or adults. Students were given enough time to answer each question. The Child Nutrition Director collected the surveys from students and returned them to the Jackson County Board of Education ATTN: Jennifer Dutton in sealed envelopes coded as "FFVP School" and "Non-FFVP School." Surveys and consent forms were stored securely in a locked filing cabinet.

**Data Analysis**

Individual student responses for each question were ranked and tabulated separately for the FFVP schools (study group) and for the non-FFVP schools (control group). Once study and control group data for each school district was ranked according to the most correct responses to each question, independent samples t-tests were used to compare group means in order to determine if there were any statistical differences.

| ***Domain*** | ***Question*** | ***Analysis*** | ***Related Survey Questions*** |
|---|---|---|---|
| Consumption | What, if any, is the difference in the types of fruits and vegetables consumed by Alabama children participating in the Fresh Fruit and Vegetable Program compared to children in non-participating schools? | Calculate the percentage of different types of fruits and vegetables consumed by study and control group participants.<br><br>Independent samples t-test to compare means | Eater Meter- Page 1 |
| Food Preferences | Does school involvement with the FFVP significantly affect student food preferences? | Calculate percentages of preferred fruits and vegetables.<br><br>Independent samples t-test to compare means | Thinking About Food Questions 1-3<br><br>MSE School Lunch Survey Question #2 |
| Knowledge | Does school involvement with the FFVP significantly increase student's nutrition knowledge? | Calculate the percentage of correct responses for study and control groups.<br><br>Independent samples t-test to compare means | Thinking About Food Questions 4-9<br><br>MSE School Lunch Survey Question #1 |
| Self-Efficacy | Does school involvement with the FFVP increase student's self-efficacy towards choosing fruits and vegetables? | Calculate percentage of students who like to try fruits and vegetables at school.<br><br>Independent samples t-test to compare means | MSE School Lunch Survey Question #5<br><br>Eater Meter- Page 3 |
| Availability | Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home? | Calculate percentages of most popular foods eaten at home.<br><br>Independent samples t-test to compare means | MSE School Lunch Survey Questions 3-4 |

*Chart 1:* Research question matrix

## Chapter IV: Findings

The purpose of this study was to assess the Fresh Fruit and Vegetable Program (FFVP), a federal intervention program designed to increase consumption of fresh fruits and vegetables among school-aged children. Elementary schools in Alabama that participated in the FFVP were matched with schools that did not participate in the 2013-2014 and 2014-2015 school years. This study assessed the impact of the program on students' fruit and vegetable intake.

### Research Questions

The following research questions were used in the study:

1. What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools?
2. Does school involvement with the FFVP significantly increase student's nutrition knowledge?
3. Are students in FFVP schools more likely to try new foods when they are offered at school?
4. Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

## Demographic Results

The following summarizes the results of three food-related pictorial surveys that were administered to a sample of low-income elementary school students in Alabama. Intervention or "Fresh Fruit and Vegetable Group" data will be compared to the control, or "Non-Fresh Fruit and Vegetable Group" to see if there are any significant differences.

### Maria Sanchez School Lunch Survey.

The first question on the Maria Sanchez School Lunch Survey asked students to pick three out of five foods (broccoli, pizza, hamburger, strawberries, brown rice and beans, taco) that they think are the healthiest.

Both groups thought broccoli and strawberries were the healthiest lunch foods. Pizza and hamburgers were thought to be least healthy by both groups.

Conclusion: It appears that students have been told that hamburgers and pizza are unhealthy fast foods. Broccoli and strawberries are promoted as superfoods. Students in both groups appear to be educated about healthy choices.

Impact: If students can differentiate between healthy and non-healthy foods at school, they have the knowledge to make healthier choices at home. Often student's knowledge is shared with their caregivers.

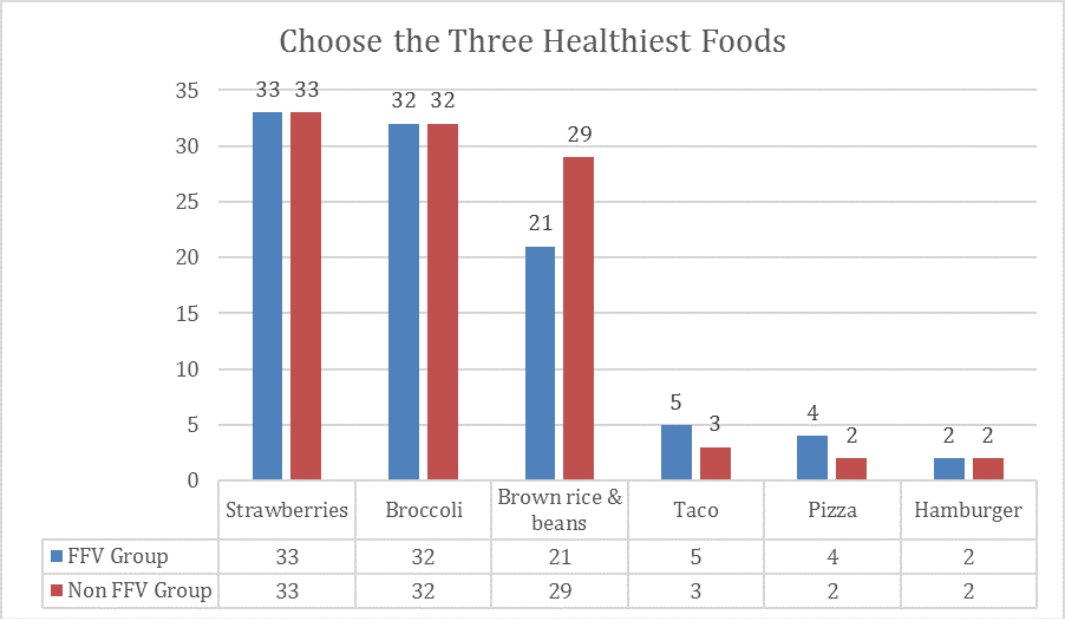


*Figure MS-1.* Study and control group percentages: Choose 3 lunch foods that you think are the healthiest.

The second question on the Maria Sanchez School Lunch Survey asked students to circle their favorite vegetables served for lunch. Mashed potatoes were the most popular choice. Potatoes were followed closely by corn, carrots, and green beans as the most favorite vegetables served for lunch. Grape tomatoes, salad greens, peas and cucumbers were rated least favorite by both groups.

Conclusion: Mashed potatoes have long been noted as a comfort food. They are familiar, warm, and filling. Grape tomatoes, salad greens, peas, and cucumbers may be less familiar to students.

Impact: It is important to include foods that are liked in school menus. If students have at least one go-to food, they are more likely to eat and enjoy their entire meal. Familiar foods paired with unfamiliar foods encourage students to try new items.

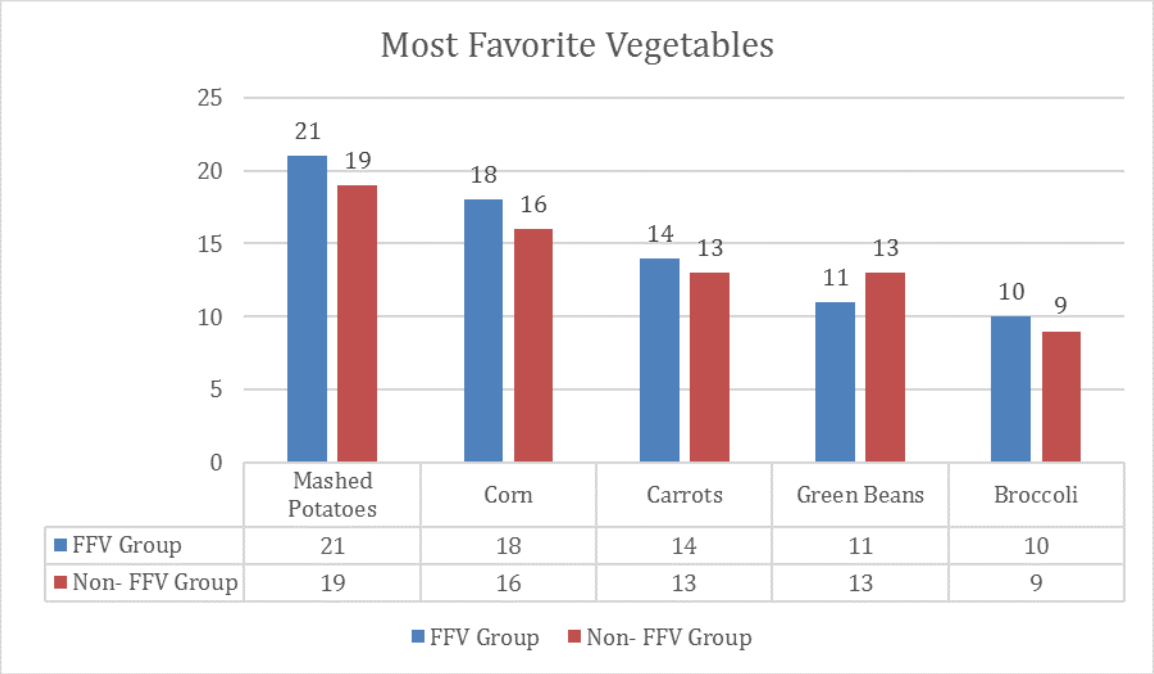


*Figure MS-2.* Study and control group percentages: Circle your most favorite vegetables served for lunch.

There were some differences between the FFVP group and the Non-FFVP group regarding foods eaten at home. The FFVP group rated chips, pizza, soda, milk, and hamburgers as the top five responses. The Non-FFVP rated pizza, fruit juice, fresh fruit, chips, and tacos as the most commonly consumed foods at home. It is interesting that the control group chose fruit and fruit juice as two of the top five foods consumed at home. This may indicate a difference in socioeconomic status between groups resulting in more variety of foods available at home.

Conclusion: There is a drastic difference between foods served at school and those served at home. The availability of foods at home appears to be based on convenience and price. Healthier foods cost more and require more preparation.

Impact: Caregivers should be educated about healthy food choices so that positive changes at school can be reinforced at home and contribute to a healthy lifestyle.

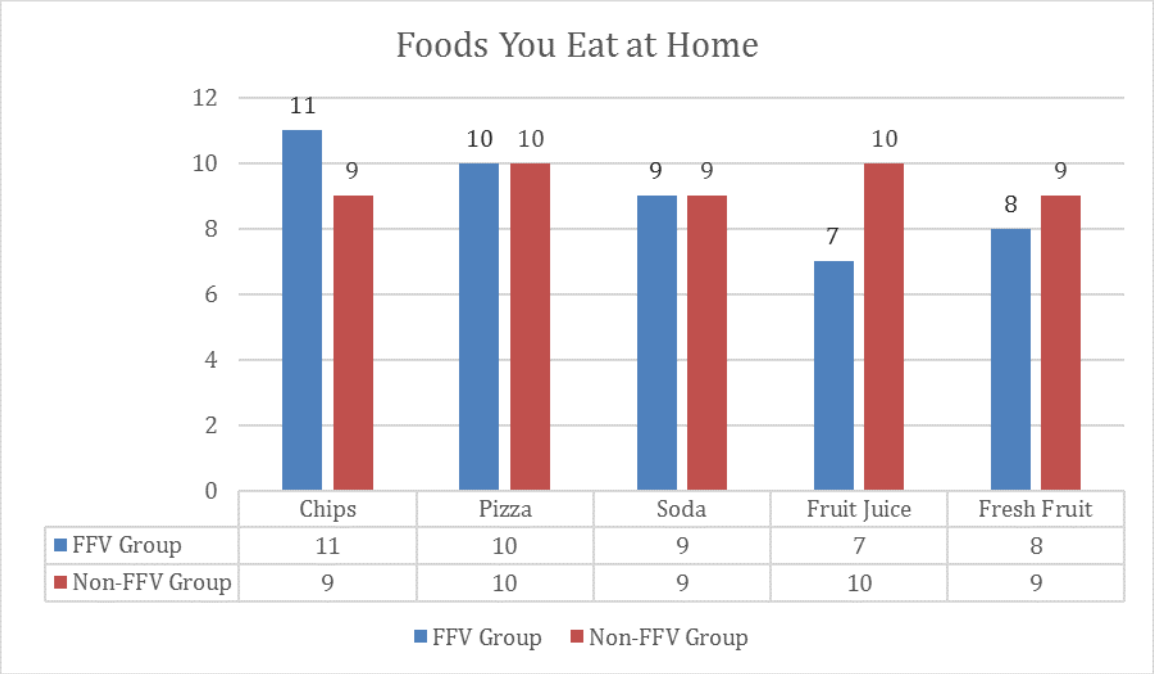


*Figure MS-3.* Study and control group percentages: Circle the foods that look like what you eat at home.

The fourth question on the Maria Sanchez School Lunch Survey asked students if they thought school lunches were similar or different from the foods consumed at home. Both groups responded that school lunches are significantly different from meals served at home. 77% of FFVP participants responded that school meals are different than meals served at home. 83% of Non-FFVP students responded that school meals are different than meals served at home.

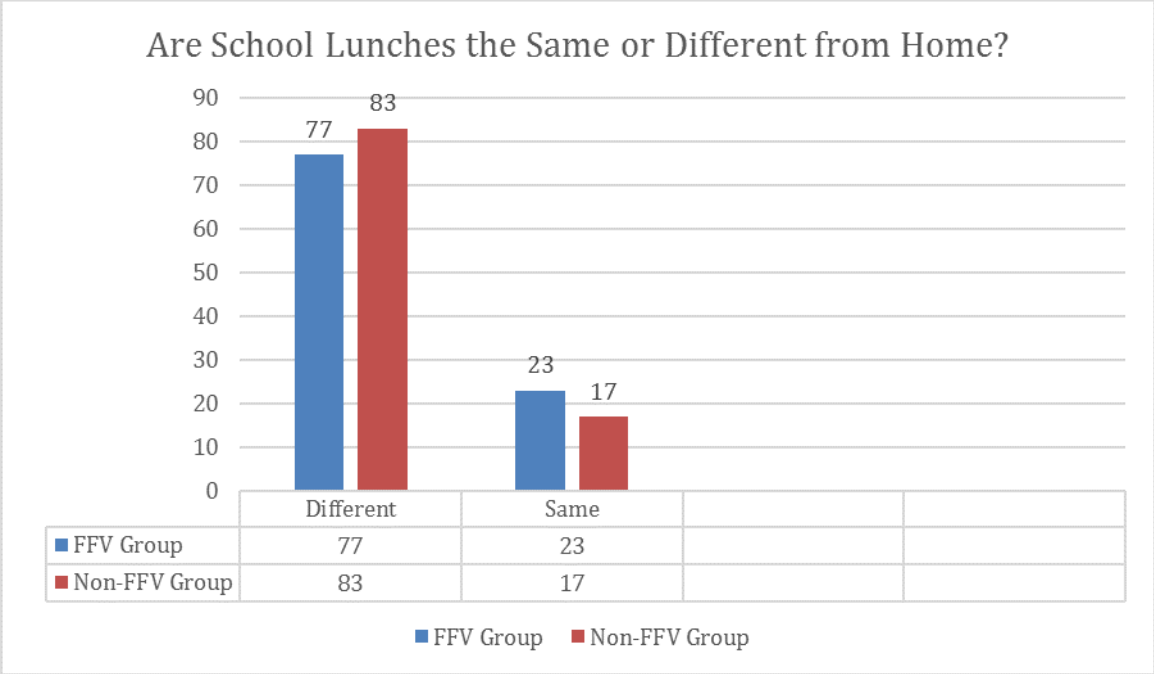


*Figure MS-4.* Study and control group percentages: Are school lunches the same or different than what you eat at home?

The last question on the Maria Sanchez School Lunch Survey asked students if they like to try new foods at school. The majority of students in both groups responded that they enjoy trying new foods at school. 72% of FFVP participants responded that they enjoy trying new foods, while 64% of Non-FFVP students responded that they enjoy trying new foods at school.

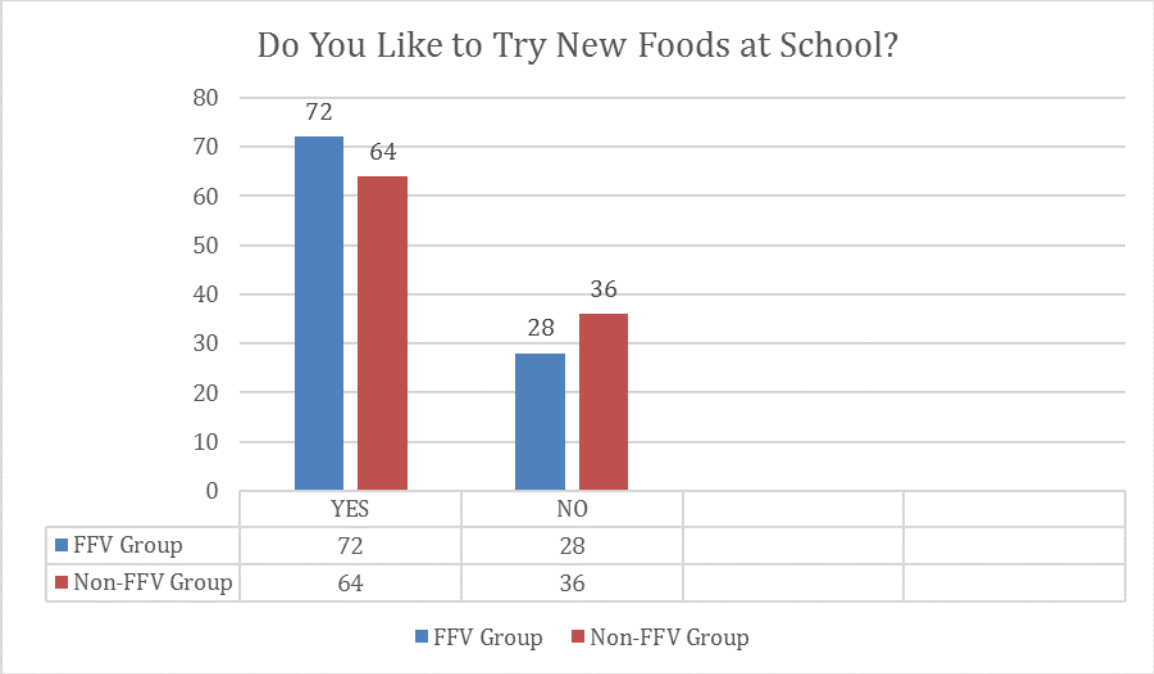


*Figure MS-5.* Study and control group percentages: Do you like to try new foods at school?

**"Thinking About Food" Questionnaire.**

Item #: A ranking value of "0" was used to identify students who responded that they had tried all 12 of the pictured fruits. Ranking values of 1-12 were used to identify the number of fruits each student reported never trying before. According to Levene's Test for Equality of Variances listed in Table 1b, equal variances cannot be assumed. The adjusted two-tailed significance value of .014 allows the researcher to conclude that there is a statistically significant difference in the number of different types of fruits that students have never tried between groups. There was a mean difference of 0.596 between groups. Therefore the FFVP or treatment group reported having tried approximately one more type of fruit than the control group.

8% of FFVP participants reported never trying the pictured fruits, while 13% of Non-FFVP students reported never trying the pictured fruits. Both groups commonly reported never trying the same three fruits: kiwi, raspberries, and grapefruit.

69% of FFVP participants liked the pictured fruits while 66% of Non-FFVP students reported liking the pictured fruit. Grapes, apples, and strawberries were the most liked fruits for both groups.

The percentage of students in both groups disliking certain fruits was identical: 13%. Similarly, raspberries and kiwi were disliked by both groups. The only difference was that grapefruit was most disliked by the FFVP group and pears were most disliked by the control group.

Responses varied between groups when reporting not being sure about liking the pictured fruits. 10% of FFVP participants were not sure and 9% of non-FFVP students reported not being sure. While responses varied, both groups reported not being sure about liking grapefruit.

Table 1a

*Group Statistics for Questionnaire Item: Have You Ever Tried Any of These Fruits Before?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 1_NumberOfFruitsNever Tried | Control Non FFVP | 104 | 1.558 | 2.1759 | .2134 |
| | Treatment FFVP | 238 | .962 | 1.6922 | .1097 |

Table 1b

*Independent Samples Test Results for Questionnaire Item: Have You Ever Tried Any of These Fruits Before?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 1_NumberOfFruits Never Tried | Equal variances assumed | 11.717 | .001 | 2.735 | 340 | .007 | .5955 |
| | Equal variances not assumed | | | 2.482 | 159.788 | .014 | .5955 |

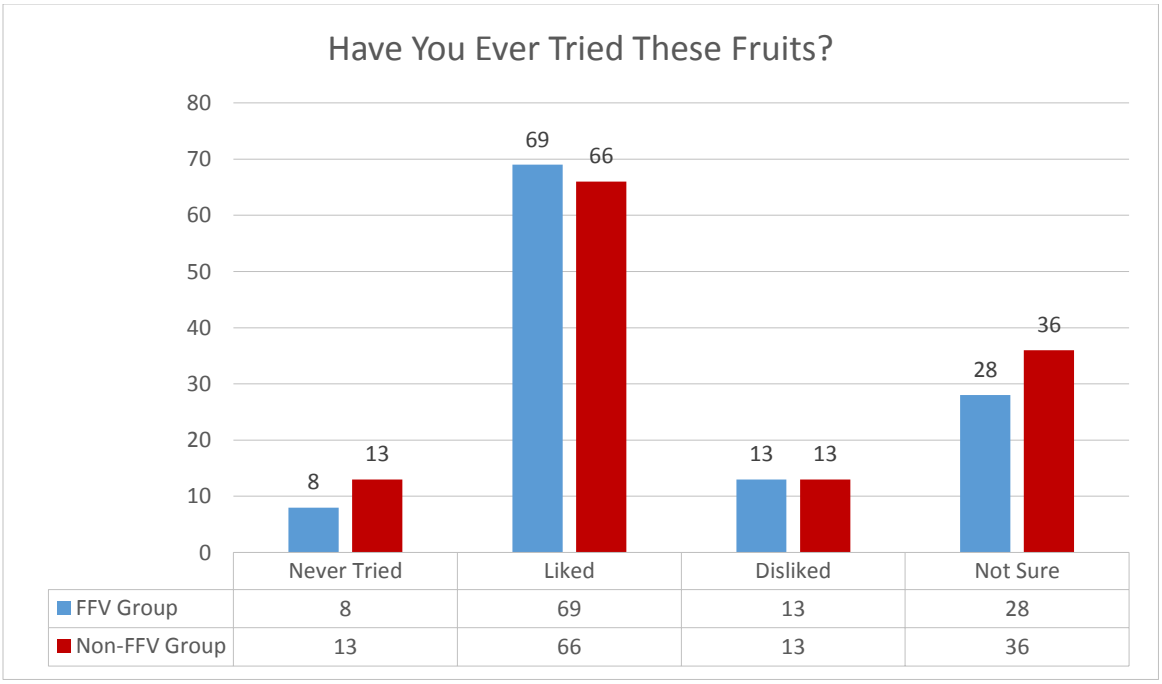


*Figure TAF-1.* Study and control group percentages: Have you tried any of these fruits before?

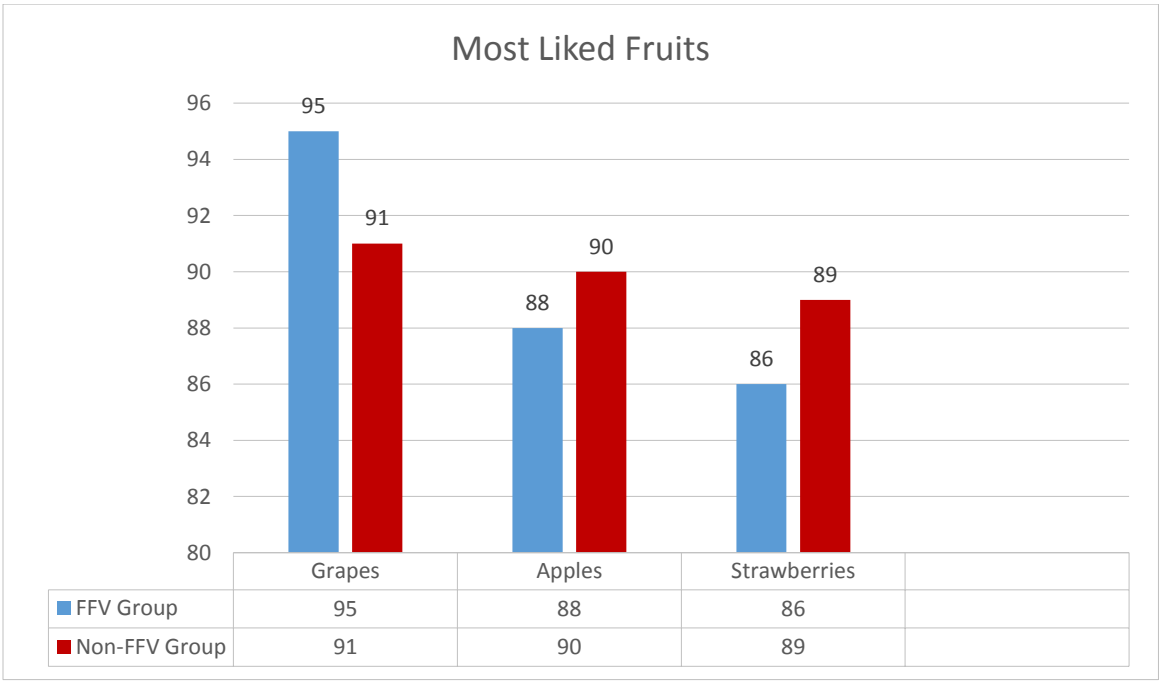


*Figure TAF-1a.* Study and control group percentages: Circle the smiley face if you tried the fruit and liked it.

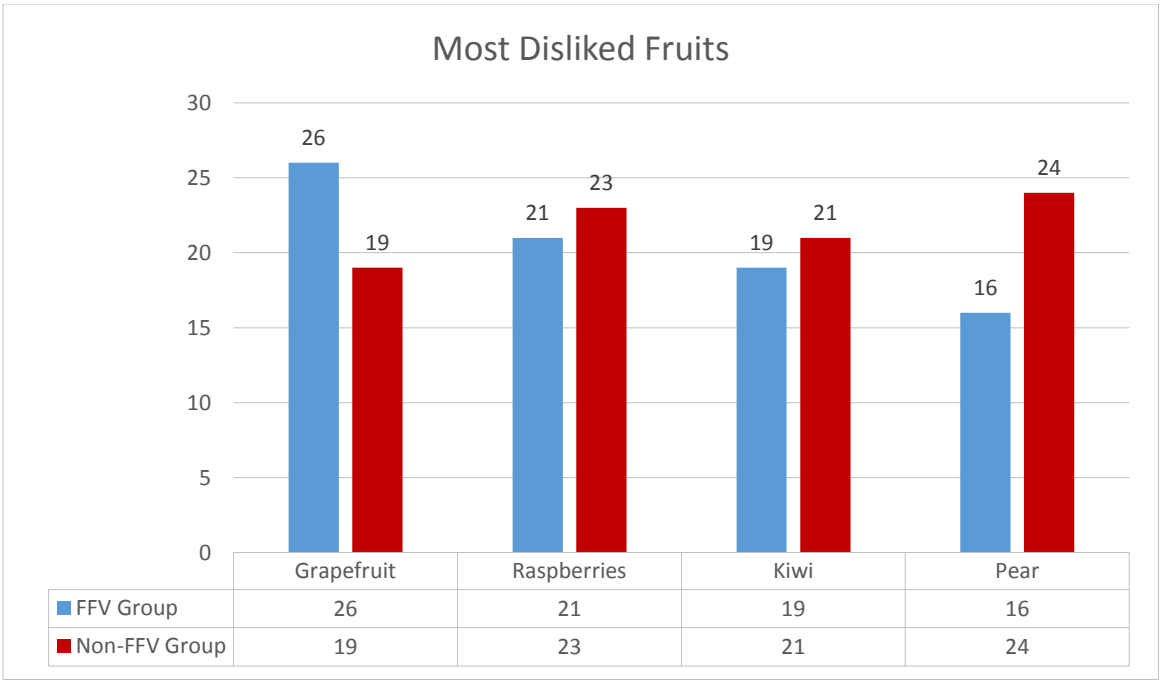


*Figure TAF-1b.* Study and control group percentages: Circle the frowny face if you tried the fruit and did not like it.

Item #2: A ranking value of "12" was used to identify students who responded that they had tried all 12 of the pictured vegetables. Ranking values of 1-11 were used to identify the number of pictured vegetables each student reported never trying before.

According to Levene's Test for Equality of Variances listed in Table 2b, equal variances cannot be assumed. The adjusted two-tailed significance value of .002 allows the researcher to conclude that there is a statistically significant difference in the number of different types of vegetables students have tried between groups. There was a mean difference of 1.902 between groups. Therefore the FFVP or treatment group reported having tried approximately two more types of vegetables than the control group.

9% of FFVP participants reported never trying pictured vegetables, while 11% of Non-FFVP students reported never trying pictured vegetables. Mushroom, bell pepper, cabbage, and celery were identified by both groups as being unfamiliar vegetables.

52% of FFVP participants reported liking the pictured vegetables, while 47% of control group students reporting liking the surveyed vegetables. Both groups reported liking corn, lettuce, carrots, and green beans.

26% of FFVP participants reported that they did not like certain vegetables, while 32% of control group students reported not liking pictured vegetables. Mushroom, celery, and bell pepper topped the list of not liked vegetables in both groups.

13% of FFVP participants were not sure about liking the surveyed vegetables, while 10% of control group respondents reported not being sure. Cabbage and tomatoes were two vegetables both groups reported not being sure about.

Table 2a

*Group Statistics for Questionnaire Item: Have You Ever Tried These Vegetables Before?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 2_NumberOfVegTried | Control Non FFVP | 104 | 7.048 | 5.4173 | .5312 |
| | Treatment FFVP | 238 | 8.950 | 4.5458 | .2947 |

Table 2b

*Independent Samples Test Results for Questionnaire Item: Have You Ever Tried These Vegetables Before?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 2_NumberOfVegTried | Equal variances assumed | 24.062 | .000 | -3.352 | 340 | .001 | -1.9015 |
| | Equal variances not assumed | | | -3.130 | 169.174 | .002 | -1.9015 |

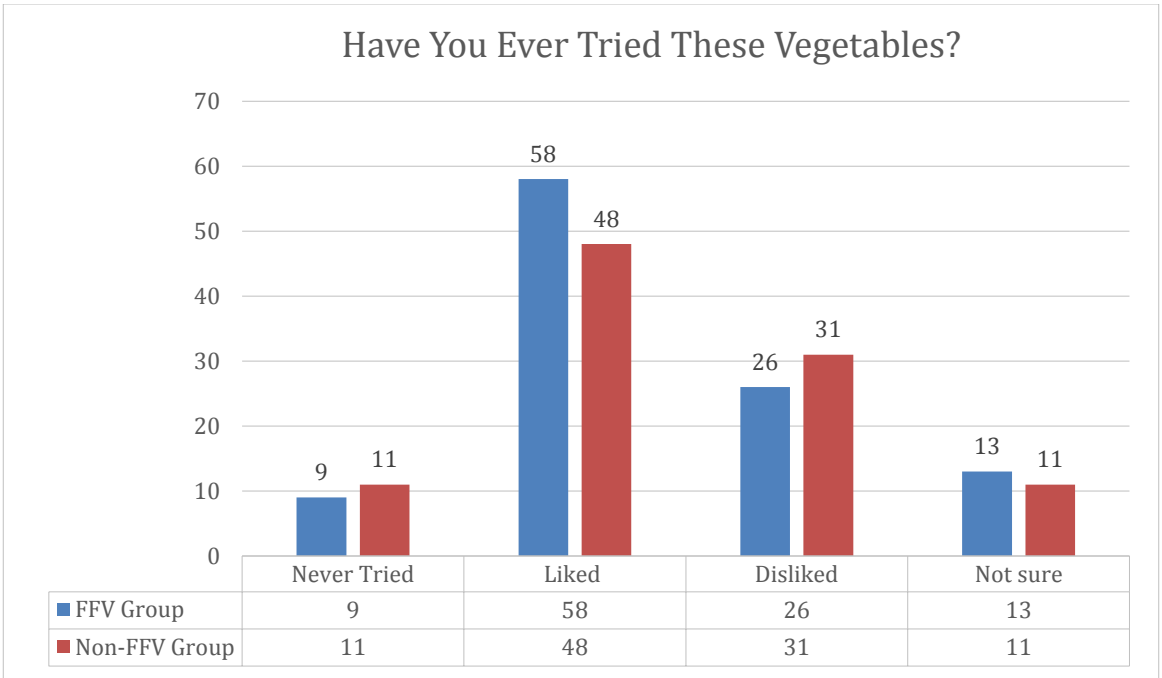


*Figure TAF-2.* Study and control group percentages: Have you tried any of these vegetables before?

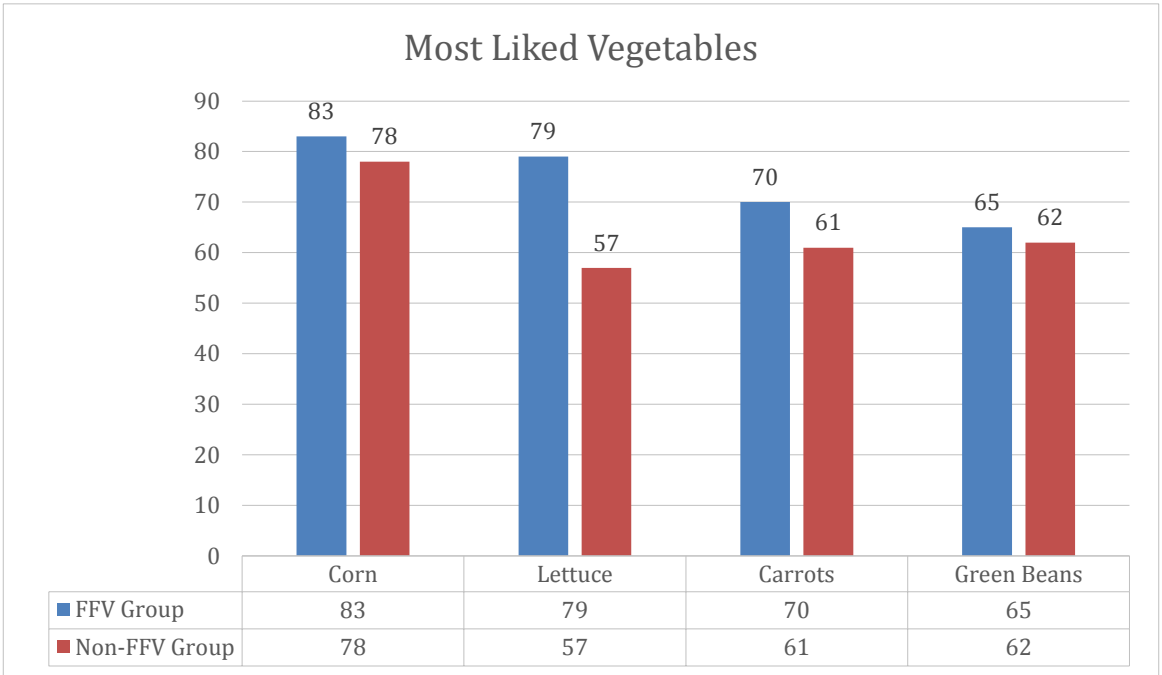


*Figure TAF-2a.* Study and control group percentages: Circle the smiley face if you tried the vegetable and liked it.

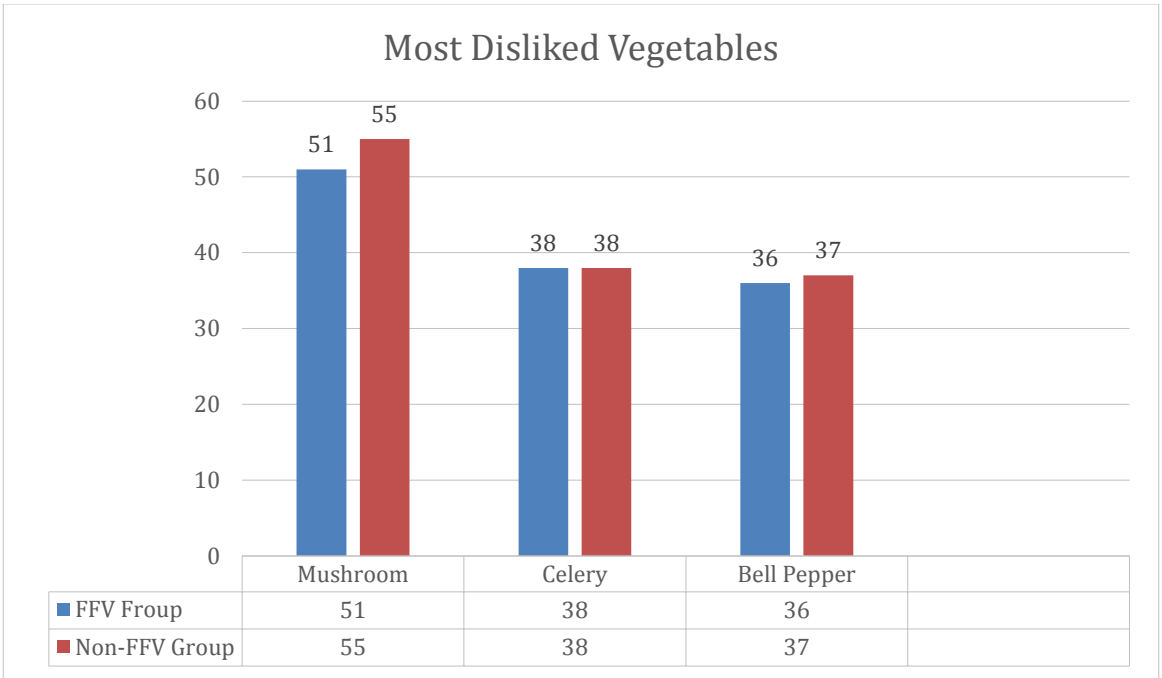


*Figure TAF-2b.* Study and control group percentages: Circle the frowny face if you tried the vegetable and did not like it.

Item #3: A ranking value of "4" was used to identify students who said they would eat the healthiest snack out of four sets of pictures. Ranking values of 0-3 were used to identify students who said they would eat 0-3 of the healthiest snacks out of four sets of pictures.

According to Levene's Test for Equality of Variances listed in Table 3b, equal variances can be assumed. The two-tailed significance value of .039 allows the researcher to conclude that there is a statistically significant difference in the types of snacks students consume between groups. There was a mean difference of 0.313 between groups. Therefore the FFVP or treatment group reported consuming healthier snacks than the control group. However, both groups reported eating at least two out of four healthy snacks.

When asked which foods are commonly eaten as a snack, FFVP participants reported grapes, apples, pears, and bananas as their top four snack picks. Control group students reported grapes, apples, cookies, and yogurt as their top four snack choices.

Table 3a

*Group Statistics for Questionnaire Item: Which of These Foods Do You Eat as a Snack?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 3_PreferAsASnack | Control Non FFVP | 104 | 2.288 | 1.2202 | .1196 |
| | Treatment FFVP | 238 | 2.601 | 1.3041 | .0845 |

Table 3b

*Independent Samples Test Results for Questionnaire Item: Which of These Foods Do You Eat as a Snack?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 3_PreferAsASnack | Equal variances assumed | 2.270 | .133 | -2.077 | 340 | .039 | -.3124 |
| | Equal variances not assumed | | | -2.132 | 208.878 | .034 | -.3124 |

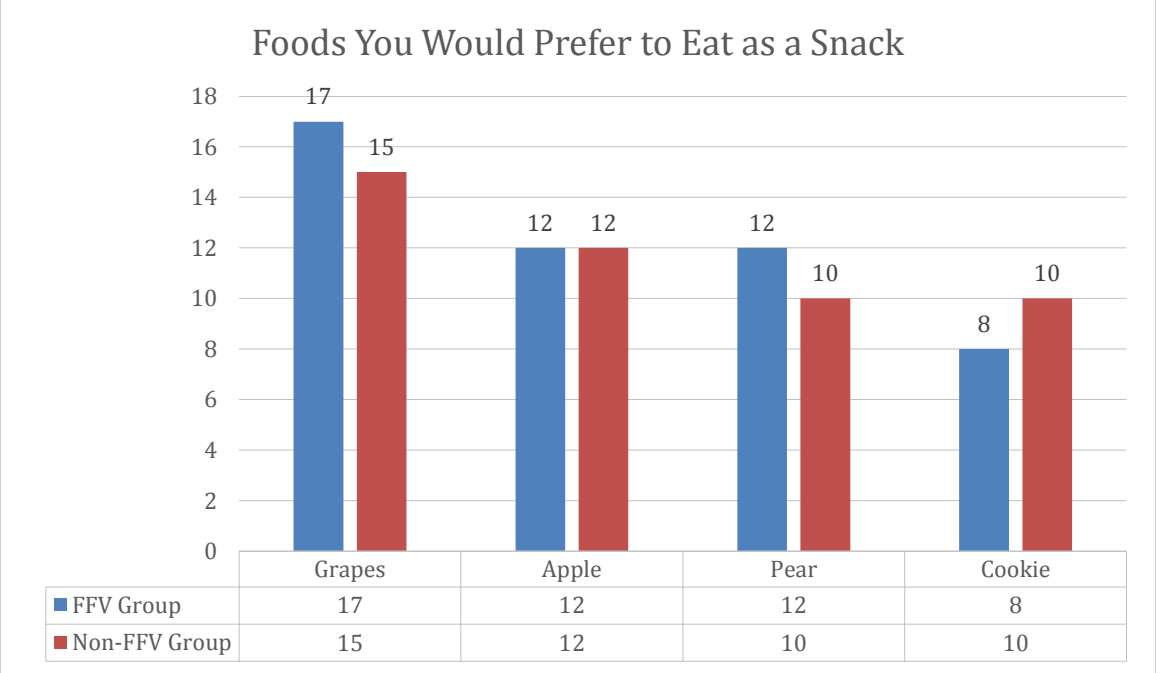


*Figure TAF-3.* Study and control group percentages: Which of these do you prefer to eat as a snack?

Item #4: A ranking value of "5" was used to identify students who picked the healthiest snack out of five sets of pictures. Ranking values of 0-4 were used to identify students who picked 0-4 of the healthiest snacks out of five sets of pictures.

According to Levene's Test for Equality of Variances listed in Table 4b, equal variances cannot be assumed. The adjusted two-tailed significance value of .128 allows the researcher to conclude that there is no statistically significant difference in the types of snacks students think are healthier between groups. On average, both groups correctly chose three out of five snacks that were healthier. The treatment group mean was 3.017, while the control group mean was 2.644.

When asked which snack combinations are healthier, both groups reported cheese and apple, breadsticks and cheese dip with apple, carrot sticks and popcorn, and banana sandwich as the healthiest snack choices listed. Fruit cake and cheese puffs, Swiss roll and crackers, snack cake and French fries, and chocolate bar and cheese puffs were thought to be least healthy by both groups.

Table 4a

*Group Statistics for Questionnaire Item: Which Snack Do You Think is Healthier?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 4_WhichSnackIsHealthier | Control Non FFVP | 104 | 2.644 | 2.1539 | .2112 |
| | Treatment FFVP | 238 | 3.017 | 1.8781 | .1217 |

Table 4b

*Independent Samples Test Results for Questionnaire Item: Which Snack Do You Think is Healthier?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 4_WhichSnackIs Healthier | Equal variances assumed | 14.775 | .000 | -1.612 | 340 | .108 | -.3726 |
| | Equal variances not assumed | | | -1.528 | 174.440 | .128 | -.3726 |

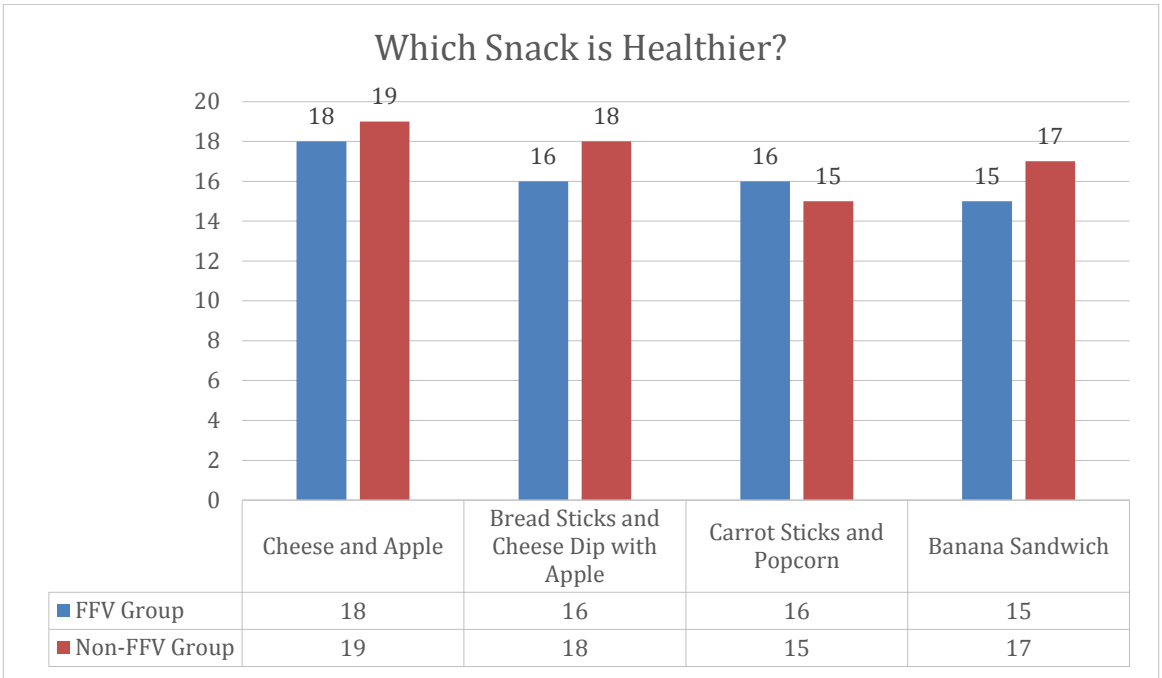


*Figure TAF-4.* Study and control group percentages: Which snack do you think is healthier?

Item #5: A ranking value of "3" was used to identify students who responded that a person should eat fruit, vegetables, and milk to have a balanced diet. Ranking values of 0-2 were used to identify students who picked none, one or two of the three items needed for a balanced diet: fruit, vegetables, and milk.

According to Levene's Test for Equality of Variances listed in Table 5b, equal variances cannot be assumed. The adjusted two-tailed significance value of $p \leq .001$ allows the researcher to conclude that there is a statistically significant difference between groups with regard to amounts of different types of foods that should be consumed to have a balanced diet. There was a mean difference of 0.295 between groups. The control group was slightly more likely to identify the correct amounts of foods a person should eat to have a balanced diet.

When asked how much of certain foods one needs to have a balanced diet, both groups responded that a person should eat a lot of vegetables, fruit, and milk. The FFVP group ranked vegetables most important, while the control group ranked fruit as the most important food. Bread, rice, and eggs were considered by both groups to be foods that a person needs in moderation. Both groups strongly agreed that chocolate, butter, and tuna fish should only be eaten in small amounts.

Table 5a

*Group Statistics for Questionnaire Item: How Much of These Foods Should a Person Eat to Have a Balanced Diet?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 5_BalancedDiet | Control Non FFVP | 104 | 2.644 | .5560 | .0545 |
| | Treatment FFVP | 238 | 2.349 | .8218 | .0533 |

Table 5b

*Independent Samples Test Results for Questionnaire Item: How Much of These Foods Should a Person Eat to Have a Balanced Diet?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 5_BalancedDiet | Equal variances assumed | 17.295 | .000 | 3.346 | 340 | .001 | .2955 |
| | Equal variances not assumed | | | 3.877 | 281.893 | .000 | .2955 |

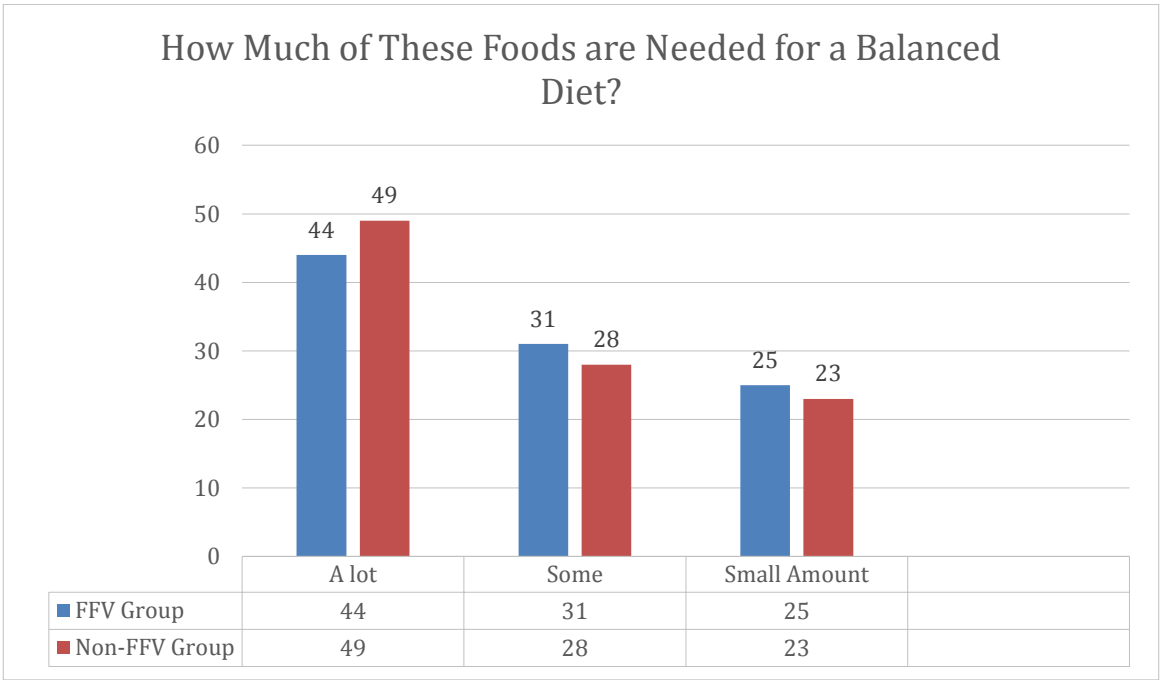


*Figure TAF-5.* Study and control group percentages: How much of these foods do you think a person should eat to have a healthy balanced diet?

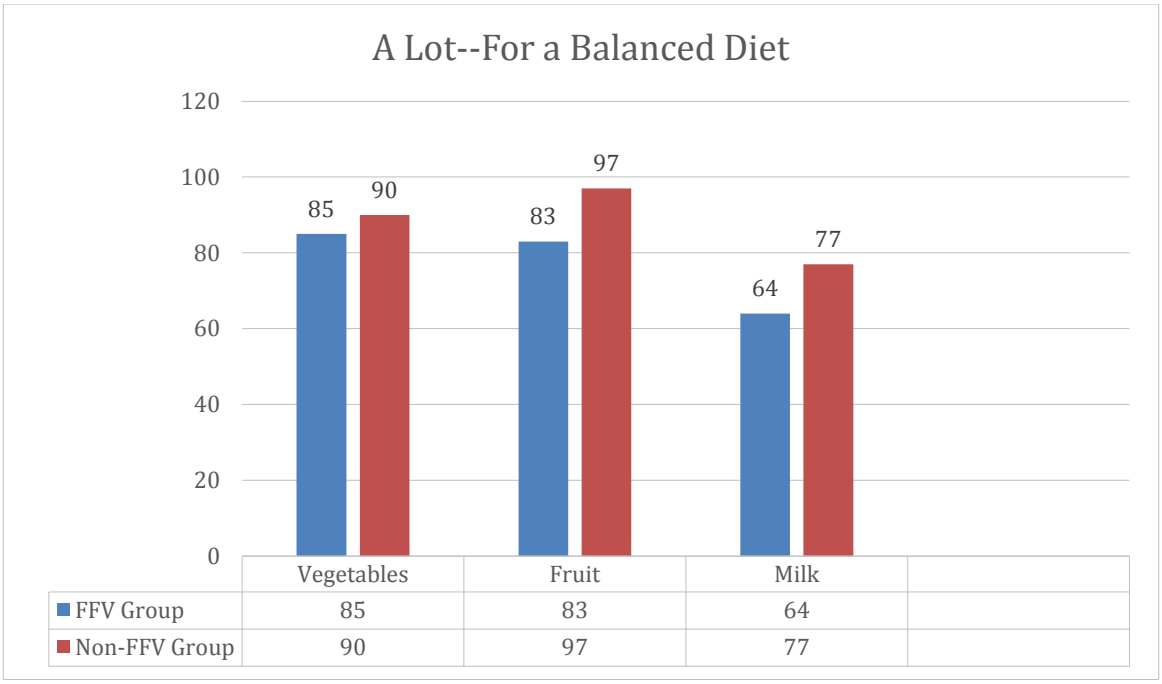


*Figure TAF-5a.* Study and control group percentages: If you think a person should eat lots, circle 3 ticks.

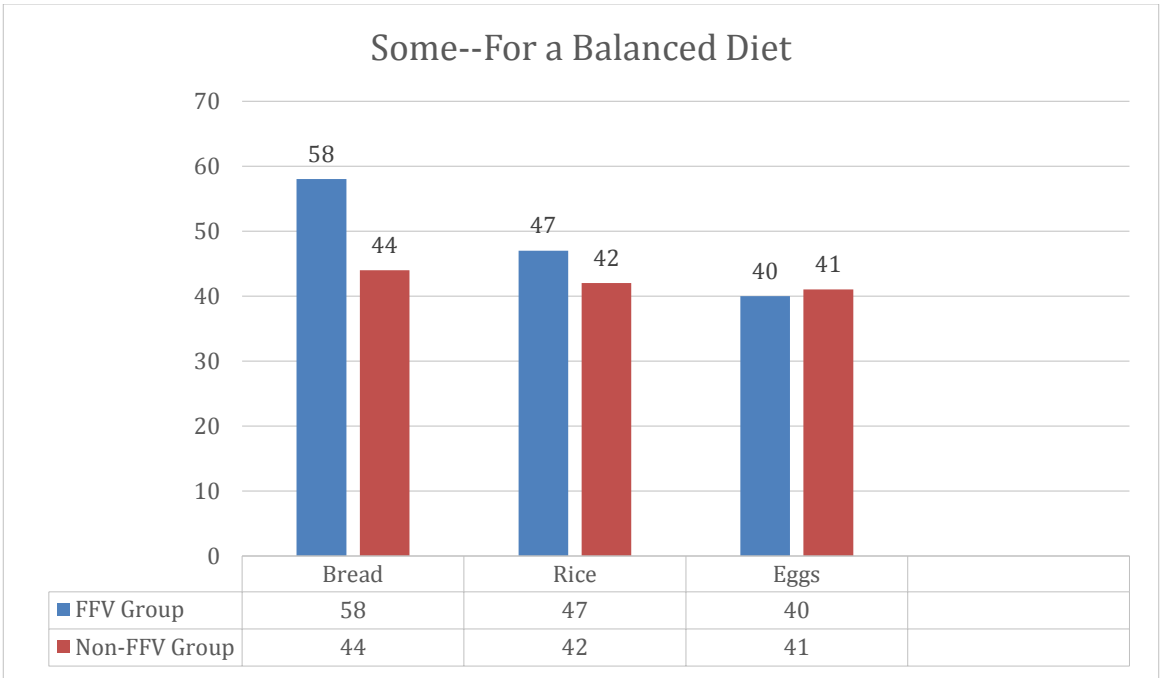


*Figure TAF-5b.* Study and control group percentages: If you think a person should only eat some, circle 2 ticks.

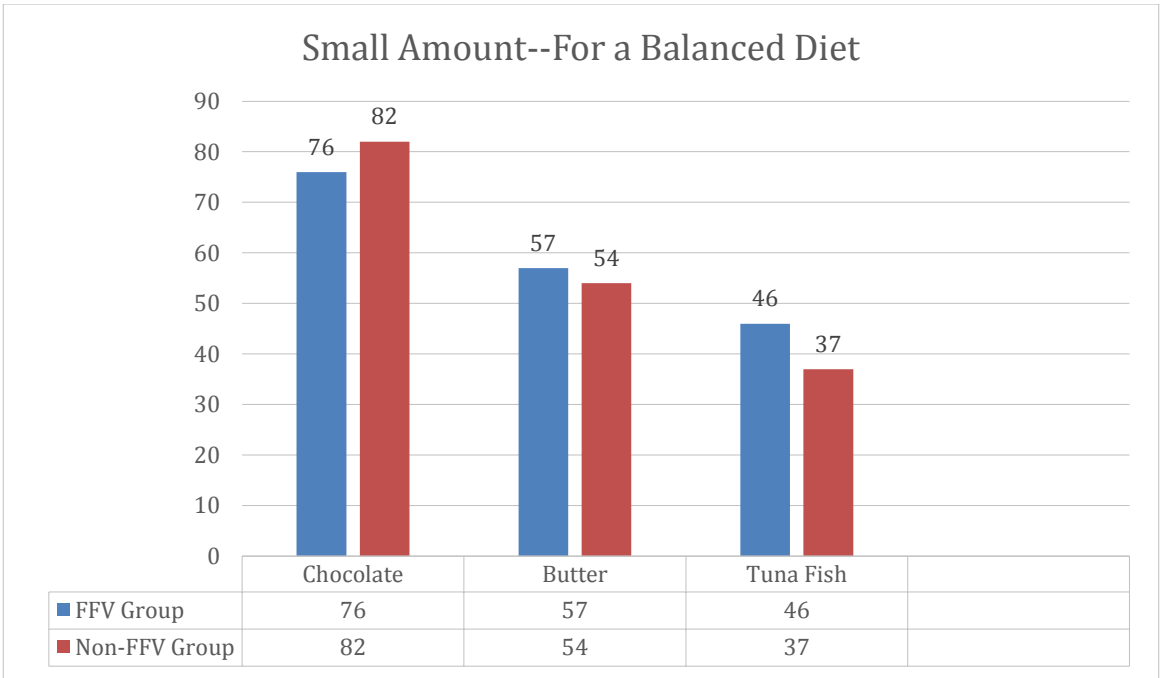


*Figure TAF-5c.* Study and control group percentages: If you think a person should only eat a small amount, circle 1 tick.

Item #6: A ranking value of "2" was used to identify students who chose items that would make a healthy, balanced packed lunch. Ranking values of 0-1 were used to identify students

who picked items that do not make a healthy, balanced packed lunch (0) and make a partially balanced packed lunch (1).

According to Levene's Test for Equality of Variances listed in Table 6b, equal variances cannot be assumed. The adjusted two-tailed significance value of .002 allows the researcher to conclude that there is a statistically significant difference between groups with regard to which four foods would make a healthy, balanced packed lunch. There was a mean difference of 0.339 between groups. The FFVP or treatment group was slightly more likely to select foods that would make a healthy, balanced packed or "sack" lunch from foods at home.

When asked which foods would make a healthy, balanced packed lunch, both groups picked apple, banana, fruit yogurt, and cheese sandwich as healthy lunch items. Chocolate bar, chocolate pudding, and mini Swiss roll were considered by both groups to be least healthy.

Table 6a
*Group Statistics for Questionnaire Item: Which Four Foods Would Make a Healthy, Balanced Packed Lunch?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 6_BalancedPackedLunch | Control Non FFVP | 104 | 1.048 | .9283 | .0910 |
| | Treatment FFVP | 238 | 1.387 | .8480 | .0550 |

Table 6b
*Independent Samples Test Results for Questionnaire Item: Which Four Foods Would Make a Healthy, Balanced Packed Lunch?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 6_BalancedPackedLunch | Equal variances assumed | 5.015 | .026 | -3.298 | 340 | .001 | -.3385 |
| | Equal variances not assumed | | | -3.183 | 181.338 | .002 | -.3385 |


*Figure TAF-6.* Study and control group percentages: Which 4 foods would make a healthy, balanced packed lunch?

Item #7: A ranking value of "2" was used to identify students who chose items that would make a healthy, balanced lunch. Ranking values of 0-1 were used to identify students who picked items that do not make a healthy, balanced lunch (0) and make a partially balanced lunch (1).

According to Levene's Test for Equality of Variances listed in Table 7b, equal variances can be assumed. The two-tailed significance value of .004 allows the researcher to conclude that there is a statistically significant difference between groups with regard to which four foods would make a healthy balanced lunch. There was a mean difference of 0.301 between groups. The FFVP or treatment group was slightly more likely to select foods that would make a healthy balanced lunch from foods offered at school.

Both groups responded that salad, peas, carrots, rice and chicken were the healthiest foods to make a balanced lunch.

Table 7a

*Group Statistics for Questionnaire Item: Which Four Foods Would Make a Healthy Balanced Lunch?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 7_HealthyBalancedLunch | Control Non FFVP | 104 | 1.077 | .9211 | .0903 |
| | Treatment FFVP | 238 | 1.378 | .8568 | .0555 |

Table 7b

*Independent Samples Test Results for Questionnaire Item: Which Four Foods Would Make a Healthy Balanced Lunch?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 7_HealthyBalanced Lunch | Equal variances assumed | 3.195 | .075 | -2.923 | 340 | .004 | -.3012 |
| | Equal variances not assumed | | | -2.841 | 184.165 | .005 | -.3012 |

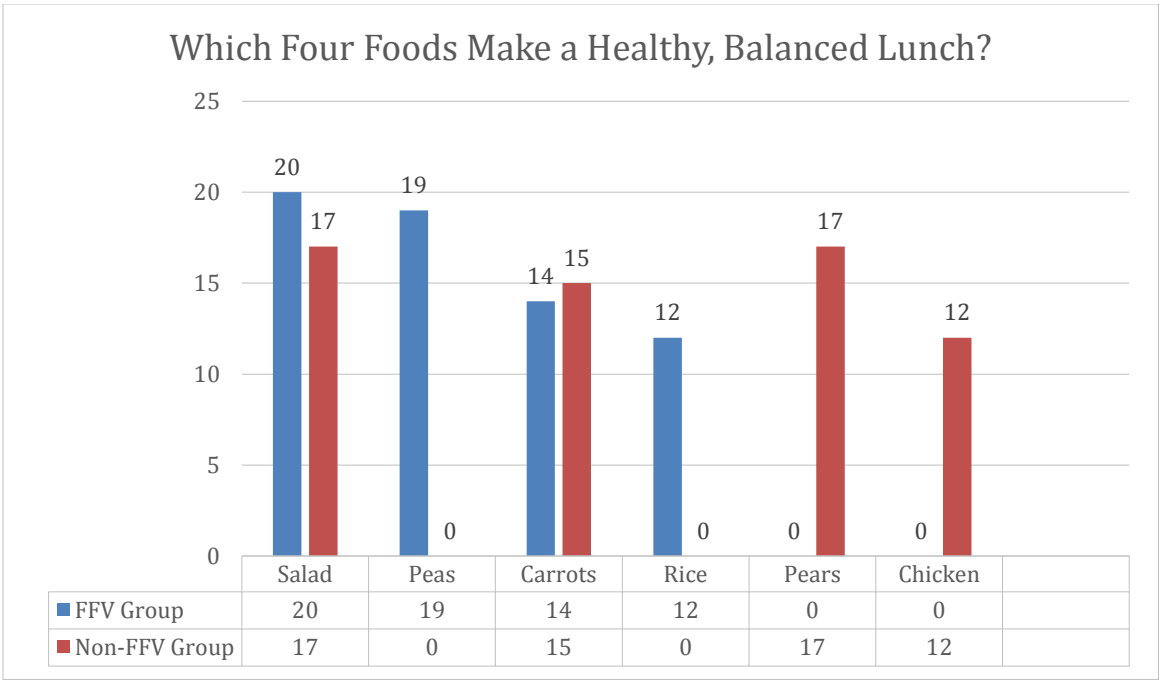


*Figure TAF-7.* Study and control group percentages: Which 4 foods would make a healthy balanced lunch?

Item #8: A ranking value of "5" was used to identify students who correctly identified all five portions of fruit. A ranking value of 0 was used to identify students who incorrectly identified all five portions of fruit.

According to Levene's Test for Equality of Variances listed in Table 8b, equal variances can be assumed. The two-tailed significance value of .001 allows the researcher to conclude that there is a statistically significant difference between groups with regard to which items count as a portion of fruit. There was a mean difference of 0.485 between groups. The control group was more likely to correctly identify portions of fruit. Both groups correctly identified at least three out of five portions of fruit.

Table 8a

*Group Statistics for Questionnaire Item: Which of These Do You Think Would Count as a Portion of Fruit?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 8_PortionOfFruit | Control Non FFVP | 104 | 3.510 | 1.1741 | .1151 |
| | Treatment FFVP | 238 | 3.025 | 1.3054 | .0846 |

Table 8b

*Independent Samples Test Results for Questionnaire Item: Which of These Do You Think Would Count as a Portion of Fruit?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 8_PortionOfFruit | Equal variances assumed | .035 | .852 | 3.252 | 340 | .001 | .4844 |
| | Equal variances not assumed | | | 3.390 | 216.826 | .001 | .4844 |

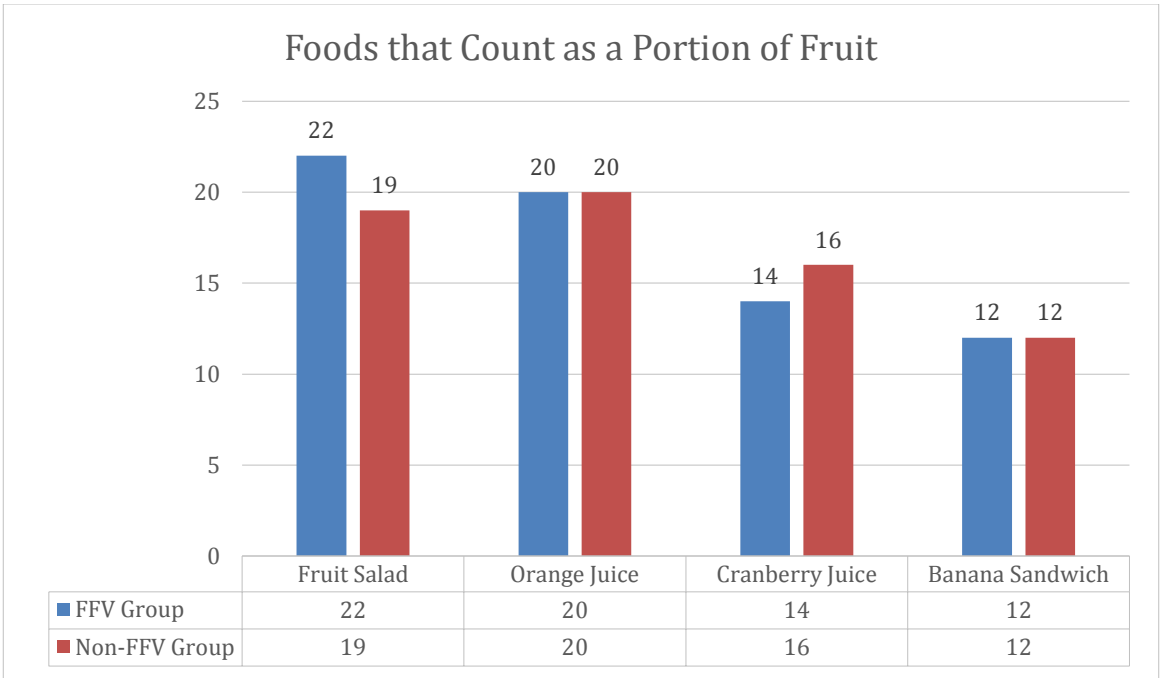


*Figure TAF-8.* Study and control group percentages: Which of these do you think would count as a portion of fruit?

Item #9: A ranking value of "1" was used to identify students who responded that people should eat four or five servings of fruit and vegetables daily. A ranking value of 0 was used to identify students who circled any number between one and nine excluding the correct responses (four or five).

According to Levene's Test for Equality of Variances listed in Table 9b, equal variances can be assumed. The two-tailed significance value of .295 allows the researcher to conclude that there is no statistically significant difference between groups with regard to the servings of fruit students think should be eaten each day.

Both groups correctly responded when asked how many servings of fruit a person should eat each day. The most common response from the FFVP group was five servings, while the control group's most popular response was four servings. Therefore, the FFVP or treatment

group was slightly more likely to identify the most correct response to the question, (five servings of fruit per day).

Table 9a

*Group Statistics for Questionnaire Item: How Many Servings of Fruit Do You Think You Should Eat Each Day?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| 9_ServingsFVNeeded Per Day | Control Non FFVP | 104 | .404 | .4930 | .0483 |
| | Treatment FFVP | 238 | .345 | .4762 | .0309 |

Table 9b

*Independent Samples Test Results for Questionnaire Item: How Many Servings of Fruit Do You Think You Should Eat Each Day?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| 9_ServingsFV NeededPerDay | Equal variances assumed | 3.580 | .059 | 1.048 | 340 | .295 | .0593 |
| | Equal variances not assumed | | | 1.034 | 190.348 | .302 | .0593 |

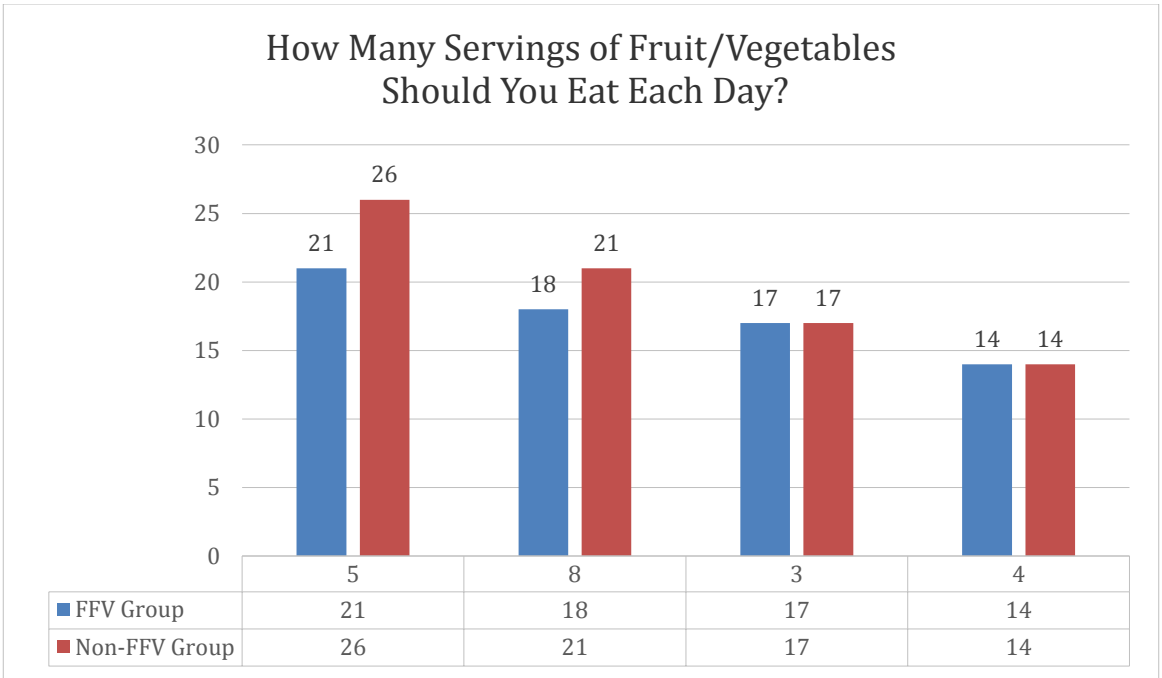


*Figure TAF-9.* Study and control group percentages: How many portions or fruit and/or vegetables do you think you should eat every day?

**"Eater Meter" Questionnaire**

Items #1 and #2: A ranking value of "5" was used to identify students who reported consuming at least 5 different fruits and vegetables last week. A ranking value of "0" was used to identify students who reported consuming less than five different fruits and vegetables last week.

According to Levene's Test for Equality of Variances listed in Table EM-1b, equal variances can be assumed. The two-tailed significance value of .194 allows the researcher to conclude that there is no statistically significant difference between groups with regard to the types of fruit students report consuming in the last week. Both groups reported consuming around three to four different types of fruit last week.

According to Levene's Test for Equality of Variances listed in Table EM-2b, equal variances can be assumed. The two-tailed significance value of .226 allows the researcher to conclude that there is no statistically significant difference between groups with regard to the

types of vegetables students report consuming in the last week. Both groups reported consuming around two to three different types of vegetables last week.

Student responses were very similar between groups. Apples, oranges, strawberries, bananas, and grapes were the most commonly consumed fruits. Both groups gave identical responses that corn, potatoes, and carrots were the most commonly consumed vegetables.

Table EM-1a

*Group Statistics for Questionnaire Item: Circle Each Fruit You Ate Last Week*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| EaterMeter1_NumberOf FruitsChecked | Control Non FFVP | 104 | 3.644 | 4.3353 | .4251 |
| | Treatment FFVP | 238 | 2.962 | 4.5110 | .2924 |

Table EM-1b

*Independent Samples Test Results for Questionnaire Item: Circle Each Fruit You Ate Last Week*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| EaterMeter1_ NumberOfFruits Checked | Equal variances assumed | .001 | .980 | 1.301 | 340 | .194 | .6820 |
| | Equal variances not assumed | | | 1.322 | 203.700 | .188 | .6820 |

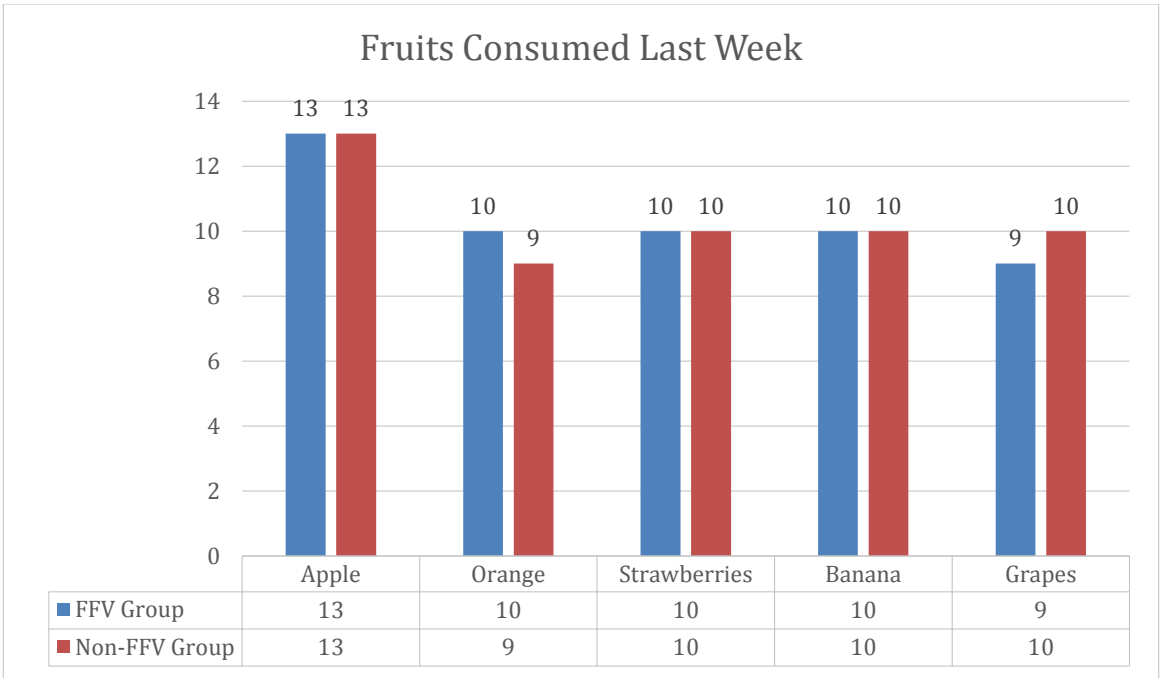


*Figure EM-1.* Study and control group percentages: Circle the fruits you ate last week.

Table EM-2a

*Group Statistics for Questionnaire Item: Circle Each Vegetable You Ate Last Week*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Eater Meter2_NumberOf VegChecked | Control Non FFVP | 104 | 2.846 | 4.3125 | .4229 |
| | Treatment FFVP | 238 | 2.273 | 3.8862 | .2519 |

Table EM-2b

*Independent Samples Test Results for Questionnaire Item: Circle Each Vegetable You Ate Last Week*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| EaterMeter2_ NumberOfVeg Checked | Equal variances assumed | .946 | .331 | 1.213 | 340 | .226 | .5730 |
| | Equal variances not assumed | | | 1.164 | 179.259 | .246 | .5730 |

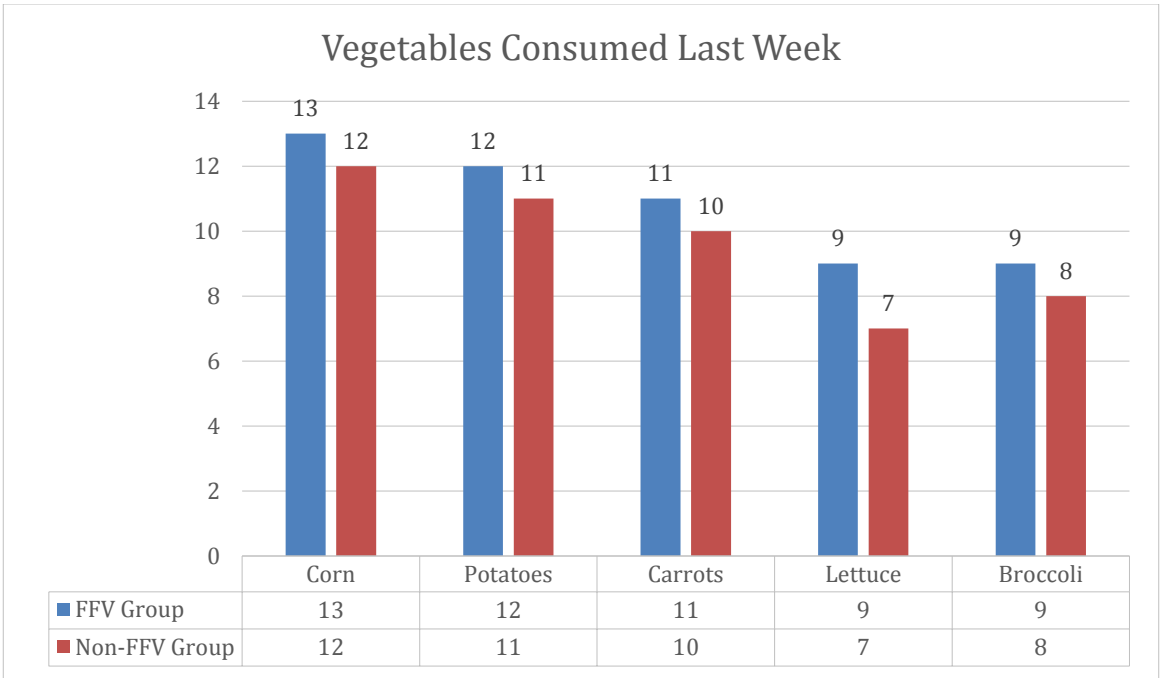


*Figure EM-2.* Study and control group percentages: Circle the vegetables you ate last week.

Items #3 and #4: A ranking value of "5" was used to identify students who reported wanting to try at least 5 different types of fruits and vegetables at home this week. A ranking value of "0" was used to identify students who reported wanting to try less than five different fruits and vegetables at home this week.

According to Levene's Test for Equality of Variances listed in Table EM-3b, equal variances can be assumed. The two-tailed significance value of .014 allows the researcher to conclude that there is a statistically significant difference between groups with regard to the number of fruits that students would like to consume at home. There was a mean difference of 1.578 between groups. The control group was much more likely to report wanting to try a greater variety of fruits at home.

According to Levene's Test for Equality of Variances listed in Table EM-4b, equal variances can be assumed. The two-tailed significance value of .014 allows the researcher to conclude that there is a statistically significant difference between groups with regard to the

number of vegetables that students would like to consume at home. There was a mean difference of 1.265 between groups. The control group was much more likely to report wanting to try a greater variety of vegetables at home.

When asked which foods they would like to eat at home, both groups responded that they would like to eat watermelon, strawberries, apples, oranges, bananas and grapes. Similarly, corn, potatoes, and carrots were chosen as the vegetables students in both groups would like to eat at home.

Table EM-3a

*Group Statistics for Questionnaire Item: Which Fruits Would You Like to Eat at Home This Week?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| EaterMeter3_NumberOf FruitsWantToTryAtHome | Control Non FFVP | 104 | 5.683 | 5.4243 | .5319 |
| | Treatment FFVP | 238 | 4.105 | 5.4092 | .3506 |

Table EM-3b

*Independent Samples Test Results for Questionnaire Item: Which Fruits Would You Like to Eat at Home This Week?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| EaterMeter3_ NumberOfFruits WantToTryAtHome | Equal variances assumed | .010 | .922 | 2.479 | 340 | .014 | 1.5777 |
| | Equal variances not assumed | | | 2.476 | 195.890 | .014 | 1.5777 |

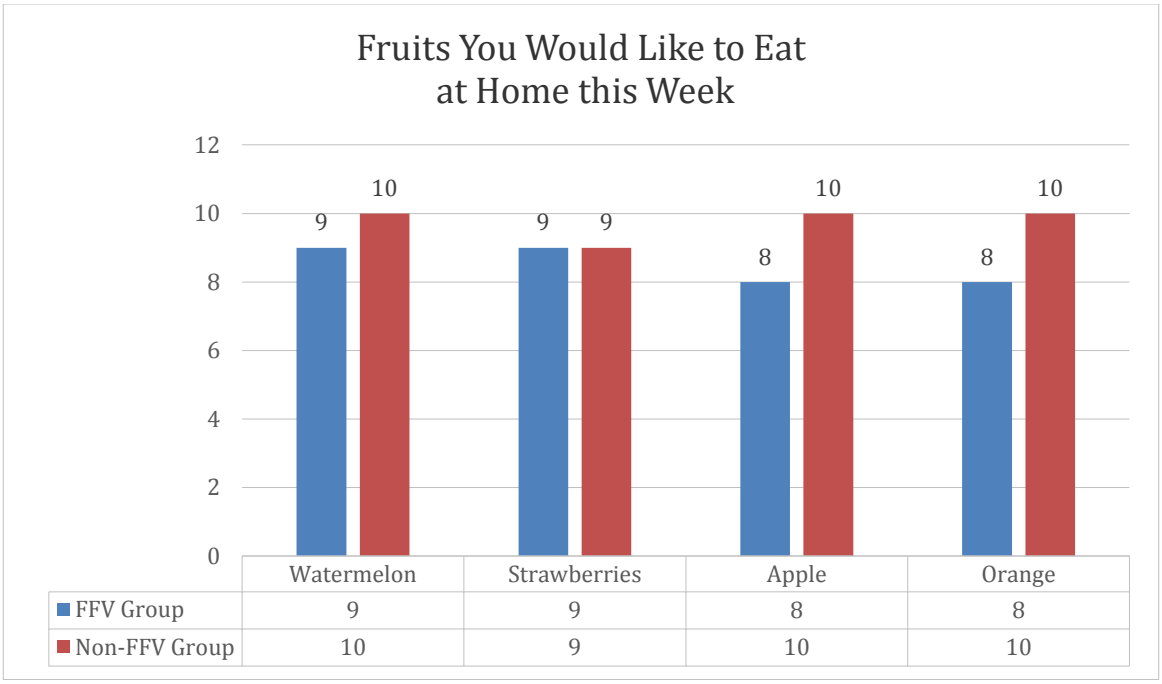


*Figure EM-3.* Study and control group percentages: Circle the fruits you would like to eat at home this week.

Table EM-4a

*Group Statistics for Questionnaire Item: Which Vegetables Would You Like to Eat at Home This Week?*

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| EaterMeter4_NumberOf VegWantToTryAtHome | Control Non FFVP | 104 | 4.135 | 4.5838 | .4495 |
| | Treatment FFVP | 238 | 2.870 | 4.2669 | .2766 |

Table EM-4b

*Independent Samples Test Results for Questionnaire Item: Which Vegetables Would You Like to Eat at Home This Week?*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| EaterMeter4_ NumberOfVegWant ToTryAtHome | Equal variances assumed | .546 | .460 | 2.465 | 340 | .014 | 1.2649 |
| | Equal variances not assumed | | | 2.397 | 184.287 | .018 | 1.2649 |

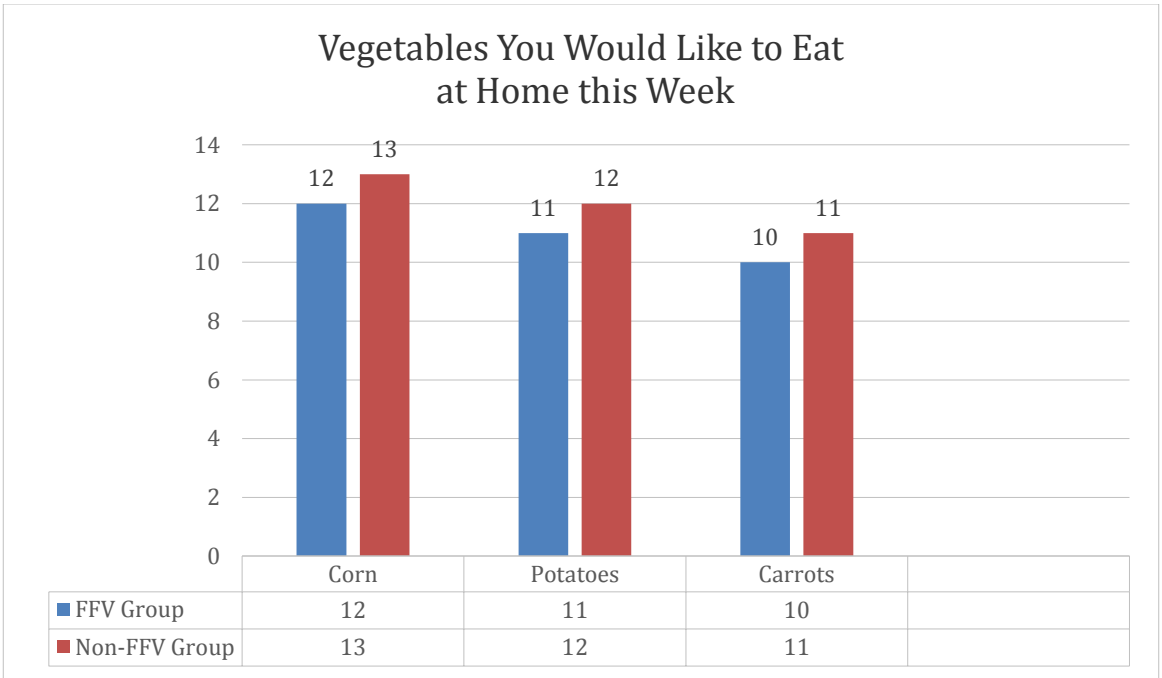


*Figure EM-4.* Study and control group percentages: Circle the vegetables you would like to eat at home this week.

**Summary**

The following is a summary of the results of the questionnaire items statistically analyzed using SPSS independent samples t-tests.

**Research Questions**

The following research questions were used in the study:

1. What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools?

There was a statistically significant difference in the number of fruits that students reported to have never tried. The FFVP (intervention) group (M = .962, SD = 1.6922, N = 238) reported having tried more types of fruits than the Non-FFVP (control) group (M = 1.558, SD = 2.1759, N = 104).

There was also a statistically significant difference in the number of different types of vegetables students reported to have tried. The FFVP (intervention) group (M = 8.950, SD = 4.5458, N = 238) reported having tried more types of vegetables than the Non-FFVP (control) group (M = 7.048, SD = 5.4173, N = 104).

In addition, there was a statistically significant difference in the types of snacks students reported consuming between groups. The FFVP (intervention) group (M = 2.601, SD = 1.3041, N = 238) reported consuming healthier snack choices compared to the Non-FFVP (control) group (M = 2.288, SD = 1.2202, N = 104).

Students at FFVP intervention schools appear to consume a greater variety of fruits and vegetables in addition to healthier snacks.

2. Does school involvement with the FFVP significantly increase student's nutrition knowledge?

There was no significant difference between groups with regard to the types of snacks students thought were healthier: FFVP (intervention) group (M = 3.017, SD = 1.8781, N = 238); Non-FFVP (control) group (M = 2.644, SD = 2.1539, N = 104).

There was a significant difference between groups with regard to amounts of different types of foods that should be consumed to have a balanced diet. In this case, the Non-FFVP (control) group was more likely to identify foods that should be consumed in greater amounts to have a balanced diet (fruits, vegetables, and milk). FFVP (intervention) group (M = 2.349, SD = .8218, N = 238); Non-FFVP (control) group (M = 2.644, SD = .5560, N = 104).

There was a significant difference between groups with regard to which four foods would make a healthy, balanced packed lunch. The FFVP (intervention) group (M = 1.387, SD = .8480,

N = 238) was more likely to pick foods that make a balanced packed lunch compared to the Non-FFVP (control) group (M = 1.048, SD = .9283, N = 104).

In addition, there was a significant difference between groups with regard to which four foods would make a healthy balanced lunch. The FFVP (intervention) group (M = 1.387, SD = .8568, N = 238) was more likely to pick foods that make a balanced lunch compared to the Non-FFVP (control) group (M = 1.077, SD = .9211, N = 104).

There was a significant difference between groups with regard to which items count as a portion of fruit. In this case, the Non-FFVP (control) group was more likely to correctly identify portions of fruit. FFVP (intervention) group (M = 3.025, SD = 1.3054, N = 238); Non-FFVP (control) group (M = 3.510, SD = 1.1741, N = 104).

There was no significant difference between groups with regard to the servings of fruit students think should be eaten each day: FFVP (intervention) group (M = .345, SD = .4762, N = 238); Non-FFVP (control) group (M = .404, SD = .4930, N = 104).

Students in both groups appear to be receiving nutrition education during the school day. The results suggest that most students are knowledgeable about which foods are healthier than others and can use that knowledge to make healthy food choices when presented with healthy options.

3. Are students in FFVP schools more likely to try new foods when they are offered at school?

There was no significant difference between groups with regard to the types of fruit students reported consuming in the last week: FFVP (intervention) group (M = 2.962, SD = 4.5110, N = 238); Non-FFVP (control) group (M = 3.644, SD = 4.3353, N = 104).

There was also no significant difference between groups with regard to the types of vegetables students reported consuming in the last week: FFVP (intervention) group (M = 2.273, SD = 3.8862, N = 238); Non-FFVP (control) group (M = 2.846, SD = 4.3125, N = 104).

There appears to be no difference in the types of fruits or vegetables consumed by treatment or control groups. Therefore, the Fresh Fruit and Vegetable Program offered at intervention schools does not appear to increase weekly consumption of a variety of fruits and vegetables.

The majority of students in both groups reported that they liked trying new foods as school; however, FFVP participants were slightly more likely to report that they enjoy trying new foods when offered at school. Since a majority of children are willing to try new foods at school, the results suggest that schools provide a good environment for introducing children to new foods.

4. Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

There was a significant difference between groups with regard to the number of different types of fruits that students would like to consume at home. The Non-FFVP (control) group was more likely to want to try different types of fruit at home. FFVP (intervention) group (M = 4.105, SD = 5.4092, N = 238); Non-FFVP (control) group (M = 5.683, SD = 5.4243, N = 104).

There was also a significant difference between groups with regard to the number of different types of vegetables students would like to consume at home. The Non-FFVP (control) group was more likely to want to try different types of vegetables at home. FFVP (intervention) group (M = 2.870, SD = 4.2669, N = 238); Non-FFVP (control) group (M = 4.135, SD = 4.5838, N = 104).

## Chapter IV: Summary, Conclusions, Implications, and Recommendations

The purpose of this study was to assess the Fresh Fruit and Vegetable Program (FFVP), a federal intervention program designed to increase consumption of fresh fruits and vegetables among school-aged children. Elementary schools in Alabama that participated in the FFVP were matched with schools that did not participate in the 2013-2014 and 2014-2015 school years. This study assessed the impact of the program on students' fruit and vegetable intake.

### Research Questions

The following research questions were used in the study:

1. What, if any, is the difference in the types of fruits and vegetables consumed weekly by Alabama children participating in the Fresh Fruit and Vegetable Program compared with children in non-participating schools?
2. Does school involvement with the FFVP significantly increase student's nutrition knowledge?
3. Are students in FFVP schools more likely to try new foods when they are offered at school?
4. Does school involvement with the FFVP affect the types of fruits and vegetables consumed at home?

### Summary

It should be noted that the accuracy of survey results are limited because responses were self-reported and young children have age-related limits to their capacity to understand survey questions and the provided response options. Therefore, results should not be interpreted as fact, but as an estimate of students' nutrition knowledge, food choices, and behavior. The pictures used for response options were carefully chosen to represent foods commonly served for lunch, and how foods are commonly prepared. Color copies of the surveys were provided in order to

clarify what each picture represented. The pictures used in the surveys could have biased the responses of the children if the pictures did not look exactly like what is served at school or home. The number of response options was limited to keep the survey brief.

**Limitations of the Study**

1. A small population was studied due to unwillingness of school districts to participate and unwillingness of parents to give IRB permission for children to take part in the study.
2. Due to locations across the state, there were eight different survey administrators. Even though each administrator was given the same instructions, each had a different delivery style. One common survey administrator would have added an element of consistency.
3. Due to the size of the school districts willing to participate in the study, three schools had no comparison group to survey.
4. The ages of the participants and their varied reasoning skills presented reliability problems.

**Strengths of the Study**

1. This study is the first examination of Alabama's Fresh Fruit and Vegetable Program, which leads the way for future study.
2. The study surveyed Fresh Fruit and Vegetable Programs across the state of Alabama.
3. The questionnaire produced consistent answers from students in study and control groups.
4. Student responses can be incorporated into planning future Fresh Fruit and Vegetable Programs.

**Conclusions**

Based on the results from this study, it may be concluded that students at FFVP (intervention) schools appear to have sampled a greater variety of fruits and vegetables and were slightly more likely to report consuming healthier snacks compared to students in non-FFVP

(control) schools. However, there was no difference in the types of fruits or vegetables students reported consuming over the course of one week. Neither group reported consuming more than five different types of fruits or vegetables in one week. Both groups favored the same fruits and vegetables. These are likely to be foods children are exposed to at home.

Students in both groups appear to be receiving nutrition education during the school day. The results suggest that most students are knowledgeable about which foods are healthier than others and can use that knowledge to make healthy food choices when presented with healthy options.

The majority of students in both groups reported that they liked trying new foods as school; however, FFVP participants were slightly more likely to report that they enjoy trying new foods when offered at school. Since a majority of children are willing to try new foods at school, the results suggest that schools provide a good environment for introducing children to new foods.

The majority of students in both groups reported that school lunches are different than what they eat at home. This suggests that students may not be consuming home meals that are as healthy and nutritionally balanced as school lunches. There appears to be no difference in the types of fruits or vegetables consumed at home by treatment or control groups. Control group students were more likely to report wanting to try a greater variety of fruits and vegetables at home.

**Implications**

This study was the first examination of the Fresh Fruit and Vegetable Program in Alabama schools. The results of this study can be useful in re-evaluating the effectiveness of school wellness programs involving school administrators, teachers, students, and families.

Despite the variance in delivery styles among survey administrators across the state, the questionnaires produced consistent responses from students in study and control groups. The surveys provided an accurate record of students' nutrition knowledge, food preferences, food choices, and related behaviors. The results of this study can be used to better understand children's food preferences, what children eat at home, and to identify opportunities for improving student nutrition in the school setting.

**Recommendations**

The following recommendations can be used to plan future activities and initiatives that promote fruit and vegetable consumption:

1. Students should have many opportunities to practice making healthy food choices, both in school and at home. To prepare students to make healthy food choices, nutrition education should be started in first grade. When students receive nutrition education early in school, children will know how to identify healthy foods and have the knowledge to make healthy food choices when given options.
2. Some favorite vegetables were corn, lettuce, carrots, green beans, and broccoli. These vegetables should be creatively incorporated into more school lunches to improve the nutrition of traditional lunch options and increase vegetable consumption among students. For example, adding broccoli and carrots to pasta or rice dishes, topping pizza with more vegetables, or including different types of lettuce in sandwiches and interesting salads.
3. Less preferred vegetables were mushrooms, celery, bell peppers, tomatoes, peas, and cucumber. These vegetables should be creatively incorporated into more school lunches to provide new ways of exposing children to these vegetables, and hopefully reduce food

waste. For example, roasted grape tomatoes could be mixed into grain dishes or tacos instead of only offering them raw. Peas and celery can be featured in soups. Salads can be made more appealing with mushrooms, bell peppers, and cucumber. Less popular vegetables can be offered in conjunction with favorite hot lunch options in order to improve consumption.

4. Many students consume milk and yogurt at home. Parents should be encouraged to serve low-fat, low-sugar, unflavored milks and yogurts to children. Non-dairy, soy varieties are healthy alternatives. Children and parents should also be encouraged to communicate with each other about what children have consumed at school so they are not drinking too many servings of milk or consuming too much sugar.
5. Students and their families can also be encouraged to eat healthier version of foods commonly eaten at home, such as whole wheat pizza and pasta with vegetables, and brown rice instead of white rice. Water should be offered instead of juice and soda. Recipes can be provided to parents to encourage consumption of fruits, vegetables, and beans. For example, few children indicated that they eat chili at home, but a vegetarian chili recipe made with a variety of beans and vegetables can be a healthy, low-cost, and convenient meal.
6. Families should be encouraged to review the monthly lunch calendar, not only so parents know what their children are eating at school, but to use as a guide for how to put together nutritionally balanced meals at home. Experienced dietitians develop school lunch menus to ensure that children eat nutritionally balanced, age-appropriate meals, which can be used as a model for parents.

In general, the results from this study suggest that students are willing to try a greater variety of foods when they are offered at school. Children should be given multiple opportunities to eat fruits and vegetables in order to establish healthy food preferences. Parents should reinforce healthy eating behaviors at home by offering young children healthy foods that reflect what is provided at school. Children should also be encouraged to tell their parents what they eat at school and what fruits and vegetables they like to eat.

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# Appendix A

Surveys:

Maria Sanchez School Lunch Survey

Thinking about Food Survey

Eater Meter Survey

**Maria Sanchez School Lunch Survey**

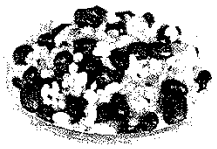
1. Choose 3 lunch foods shown below that you think are the healthiest.

Broccoli

Pizza

Hamburger

Strawberries



Brown Rice & Beans

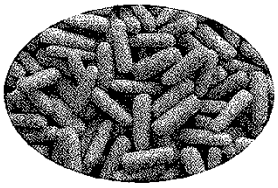
Tacos

2. Circle your most favorite vegetables served for lunch.

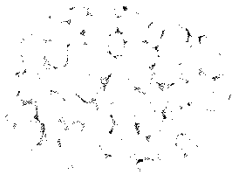
Broccoli

Green Beans

Peas

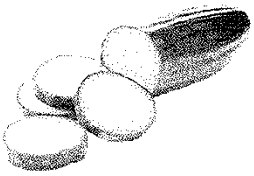


Carrots

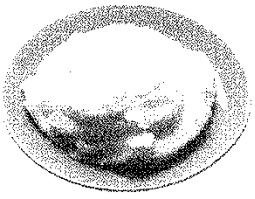


Corn

Salad Greens



Cucumbers



Mashed Potatoes

Grape Tomatoes

3. Circle the foods that look like what you eat at home.

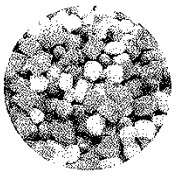
Pizza

Hamburger

Taco

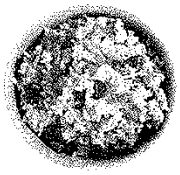
Pasta


Yogurt

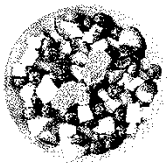


Mixed Vegetables


Chips



Rice



Fresh Fruit

Chili


Fruit Juice


Milk

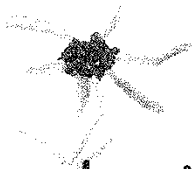
Soda

4. Are school lunches the same or different than what you eat at home?

THE SAME DIFFERENT

5. Do you like to try new foods at school? YES! NO!

School:



# Thinking about Food

**We would like to know what you think about different foods. No one in your school or at home will read your answers.**

## Example question

Here are some pictures of things to eat.
Have you tried any of these foods before?
if you have NEVER TRIED IT before, mark X on picture
if you tried it and LIKED it, circle the smiley face
if you tried it and did NOT like it, circle the frown
if you are NOT SURE, circle the straight face

bread roll



cheese



fruit salad

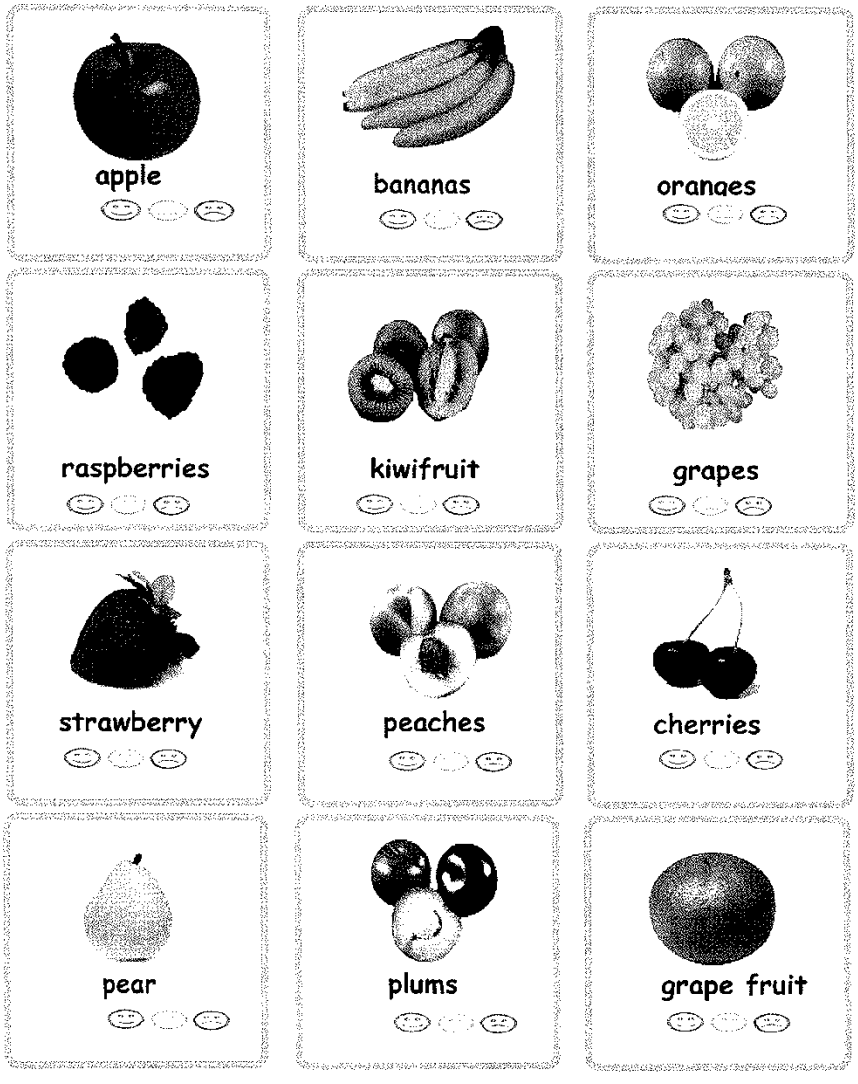


**NFS 3942-3** National Foundation for Educational Research, Milestone House, Upton Park, Slough, Berks, SL1 2DQ. © NFER **PQ**

## Here are some pictures of different fruits.

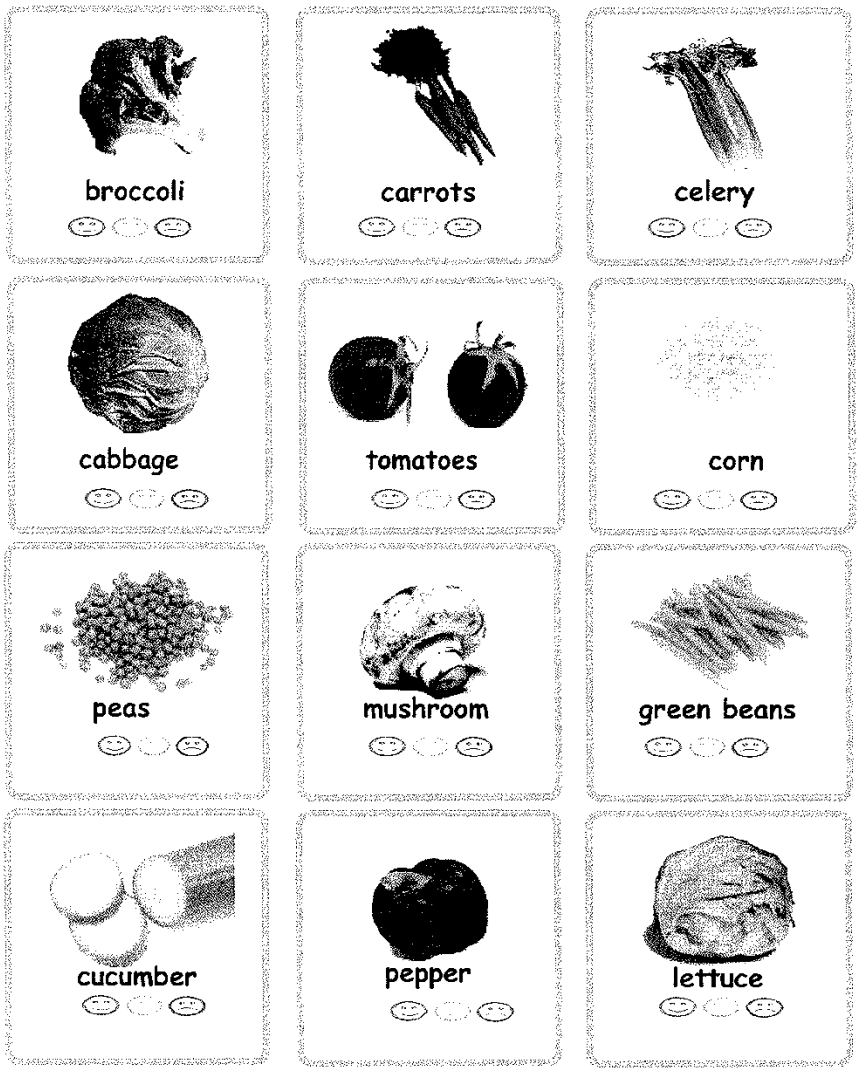
Have you tried any of these fruits before?

X = Never Tried it Before
Smile = Liked It
Frown = Did Not Like It
Straight Face = Not Sure



## Here are some pictures of different vegetables.

Have you tried any of these vegetables before?



Here are some pictures of foods that you might eat as a snack between meals.

Which of these do you prefer to eat as a snack?
Circle your responses.

apple

or


chips

snack cake

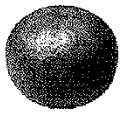
or

pear

banana

or

cookie



orange

or

yogurt

crackers

or

grapes

## 4 Here are some more pictures of foods that you might eat as a snack between meals.

This time, tell us which of these you think is healthier.
Circle your responses.

cheese and apple

or

fruit cake and cheese puffs

or

mini swiss roll and crackers

crackers and fruit roll-up

or

breadsticks and cheese dip with grapes

or

chocolate bar and cheese puffs

donut and chips

or

carrot sticks and popcorn

or

onion rings and fruit chews

cheese triangles and chips

or

fruit cake and chocolate

or

rice crispy treat and raisins

chocolate bar and gummy bears

or

banana sandwich

or

snack cake and French fries

## 5 Here are some pictures of different foods and drinks.

**How much of these foods do you think a person should eat to have a healthy balanced diet?**

if you think a person **should** eat lots, circle the **3** ticks ✓✓✓

if you think a person **should** only eat some, circle the **2** ticks ✓✓

if you think a person **should** only eat a small amount, circle the **1** tick. ✓

vegetables ✓✓✓ ✓✓ ✓

milk ✓✓✓ ✓✓ ✓

chocolate ✓✓✓ ✓✓ ✓

butter ✓✓✓ ✓✓ ✓

bread ✓✓✓ ✓✓ ✓

rice ✓✓✓ ✓✓ ✓

eggs ✓✓✓ ✓✓ ✓

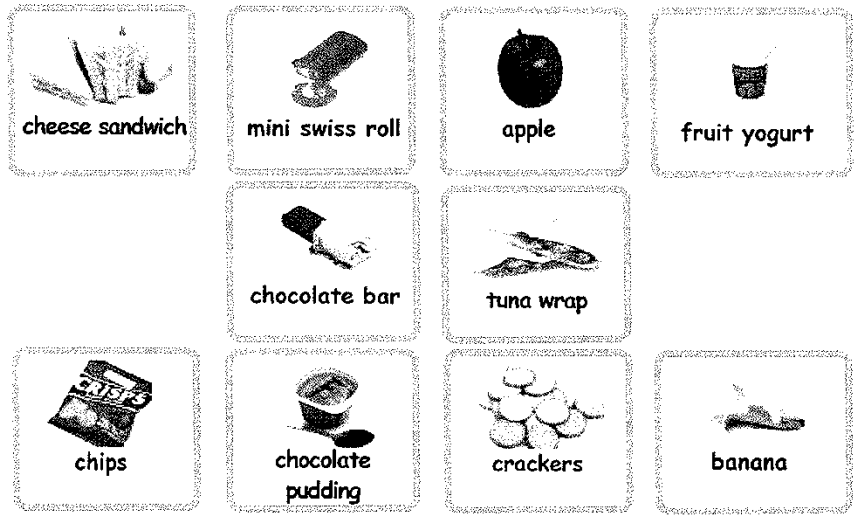
tuna fish ✓✓✓ ✓✓ ✓

fruit ✓✓✓ ✓✓ ✓

cheese ✓✓✓ ✓✓ ✓

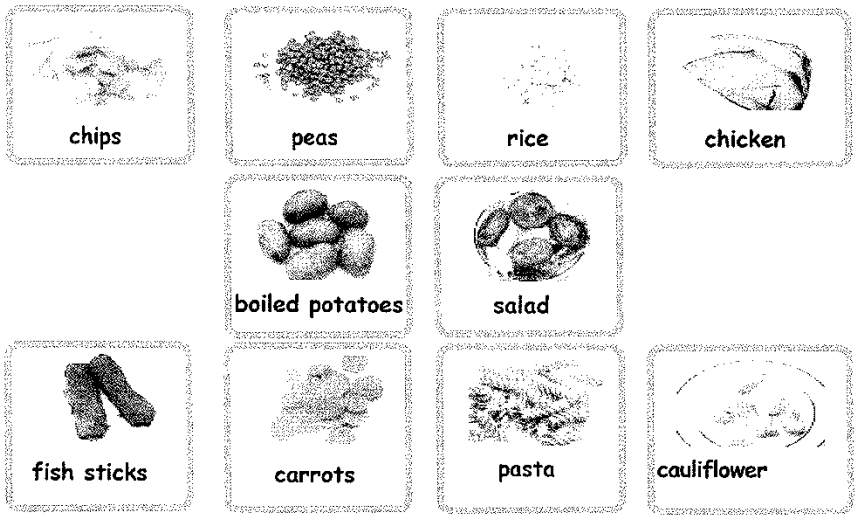
## 6 Here are some pictures of different foods that you might have in a packed lunch.

Which 4 foods would make a healthy balanced packed lunch?
Circle your responses.




## 7 Here are some pictures of different foods that you might have for a lunch.

Which 4 foods would make a healthy balanced lunch?
Circle your responses.




7

## Here are some pictures of different foods and drinks.

Which of these do you think would count as a portion of fruit?

Circle your responses below.


strawberry popsicle


banana sandwich


cranberry juice

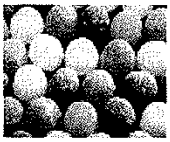

orange juice


raisins


Cherry Jello


fruit cake


fruit salad


Fruity Pebbles

How many portions of fruit and/or vegetables do you think you should eat every day?

*(circle the number)*

0 1 2 3 4 5 6 7 8

Thank you for completing this questionnaire.

# 1 Fruit & Veggie Eater Meter!

Are you ready to become one of the **Fruit & Veggie Color Champions™** like Yaz O'Frazz, Raoul, Big Pauly, Greta and Winonna? By trying new **fruits & veggies,** and eating the recommended amounts, you can earn certificates and rewards.

**First, let's find out how you did last week.**

In the boxes below, write the number of times you ate each fruit or veggie last week. Then write your grand total in the circle below. Remember the pictures of the **fruits & veggies** are just representations and **all forms count: fresh, frozen, canned, dried and 100% juice!**

## fruits

grapefruit | strawberry | mango | kiwifruit | green grapes | apple | pineapple | orange | cranberries

peaches | bananas | watermelon | plums | avocado | blackberries | pear | blueberries

draw it here!

other fruit

## veggies

tomato | corn | [illegible] | beets | broccoli | [illegible] | peppers | peas | asparagus

[illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | zucchini | winter squash

draw it here!

other veggie

**Grand Total!**

**Number of times I tried fruits & veggies last week.**

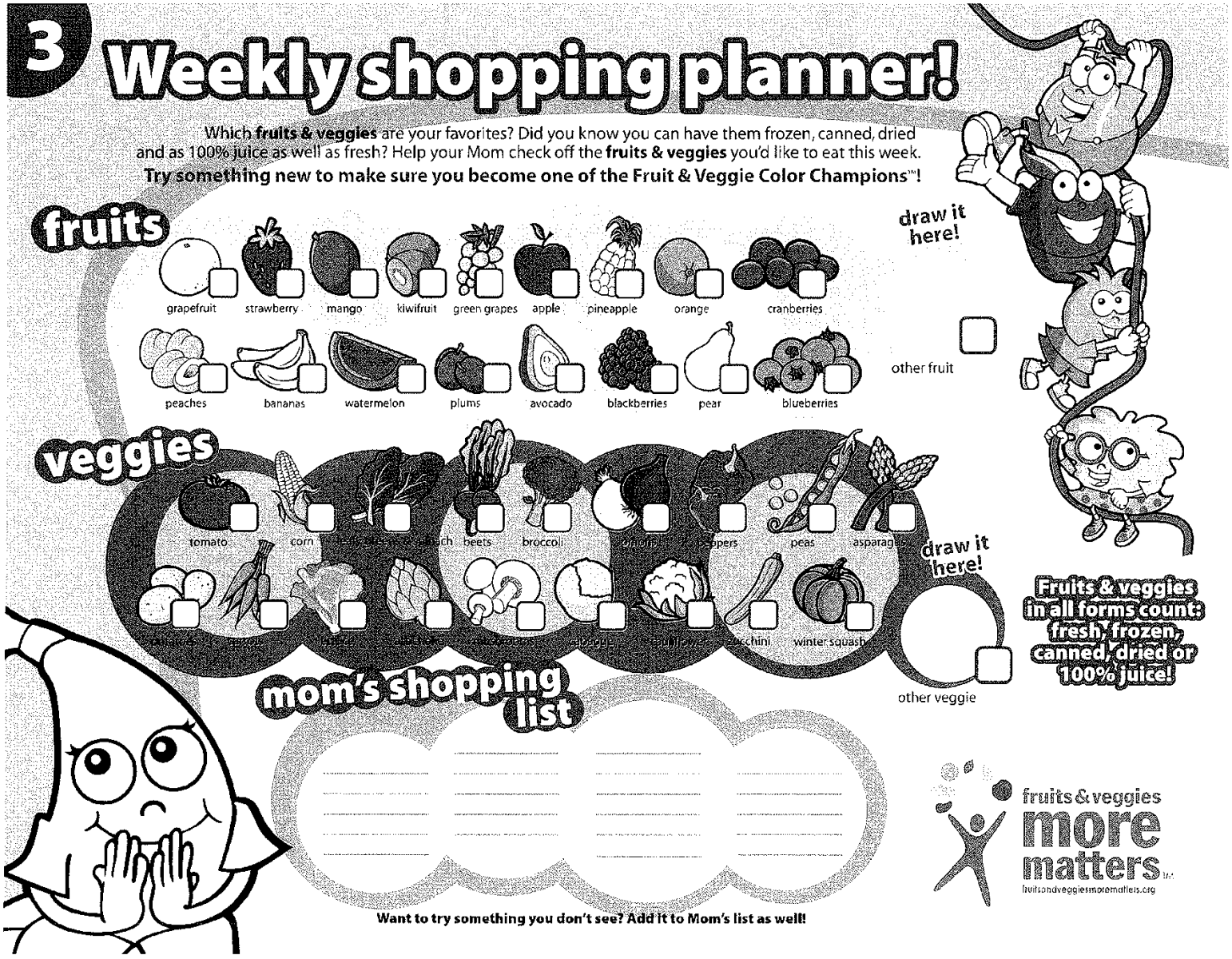
**How many more would I like to try next week?**

fruits & veggies more matters™
fruitsandveggiesmorematters.org

# 3 Weekly shopping planner!

Which **fruits & veggies** are your favorites? Did you know you can have them frozen, canned, dried and as 100% juice as well as fresh? Help your Mom check off the **fruits & veggies** you'd like to eat this week.

**Try something new to make sure you become one of the Fruit & Veggie Color Champions™!**



Appendix B

Superintendent Permission Letter

AUBURN UNIVERSITY
COLLEGE OF EDUCATION
EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

Dear Child Nutrition Director,

I would like to invite you to participate in a research study that I am conducting as a doctoral student at Auburn University. The purpose of the study is to learn more about fruit and vegetable consumption of 3rd and 4th grade students. Your school system was selected as a possible participant in this study because you participate in the Fresh Fruit and Vegetable Program.

If you decide to participate, you will be asked to administer a set of pictorial surveys. The surveys will be read aloud to students. The surveys will take approximately 30 minutes for students to complete. The surveys should be administered during the first three months of the 2014-15 school year (September-November 2014) and returned before December 20, 2014.

If any student feels uncomfortable answering a question, he or she can circle "no response." I cannot guarantee that any child will receive any benefits from this research; however, there are no risks involved. Consent forms will be sent home for parent/guardian signature. In addition, students must also sign an assent form stating that they understand what is expected and agree to participate in the study. Any child who does not wish to participate in the study may leave the room and go to the school library at the time the survey is given.

Any information that is obtained in connection with this study and that can be identified with any child will remain confidential and will be disclosed only with parental permission or as required by law. Surveys will be completed anonymously and will only be coded by the school name and grade level. All surveys and data collected will be maintained in a locked file cabinet in my office located at the Jackson County Board of Education. If you have any questions about the study, please feel free to contact me at 256-647-3502; duttonj@jackson.k12.al.us.

Your signature indicates that you have read and understand the information provided above and that your school district willingly agrees to participate.

School District: _____

CNP Director Signature: _____

Superintendent Signature: _____

Date: _____

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460: Fax: 334-844-3072

www.auburn.edu

# Appendix C

## Approved Consent Forms

AUBURN UNIVERSITY
COLLEGE OF EDUCATION
EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

# A Study of the Impact of the Fresh Fruit and Vegetable Program in Alabama Schools

## Assent Form for Minors

I am willing to take part in the Fresh Fruit and Vegetable Program Study. I understand that the researcher from Auburn University is hoping to learn more about what I like to eat. I understand that I will answer questions about what I eat at school and home. I will be asked about the types of fruits and vegetables I have eaten during the school year. This study will take place in the classroom and should take about 30 minutes of my time.

I am taking part because I want to. I have been told that I can stop at any time, and if I do not like a question, I do not have to answer it. No one will know my answers. I agree to answer questions honestly.

Name _____

Signature _____

Date: _____

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460: Fax: 334-844-3072

www.auburn.edu

Age/Grade: _____

AUBURN UNIVERSITY

COLLEGE OF EDUCATION

EDUCATIONAL FOUNDATIONS, LEADERSHIP AND TECHNOLOGY

## GUARDIAN AUTHORIZATION

### A Study of the Impact of the Fresh Fruit and Vegetable Program in Alabama Schools

Your child is invited to participate in a research study conducted by Jennifer Dutton, a doctoral student at Auburn University. The purpose of the study is to learn more about fruit and vegetable consumption. Your child was selected as a possible participant in this study because the school system your child attends currently participates in the Fresh Fruit and Vegetable Program.

If you decide to allow your child to participate, he or she will simply answer a series of pictorial food related surveys. The survey will be read aloud to students and your child will circle his or her responses. The survey will take approximately 30 minutes.

If your child feels uncomfortable answering a question, he or she can circle "no response." I cannot guarantee that your child personally will receive any benefits from this research; however, there are no risks involved.

Survey data will be collected as anonymous, meaning that surveys will not ask your child for any identifying information. Student responses will be analyzed at the school and grade level.

Information obtained in this study may be shared with the Alabama Department of Education Child Nutrition Program Department. All surveys and data collected will be maintained in a locked file cabinet in the researcher's office located at the Jackson County Board of Education.

Your child's participation is voluntary. Your decision whether or not to allow your child to participate will not affect your or your child's relationship with his or her teacher or school. If you decide to allow your child to participate, you and/or your child are free to withdraw your consent and discontinue participation at any time without penalty.

If you have any questions about the study, please feel free to contact Jennifer Dutton at 256-647-3502; duttonj@jackson.k12.al.us. If you have questions regarding your rights as a research subject, please contact the Auburn University IRB office at 334-844-5966; irbadmin@auburn.edu. You will be offered a copy of this form to keep.

4036 Haley Center, Auburn, AL 3684-5221; Telephone: 334-844-4460: Fax: 334-844-3072

www.auburn.edu

Guardian Initial_____

Your signature indicates that you have read and understand the information provided above, that you willingly agree to allow your child to participate, that you and/or your child may withdraw your consent at any time and discontinue participation without penalty, that you will receive a copy of this form, and that you are not waiving any legal claims.

Printed Guardian Name: _____

Guardian Signature: _____

Date: _____

Principal Investigator Name: _____

Principal Investigator Signature: _____

Date: _____

Appendix D

Survey Instructions

**Survey Instructions:**

The following surveys were created to learn more about what students think of school lunches, what food items or meals are working well, and how school lunches can be improved to increase the consumption of fruits and vegetables among young children. The surveys also explore how the foods children eat at home influence what children will eat at school.

Each student should complete three short pictorial surveys. The first survey, the "Maria Sanchez School Lunch Survey," was developed in California and measures nutrition knowledge (what is considered healthy); food preferences for different types of vegetables; foods most commonly consumed at home; and self-efficacy towards trying new foods at school. The second survey, "Thinking About Food," is a follow up to the first survey and asks more in-depth questions about the types of fruits and vegetables the student has or has not tried and whether or not those items were accepted. The survey also asks students to choose between two snacks, one of them being a fruit. In addition, the student is asked which of three snacks he or she thinks is healthier. The survey concludes with nutrition knowledge questions asking the student to select combinations of items they think would make a balanced lunch. The final survey, "Eater Meter," asks the student to number the times he or she ate a particular fruit or vegetable during the past week. The last page of Eater Meter asks students to check a box next to the fruit or vegetable he or she would like to try.

**Eater Meter: Only pages 1 and 3 should be completed.**

**Page 1 of Eater Meter asks students to write the number of times they ate the pictured fruit or vegetable last week.**

**Page 3 of Eater Meter asks students to check the boxes next to the fruits or vegetables they would like to eat <u>at home</u> this week.**

Please read each question, so the children understand what is being asked, and explain each answer option. For example, read the question to make sure the children understand that you want to know what kinds of food they eat at home, not necessarily what are their favorite foods to eat. Then ask, "Do you eat pizza at home? If you eat pizza at home, circle the pizza." Ask this for each answer option shown.

After reading through each question and allowing children enough time to answer each one, collect the surveys and make sure the grade of the students is noted on the first page. The survey is anonymous and students do not need to write their name on the survey. I will need to know if the surveys come from a FFVP school or a non-participating school.

Thank you for helping us learn more about how to improve the nutrition and health of Alabama students.