

# EVALUATION OF A FRESH FRUIT AND VEGETABLE PROGRAM

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Title

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## ABSTRACT

Strang, Michelle Glee, M.S., Department of Health, Nutrition, and Exercise Sciences, College of Human Development and Education, North Dakota State University, July 2010. Evaluation of a Fresh Fruit and Vegetable Program. Major Professor: Dr. Julie Garden-Robinson.

The goal of this study was to assess the effectiveness of a Fresh Fruit and Vegetable Program (FFVP) on participants' fruit and vegetable behavior at school and at home. The evaluation addressed 2 questions: (1) Did the Fresh Fruit and Vegetable Program affect students' availability of fruits or vegetable in the home, willingness to try or request fruits or vegetables from a parent, or fruit or vegetable consumption throughout the day? (2) Were any of these factors influenced by student age, ethnicity, family income, or gender? During the 2009-2010 school year, the intervention school distributed a daily fruit or vegetable snack to all students (kindergarten through grade 5) during the school day. Data were collected in the spring of 2010 from 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> grade students and their parents from two schools, one intervention ( $n=264$ ) and one control ( $n=326$ ), using a post-only survey. Data from parent and student surveys revealed no differences between schools; however, significant differences among demographic groups were uncovered. Students' willingness to try new fruits and vegetables was impacted by age, family income, and gender. When testing for the availability of fruits and vegetables in the home, data varied by age and ethnicity, while overall fruit and vegetable consumption scores and willingness to request fruits and vegetables from a parent differed by family income and gender. Findings indicate that the FFVP did not affect students' fruit and vegetable behavior away from school; conversely, student characteristics such as gender and family income did play a role. Future research should investigate if distributing free fruits and vegetables at school

as a component of a more comprehensive approach, including supplemental activities such as nutrition education and parental involvement, would increase the positive outcomes of the program.

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# CHAPTER 1

## INTRODUCTION

Chronic diseases such as obesity, diabetes, and cardiovascular disease are on the rise, and as a result, incidence of disability and premature death also are increasing (World Health Organization, 2003). Although diseases like these are most often seen in adults, increasingly, many weight-related conditions are being diagnosed in children. According to the World Health Organization (WHO), this phenomenon is partially attributable to a shift in dietary and lifestyle patterns; specifically, increased consumption of energy-dense foods that are high in saturated fats, and low consumption of unrefined carbohydrates including fruits and vegetables (WHO, 2003). These dietary alterations not only influence the existing health of individuals, but more importantly, they may contribute to the development of disease later in life (WHO, 2003).

There is strong and growing evidence that simply boosting consumption of fruits and vegetables (FVs) may help prevent disease and promote health throughout the lifecycle. A recent study on FV intake from the Boyd Orr cohort found that childhood fruit consumption may have a positive effect on adult cancer risk (Maynard, Gunnell, Emmett, Frankel, & Davey Smith, 2005). Furthermore, the WHO confirmed that 2.6 million deaths and 31% of cardiovascular disease may be prevented each year by simply increasing consumption of FVs to 600 grams per day (Lock, Pomerleau, Causer, Altmann, & McKee, 2005). However, Healthy People 2010 reported that most children are not meeting these recommendations and what's more, the bulk of the FVs being consumed are in the form of fruit juice and French fries (United States Department of Health and Human Services,

2000). Therefore, helping children establish healthy eating behaviors, including meeting FV intake goals, may help prevent diet-related disease later in life.

Finding the optimum approach to increase FV consumption has been a topic of research for many years. Hendy, Williams, and Camise (2005) found that by making FVs more available and providing children with opportunities for tasting unfamiliar FVs, preference, and therefore consumption, will increase. Moreover, children spend much of the day in school, which makes the school setting an ideal location for this type of approach to take place.

The goals of the United States Department of Agriculture (USDA) Fresh Fruit and Vegetable Program (FFVP) were based on factors such as these. The FFVP initially began in 2002 as a pilot project to increase FV consumption in children across four U.S. states and an Indian Tribal Organization. Section 19, under the Food, Conservation and Energy Act of 2008, permanently authorized the program nationwide. Today, the program is active in all 50 states, as well as the District of Columbia, Guam, Puerto Rico and the Virgin Islands. The program provides a variety of fresh FVs free to children in selected schools, based on the percentage of students receiving free and reduced priced meals (Buzby, Guthrie, & Kantor, 2003).

A principal goal of the FFVP was to create a healthier school environment by expanding the variety of FVs offered, thereby increasing FV consumption (USDA, 2008). An assessment of the pilot program took place in 2003. Since then, several states have evaluated their local FFVP for various outcomes; however, most of these studies have focused primarily on participant intake as a result of the program. The current study aims

to measure program effects, not only on student consumption, but also on FV behaviors away from school.

### **Purpose of the Study**

The purpose of this study was to evaluate the effects of a Fresh Fruit and Vegetable Program, as well as the influence of age, ethnicity, income, and gender diversity on the fruit and vegetable behavior of students in grades three through five.

### **Research Questions**

In order to meet the objectives for this study, the following research questions were asked:

1. Does the FFVP influence students' willingness to try new FVs?
2. Does the FFVP influence availability of FVs in the home?
3. Does the FFVP influence students' overall FV consumption?
4. Does the FFVP influence students' willingness to request FVs from a parent?
5. Are any of the above factors influenced by student age, ethnicity, family income and/or gender?

### **Study Limitations**

Potential limitations to this research included:

1. Small sample size with participants from only two schools
2. No baseline data were collected.
3. All data was self-reported.
4. The 2 schools selected were similar but not identical in demographics.

## **Definition of Terms**

Cardiovascular disease – a term that generally refers to conditions that involve narrowed or blocked blood vessels that can lead to a heart attack, chest pain (angina) or stroke (MayoClinic.com, 2010)

Diabetes – a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both (National Diabetes Education Program, 2010)

Institute of Medicine (IOM) - an independent, nonprofit organization that works outside of government to provide unbiased and authoritative advice to decision makers and the public (Institute of Medicine, 2010).

U.S. Department of Health and Human Services (DHHS) - the primary federal agency protecting the health of all Americans (Department of Health and Human Services, 2010)

United States Department of Agriculture (USDA) – the government agency that provides leadership on food, agriculture, and natural resources, and associated issues based on public policy, available sciences, and efficient management (United States Department of Agriculture, 2010).

World Health Organization (WHO) – the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends (World Health Organization, 1010).

## **CHAPTER 2 REVIEW OF LITERATURE**

Because the USDA Fresh Fruit and Vegetable Program (FFVP) is relatively new, data reflecting the effects and outcomes are somewhat scarce. A recent review of literature suggested that the FV intake of children participating in distribution programs similar to the current FFVP has increased; however, few studies have examined results specific to the home food environment. Therefore, this review of literature focuses on recent, school-based, FV interventions and relevant determinants of FV intake in children.

### **Importance of FV Consumption**

In the past 2 decades, the prevalence of overweight has doubled in children and almost tripled in adolescents (US Department of Health and Human Services, 2001). If expanding waist lines were the only concern, the impact would be modest. However, research has shown that weight gain often is accompanied by an increase in the incidence of weight-related diseases, even in children. In fact, according to the Institute of Medicine, chronic diseases and conditions, such as type-two diabetes, high blood pressure, and high cholesterol are increasingly being diagnosed in overweight and obese children (2009). Because of the direct impact of early and continuing obesity, life expectancy of children, for the first time in history, will be less than that of their parents (Institute of Medicine, 2009).

Diet and nutrition are key variables in determining risk for chronic disease. In other words, modifying dietary intake may have strong positive or negative effects on overall health (WHO, 2003). In the past, policies designed to diminish the prevalence of weight-related disease have focused on reducing primary risk factors, such as smoking and

consuming a high-fat diet. Lock et al. (2005) studied global disease that was attributable to low consumption of FVs and found that by simply increasing FV consumption (up to 600 grams per day), CVD could be decreased by over 30%, thus preventing 2.6 million deaths.

Not surprisingly, six of the nine 2005 Dietary Guidelines for Americans are either directly or indirectly related to the consumption of FVs (United States Department of Health and Human Services, 2005). However, studies show that most children are not eating enough FVs, particularly the most nutrient-dense varieties that are strongly correlated with reduced risk for disease. These include leafy green, yellow/orange and cruciferous vegetables, as well as citrus fruits (Nanney, Haire-Joshu, Hessler, & Brownson, 2004). According to Wells and Buzby (2008) Americans are consuming less than half of the recommended amount of FVs set forth in the 2005 Dietary Guidelines for American's. Furthermore, starchy vegetables such as potatoes (French fried) account for a third of the vegetables eaten, and the majority of fruit consumed was in the form of juice, apples, bananas, and grapes.

Of greater consequence may be that eating behaviors, whether good or bad, tend to track from childhood through adolescence to adulthood (Lien, Lytle, & Klepp, 2001). In fact, by the time a child reaches adolescence, he or she is four times less likely to meet fruit intake guidelines and nearly 2.5 times less likely to meet the recommendations for vegetable intake (Lorson, Melgar-Quinonez, & Taylor, 2009). Therefore, helping children to establish healthy eating behaviors early in life may help to prevent diet-related diseases throughout life.

The question then becomes, "how do we get kids to eat healthier?" Often, nutrition education programs focus on limiting certain foods, namely those high in fat, sugar, and

total calories. Although this may appear to be a sensible strategy, when constraints such as these are placed upon children, the desired outcome is rarely achieved. Limiting food choices may inadvertently lead to increased preference, and thus consumption of the restricted foods. An alternate and possibly better approach may be to teach children the importance of increasing healthy, nutrient-dense foods such as FVs, as opposed to restricting any specific foods, nutrients, or food groups. The simple act of “refocusing” children on what they can eat versus what they cannot may help them adopt a healthier diet. A study by Epstein, Gordy, Raynor, Beddome, Kilanowski, and Paluch (2001) found that children who were encouraged to increase dietary FVs not only improved their intake of healthy foods, but also decreased consumption of nutrient-poor foods.

### **The USDA Fresh Fruit and Vegetable Program**

Recommendations for FVs have increased in recent years and the majority of children are not even close to meeting these guidelines. Implementing strategies such as increasing availability and providing children with opportunities for tasting unfamiliar FVs, may increase consumption (Hendy et al., 2005) and the school setting is a logical environment to focus these strategies.

The USDA Fruit and Vegetable Program, launched in 2002 under the Farm Security and Rural Investment Act, was based on this knowledge. The purpose of the program was to determine the best practices for increasing FV consumption in schools. As a result of its popularity, the program now provides fresh FVs free to children in selected schools in all 50 states, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands (Buzby et al., 2003).

Goals of the FFVP include providing healthier food choices, expanding the variety of FVs children are exposed to, increasing children's FV consumption, and impacting children's present and future health by making positive changes in their diets (Buzby et al., 2003). Because the program targets low-income children, participants may be exposed to FVs that otherwise may not be available to them.

### **School-Based Fruit and Vegetable Interventions**

The FFVP now exists in all 50 states in the U.S., and worldwide there are several school-based, FV-distribution programs, all with similar goals.

To determine the feasibility and success of the FFVP in its first year, an evaluation was conducted by Buzby et al. (2003). Although participation in the pilot program was voluntary, school sites were chosen to represent a mix of large and small, rural, suburban and urban elementary, middle, and high schools including students from diverse ethnic backgrounds and family income levels (Buzby et al., 2003). The researchers found that the majority of the participating schools considered the program to be very successful and would like the pilot to continue. While quantitative data on the effects of the pilot were limited, the perceived values of the program were collected from both school staff and students. Some of the program benefits cited by staff members included improvements such as increased attention in class, reduced consumption of less-healthy foods, decreased number of unhealthy snacks brought from home, and increased awareness and preference for a variety of FVs, particularly less familiar types. Of the students surveyed, many reported improvements in eating habits, greater willingness to try different FVs, and greater consciousness about eating too much junk food.



Mississippi was one of the first states in the U.S. to evaluate its FFVP. The intervention, completed in 2004 by Coyle et al., was designed to increase access to fresh FVs, to increase preference for FVs, and to increase overall FV consumption. The 25 schools selected to participate in the program distributed FVs to children in grades K-12, free of charge, during the school day, and provided nutrition education activities to promote consumption. Students in grades 5, 8, and 10 were asked to complete a pre/post evaluation.

The results of this evaluation suggest that the FFVP increased familiarity of a variety of FVs in all students and increased fruit intake in older students, although the effects were relatively modest.

An evaluation of the FFVP in Wisconsin Schools assessed 4<sup>th</sup> and 5<sup>th</sup> grade students at four Eau Claire schools (2 interventions and 2 controls) with parameters such as willingness to try FVs, number of FVs tried and liked, and overall FV consumption (Jamelske, Bica, McCarty, & Meinen, 2008). The researchers concluded that the FFVP was very effective in increasing participant FV consumption. Also, small increases were seen in two additional areas: willingness to try new vegetables served in school and overall number of FVs tried. On the other hand, there was no evidence that the FFVP had any impact on food choices outside of school.

During the 2006-2007 school years, Cullen, Watson, and Konarik (2009) assessed whether a FFVP improved student exposure to and preference for FVs in one Houston high school. Students from the intervention and the control schools completed a post-intervention survey comparing FV exposure and preference. Although it was hypothesized that increasing the availability of fresh FVs would improve student exposure to and

preference for FVs, students in the control school actually reported higher FV exposure scores as well as higher preferences for vegetables than the students participating in the FFVP.

At the same time, Davis, Cullen, Watson, Konarik, and Radcliffe (2009) further assessed whether the FFVP had any impact on students' FV intake. Compared with the control group, students attending the intervention school were significantly more likely to report eating fruit at least twice per day, and consuming total fruit, juice, and vegetables five or more times per day in the preceding 7 days.

Researchers in Canada have recently evaluated the influence of a Canadian health promotion initiative, the Northern Fruit and Vegetable Pilot Program (NFVPP), on elementary school-aged children's FV intake (He et al., 2009). Twenty-six elementary schools with students in grades five to eight were included in the study which consisted of three intervention arms; free FV snack plus enhanced nutrition education, FV snack alone, and control group. Using the Pro-Children Questionnaire, children's FV consumption was measured, along with differences in awareness, knowledge, self-efficacy, preference, intention, and willingness to increase FV consumption.

Students in the "FV plus education" group consumed significantly more FVs during school than the control students by almost  $\frac{1}{2}$  serving per day. Similarly, the students in the group receiving free FVs with no education also consumed more FVs than control students, but the difference was not statistically significant.

The Norwegian School Fruit Program, similar to the FFVP in the U.S., was evaluated by Bere, Veierod, and Klepp (2005). The study assessed outcomes of 7th-grade students attending schools that were participating in a fee-based school fruit program, a

free FV-distribution program, or a no subscription program (control). The students in the treatment schools (free fruit or paid fruit) received a piece of fruit daily throughout the school year. Questionnaires were completed by the pupils and their parents at baseline in the fall of 2001, and again in the spring of 2002. Results showed that students attending the “free distribution” schools had significantly higher intake of FVs, both at school and all day, than the students attending the “paid fruit” or control schools. These results suggest that offering free FVs to children in school is an effective strategy to increase FV intake.

Bere, Veierod, Skare, and Klepp (2007) further evaluated the long-term effects of the Norwegian School Fruit Program three years post intervention. Analysis showed that the free distribution of FVs had a significant, positive effect on FV intake three years later; however, the reduction in the consumption of unhealthy snacks seen in the first follow-up was not sustained.

A study by te Velde et al. (2008) reported the effects of the Pro Children Study, a school-based, FV intervention implemented in 62 schools across Norway, the Netherlands, and Spain. The intervention included 10 - 11 year-old children and was a combination of a curriculum and various school-based efforts, including a FV-distribution component. Intake was assessed with questionnaires completed pre-intervention, after the first year of intervention, and 1 year later.

At first follow up, a significant increase in FV intake, both at school and at home, was found in the total sample, although FV intake in the intervention schools was 20% higher than control schools. After 1 year, significant impacts were observed in Norway only, where the intervention had been most effectively implemented. The researchers

concluded that the Pro Children intervention significantly improved FV intakes, predominantly in schools where the intervention was fully employed.

A comparison between the long-term effectiveness of two similar, school-based interventions was reported by Reinaerts, Crutzen, Candel, De Vries, and De Nooijer (2008). Six primary schools were recruited and randomly assigned to either a “free distribution” program or a “multi-component” program, consisting of a classroom curriculum and parental involvement, but no distribution of FVs. Through different strategies, both interventions attempted to increase consumption by making daily FV intake a habit. Children in the multi-component group were expected to bring FVs to school daily, and all children were given a special time to eat the snack.

During the first follow-up, both interventions showed significant effects on fruit, juice, and vegetable (FJV) consumption. However, the distribution program proved to be more effective, especially at improving vegetable consumption. At the second follow-up, it was concluded that although both programs showed the same effects regarding 24-hour FJV and fruit consumption over time, the distribution program also showed an increase in children’s vegetable consumption. Surprisingly, the children in the distribution group increased their vegetable consumption at home as well.

### **Determinants of FV Consumption**

By the time a child reaches 3 or 4 years of age, dietary consumption is no longer strictly driven by hunger, but instead by a variety of environmental and social factors (Birch, 1999). In order to create effective interventions to help increase FV intake, these factors must be determined and explored. In order to determine the effectiveness of the current FFVP, the following determinants of FV consumption were examined.

## **Availability**

Consumption of a healthy diet is greatly dependent upon which foods are made available and accessible to children in the home. Evidence from a review by Blanchette and Brug (2005) highlighted availability and accessibility as two of the most important determinants of FV intake in children ages 6-12. Often, interactions between these and other key factors combine to either reduce or increase consumption. For example, when FV availability is limited, exposure will be minimal, which may decrease preference for FVs (Birch, 1999). On the same note, Bere and Klepp (2005) examined the relationship between accessibility and both change in preference and change in intake. Results showed that for children who had FVs accessible to them, changes in preference were related to significantly larger changes in intake than for children with low FV accessibility. This indicates that high accessibility to FVs may be directly related to intake. However, exposure to unhealthy foods will increase consumption of those foods as well, so it is vital that FVs are offered early and often to help develop healthy dietary habits that last throughout life (Busick, Brooks, Pernecky, Dawson, & Petzoldt, 2008). School-based distribution programs such as the current FFVP may help increase students' at-home FV availability by increasing availability, accessibility, and repeated exposure at school.

## **Willingness to Try New FV**

Though availability has a substantial effect on the number of FVs eaten, another important determinant may be a child's willingness to try new or different FVs. Food neophobia (fear of the new) is present in humans, particularly children, as a protective measure against ingesting foods that may be toxic (Birch, 1999). However, the initial neophobic response of a new food can be transformed into a preference through repeated

exposures. In fact, children may need to taste and experience a new food between 5 and 10 times before a preference is developed (Birch, 1999). Busick et al. (2008) reported that parents who purchased the most FVs had children who were more willing to taste them when offered, while children with parents who purchased the fewest FVs, and therefore had the least exposure, were less likely to try them.

For humans, eating is a social event and family members and peers can have a significant impact on a child's willingness to try new food (Birch, 1999). A study by Birch (1980) found that children increased their preference for and consumption of disliked vegetables by simply observing peers selecting and consuming the disliked foods. School-based distribution programs such as the current FFVP may help increase students' willingness to try new and different FVs by providing repeated exposures, as well as offering students' the opportunity to observe peers choosing and consuming healthy snack options.

### **Taste/Preference for FVs over Other Foods**

Children tend to eat what they like, regardless of whether the food is healthy or unhealthy. Unfortunately, foods high in sugar, fat, salt, and energy are readily available and heavily advertised to young children, fostering food preferences that oppose current recommendations. In order to combat this, nutrition experts first must determine how food preferences develop and establish which factors most influence dietary choices. These questions have been the foundation of research for many years.

Our genetic predisposition for certain tastes, such as sweet and salty, is a dominant factor, but genetics can only partly explain children's dietary selections (Birch 1999). Preferences are also based on associations that are made with the contexts and

consequences of eating the foods (Birch, 1999). Hence, babies are born with certain genetic preferences, but very early in life, environment and experience with food become the primary determinants affecting the development of food preferences. Because food preferences are learned, they are modifiable. In order to increase preference for healthy foods, environments that encourage young children to eat FVs must be made available (Birch, 1999). School-based FV-distribution programs such as the current FFVP may help increase students' preference for and consumption of FVs by providing positive FV experiences in a supportive environment.

### **Self-efficacy and Proxy-efficacy**

Social cognitive theory (SCT) has been widely used as a model for studying and understanding health behaviors, specifically FV consumption (Geller, Dzewaltowski, Rosendranz, & Karteroliotis, 2009). One impact identified by SCT is proxy efficacy, defined as the belief that an individual can influence others to help them reach a desired outcome (Bandura, 2001). In most cases, parents, guardians, or other adults are responsible for providing FVs for their children, thus children may need to exert proxy-efficacy to influence the adults who are in charge of purchasing (Bandura, 2000). When proxy-efficacy is high, children are more likely to request FVs, which may result in increased opportunities for consumption (Geller et al., 2009).

Another important influence of SCT is self-efficacy, or the belief in one's ability to take part in a particular behavior in order to obtain a desired outcome. For instance, if a child believes in his or her capability to ask a parent or caregiver to buy or prepare a specific FV, availability or accessibility of those FVs may be increased (Reynolds, Hinton, Shewchuk, & Hickey, 1999). Positive self-efficacy was found to be related to daily intake

of FVs in a study by De Bourdeaudhuij et al. (2008). Specifically, children who were the most confident that they could eat FVs daily were 1.5 times more likely to consume vegetables daily and more than 2 times more likely to consume fruit daily. School-based FV-distribution programs such as the current FFVP may provide students with the confidence and knowledge needed to request FVs from a parent or guardian.

### **Income/SES**

Food choice is known to be influenced by a wide range of social and economic factors including family socio-economic status. Children in families with low SES backgrounds traditionally have lower FV intake, due in part to the strong association between family food security and home availability (Neumark-Sztainer, Wall, Perry, & Story, 2003).

Not surprisingly, obesity is linked to low SES also. Although the prevalence of overweight and obesity has increased in both genders, among all races and ethnicities, and across all ages, minority groups and those with lower incomes are at a higher risk (U.S. Department of Health and Human Services, 2001). Therefore, FV distribution programs may have an important positive influence on the dietary intake of low-income students and hopefully deter weight gain in this obesity-prone population.

In a recent study by Geller et al. (2009) children attending lower-diversity and higher-SES schools were significantly more confident that they could influence their parents to make FVs more available, compared to children attending schools with higher racial/ethnic diversity and lower-SES. This trend has been observed in many studies including one done by Lorson et al., (2009) which found that children and adolescents living in households above 350% of the federal poverty level had significantly higher fruit



intakes than those living in households with incomes between 130% and 350% of the poverty level. Although no differences were observed across income levels for vegetable intakes, children living in food insecure households tended to have higher proportions of vegetables from French fries than children from fully food secure households (Lorson et al., 2009).

### **Age, Gender and Race**

A study by Granner et al. (2004) examined the factors of FV intake by race, gender, and age in young adolescents in South Carolina. Although race wasn't a major factor, there was some variance observed. Black participants reported a lower preference for vegetables than white participants, while white adolescents reported greater availability of FVs in the home.

Lorson et al. (2009) evaluated correlates of FV intake in U.S. children and found that boys consumed significantly more vegetables than girls; however, French fries were the leading source, accounting for more than 28% of total intake. When participant age was analyzed, fruit intake tended to increase while intake of vegetables decreased with age. A review by Rasmussen et al. (2006) found similar results in that girls and younger children tended to have a higher or more frequent intake of FVs than boys and older children.

### **Summary**

Improving childrens' diets by increasing FV intake is an important and complex undertaking that may help deter or even eliminate diet-related diseases later in life. However, determinants of FV consumption first must be addressed and implemented into effective programs. The FFVP, and programs like it, are reaching this goal by applying

strategies such as increasing availability and providing children with opportunities for tasting unfamiliar FVs.

## **CHAPTER 3**

### **METHODS**

The USDA Fresh Fruit and Vegetable Program (FFVP) provides FVs free to school children, with the goal of increasing exposure and improving consumption of FVs. In meeting these goals, the program is helping children discover healthier dietary habits that will hopefully last a lifetime.

During the 2009-2010 school year, the intervention school received funds from this grant to provide over 450 servings of fruit or vegetables daily, Tuesday through Friday, for all student in the school. Foodservice staff prepared and distributed the snack, and the school used a variety of promotional activities, such as hallway posters, to support the program and to encourage students to try unfamiliar fruits or vegetables (e.g., jicama, yellow squash, and bok choy). More common produce, such as peppers, kiwi fruit, mango, pea pods, and various berries and melons, were served regularly. Periodically when a less familiar FV was served, the whole food was used as a visual teaching aid in the classroom, along with the prepared snack. Students also participated in a weekly health curriculum; however, education specific to nutrition was limited.

This study was conducted in the spring of 2010 with the purpose of evaluating the effectiveness of a Fresh Fruit and Vegetable Program on participants' fruit and vegetable behavior at school and at home. The evaluation addressed 2 questions: (1) Did the Fresh Fruit and Vegetable Program affect students' availability of fruits or vegetable in the home, willingness to try or request fruits or vegetables from a parent, or fruit or vegetable consumption throughout the day? (2) Were any of these factors influenced by age, ethnicity, family income, or gender of the student?

The Institutional Review Board at North Dakota State University approved this study (Appendix A). Permission to complete the study was granted from the Boards of Education, the building principals, the parents of all participating students, and the students themselves.

### **Participants**

The study population consisted of students in grades 3, 4, and 5 from two elementary schools (1 intervention and 1 control) in the upper Midwest. The intervention school utilized in this study was selected because it had participated in the USDA FFVP during the 2009-2010 school year. The control school was selected because of its similar characteristics to that of the intervention school, including overall school size, ethnic/racial composition, and percent of students eligible for free or reduced-priced meals. For all students attending the intervention school, weekly health education was included in the curriculum; however, education specific to nutrition was very limited. Students attending the control school did not receive free FVs and nutrition education was not offered.

### **Procedure**

Passive parental permission was granted for data collection in both schools. Parental consent forms were sent home with students one week prior to data collection at each site (Appendix B). If parents did not want their child to participate, they were instructed to sign the letter and return it to school with their child.

A trained data collector administered surveys in both schools during regularly scheduled class periods in March 2010. Students were informed that they were not required to complete the survey, and those who chose not to participate were given the option to sit quietly at their desk until the class had finished. Participants were given one

parent survey (Appendix C) and one student survey (Appendix D) which were numbered identically, and asked to set the parent survey aside. Each survey included a cover page detailing specific study information, as well as the rights of participants. Because student demographic data was provided by the intervention, but not the control school, different forms were used at each site. (Appendices E & F) All survey questions were read aloud and time was given for questions at the end. Upon completion, student surveys were collected and placed into an envelope. Students were instructed to bring home the parent survey, have a parent/guardian fill it out, and return it to school. During the following week, classroom teachers collected parent surveys as they were returned, and placed them into an envelope to be picked up by the survey administrator. Students who returned a completed parent survey were eligible for a drawing. As a token of appreciation, all students received a FV tattoo and a pencil.

### **Survey Instrument**

The survey instrument used in this study was based on a previously validated questionnaire from the Pro Children study (DeBourdeaudhuij et al., 2004), and was reviewed by nutrition and education experts. Student surveys were pilot-tested with a sample of 3<sup>rd</sup> and 4<sup>th</sup> grade students ( $n=60$ ) for readability and comprehension. These data were not analyzed and no revisions were needed, as there were no questions during or after survey administration. In addition, classroom teachers completed a survey readability review to ensure similar characteristics (Appendix G).

The post-only survey asked a series of questions that aimed to answer the research questions: willingness to try FVs, availability of FVs in the home, overall consumption of FVs, and willingness to request FVs from a parent. Parent surveys were identical to

student surveys with wording changed to fit the situation. Response options for evaluating participants' usual intake of FVs included 2 questions, each with composite scores ranging from 1-6 (1 = "more than once a day" to 6 = "almost never"). Options for the remaining questions were measured on a five-point scale (1 = "always" to 5 = "never").

Demographic data were provided by the intervention school only. Therefore, four additional questions were added to the control-school survey (both parent and student) to obtain information on age, gender, ethnic origin, and free/reduced-priced lunch eligibility of the student (Appendix H).

### **Data Analysis**

All data were entered into an Excel spreadsheet as received and analyzed using SAS (Version 9.2) software. Survey questions that aimed to answer a single research question were grouped together to form the testing variables (Table 1). Using paired t-tests, data from both parent and student surveys were analyzed to compare differences between schools that could be attributed to participation in the FFVP. Next, student data from both intervention and control schools were combined and further evaluation of gender, ethnicity, and income was completed. Data based on grade level were examined in the same manner using analysis of variance followed by *t*-tests. Finally, parent data from both schools were combined and analyzed using the same tests. Significance level was set at  $p \leq 0.05$ .

Because student demographics at the control school were self-reported, there were many missing or conflicting responses for these questions. In the case where both student and parent surveys were available, student demographic data that were either missing or different from their parent's response were changed to match that of the parent. When only a student survey was completed, the data remained unchanged.

Table 1. Testing Variables and Parallel Survey Questions

Testing Variables	Survey Questions (Q)			
1. Does the FFVP influence willingness to try new F/Vs	Q2/Q12 – I like to try new F/Vs that I have never tasted before			
2. Does the FFVP influence availability of F/Vs in the home	Q3/Q13 – At home, there are F/Vs for me to choose for a snack	Q6/Q16 – My parent will prepare F/Vs for meals or snacks when I ask	Q7/Q17 – At home, FVs are served with the evening meal	Q10/Q20 – If I ask my parent to buy F/Vs, they will buy them
3. Does the FFVP influence overall F/V consumption	Q1/Q11 – I usually eat F/Vs (how often)	Q4/Q14 – I choose F/Vs for a snack instead of foods like chips and candy	Q8/Q18 – If F/Vs are served with the evening meal, I will eat them	
4. Does the FFVP influence willingness to request F/Vs from a parent	Q5/Q15 – I ask my parent to prepare F/Vs for meals or snacks	Q9/Q19 – I ask my parent to buy F/Vs		
5. Are any of the previous variables influenced by age, income, race, or gender	Q21-Q24* demographic question			

\* Control only: Intervention-student demographics were provided by the school

**Note:** Survey questions 1-10 inquired about fruit behaviors and questions 11-20 were identical questions about vegetable behaviors

## **CHAPTER 4**

### **RESULTS**

The goal of this study was to assess the effectiveness of a Fresh Fruit and Vegetable Program (FFVP) on participants' fruit and vegetable behavior at school and at home. The evaluation addressed 2 questions: (1) Did the Fresh Fruit and Vegetable Program affect students' availability of fruits or vegetable in the home, willingness to try or request fruits or vegetables from a parent, or fruit or vegetable consumption throughout the day? (2) Were any of these factors influenced by student age, ethnicity, family income, or gender?

#### **Participant Demographics**

Demographic characteristics of students who completed the survey are provided in Table 2. The final sample consisted of 590 students: 264 from the intervention school and 326 from the control school. Approximately equal numbers of girls ( $n=279$ ) and boys ( $n=311$ ) were represented in the sample. The majority of the participants were white (75%) with the remaining students distributed among African American, Native American, Hispanic/Latino, Asian, and all other ethnicities. Third grade students comprised 30% of the sample, fourth grade students, 37%, and fifth grade students, 33%. Nearly half of the students were from low-income households (42%) as delineated by free/reduced-priced lunch eligibility.

#### **Willingness to Try New FVs**

To answer the first research question based on willingness to try new FVs, paired t-tests were used to assess student and parent surveys from both schools (Table 3).



Table 2. Demographic Characteristics of Student Participants

	<u>Intervention School<sup>1</sup></u>		<u>Control School<sup>2</sup></u>	
	<i>n</i>	%	<i>n</i>	%
Gender				
Male	142	53.8	169	51.8
Female	122	46.2	157	48.2
Grade				
3	89	33.7	98	30.1
4	83	31.4	122	37.4
5	92	34.9	106	32.5
Race/Ethnicity				
White	223	84.5	190	64.8
Other <sup>3</sup>	41	15.5	103	35.2
Income				
Lower Income <sup>4</sup>	118	44.5	93	39.1
Upper Income	148	55.6	145	60.9

<sup>1</sup>Data provided by school

<sup>2</sup>Data provided by students and parents

<sup>3</sup>Other: American Indian, African American, Asian, Hispanic, and all other

<sup>4</sup>Lower income: Students eligible for free or reduced priced school meals

Table 3. Mean Student and Parent Scores for Willingness to Try New Fruits and Vegetables – Intervention and Control School Comparison

	<u>Student Survey</u>			<u>Parent Survey</u>		
	Intervention	Control	<i>p</i>	Intervention	Control	<i>p</i>
Fruits	2.56	2.48	0.46	2.67	2.64	0.83
Vegetables	2.82	2.90	0.42	2.95	3.02	0.57

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Analysis of parent and student data revealed that intervention had no significant effect on students' willingness to try new FVs. Subsequently, intervention and control school data were combined and additional tests were run to determine whether students' willingness to try new FVs may be influenced by age, ethnicity, family income or gender (Table 4).

Table 4. Mean Student and Parent Scores\* for Willingness to Try New Fruits and Vegetables by Grade, Race, Income, and Gender

Student Survey													
	Grade Level				Race/Ethnicity			Income			Gender		
	3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits	2.51	2.43	2.60	0.32	2.52	2.44	0.47	2.46	2.50	0.73	2.58	2.44	0.14
Vegetables	2.81	2.73	3.08	0.01	2.86	2.84	0.87	2.75	2.91	0.15	2.99	2.74	0.01

Parent Survey													
	Grade Level				Race/Ethnicity			Income			Gender		
	3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits	2.63	2.60	2.72	0.64	2.65	2.65	1.00	2.46	2.76	0.01	2.87	2.46	0.00
Vegetables	3.02	2.97	3.02	0.91	2.97	3.11	0.32	2.76	3.15	0.00	3.12	2.89	0.05

\*Combined data from both control and intervention schools

<sup>1</sup>Other: American Indian, African American, Asian, Hispanic, and other

<sup>2</sup>Low- income: Students eligible for free or reduced priced school meals

<sup>3</sup>High-income: Students not eligible for free or reduced priced school meals

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Testing of student data for demographic differences exposed significant variations between grade level and gender. Younger students (grade 3:  $\bar{x}=2.81$ , grade 4:  $\bar{x}=2.73$ ) and girls ( $\bar{x}=2.74$ ) had higher scores for willingness to try new vegetables than did older children (grade 5:  $\bar{x}=3.08$ ,  $p=0.01$ ,  $df=527$ ,  $F=4.48$ ) and boys ( $\bar{x}=2.99$ ,  $p=0.01$ ,  $df=526$ ,  $t=-2.47$ ).

Analysis of parent data showed significant differences in FV scores based on income and gender. Specifically, lower-income students (fruits:  $\bar{x}=2.46$ , vegetables  $\bar{x}=2.76$ ) were significantly more willing than upper-income students (fruits:  $\bar{x}=2.76$ ,  $p=0.01$ ,  $df=313$ ,  $t=2.60$  and vegetables:  $\bar{x}=3.15$ ,  $p<0.01$ ,  $df=313$ ,  $t=3.23$ ) to try new FVs. Girls (fruits:  $\bar{x}=2.87$ , vegetables:  $\bar{x}=3.12$ ) were also significantly more willing than boys (fruits:  $\bar{x}=2.46$ ,  $p<0.01$ ,  $df=323$ ,  $t=-3.79$  and vegetables:  $\bar{x}=2.89$ ,  $p=0.05$ ,  $df=323$ ,  $t=-2.00$ ) to try new FVs.

## Availability of FV in the Home

To answer the second research question based on availability of FVs in the home, paired t-tests were used to compare student and parent surveys from both schools (Table 5).

Table 5. Mean Student and Parent Scores for Availability of Fruits and Vegetables in the Home –Intervention and Control School Comparison

	Student Survey			Parent Survey		
	Intervention	Control	<i>p</i>	Intervention	Control	<i>p</i>
Fruits	2.20	2.18	0.71	1.89	1.92	0.66
Vegetables	2.23	2.16	0.33	1.70	1.69	0.80

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Data from parents and students established that the intervention had no significant effect on the availability of FVs in the home. Subsequently, intervention and control school data were combined and additional tests were run to determine if age, ethnicity, family income or gender influenced FV availability (Table 6).

Table 6. Mean Student and Parent Scores\* for Availability of Fruits and Vegetables in the Home by Grade, Race, Income, and Gender

	Student Survey												
	Grade Level				Race/Ethnicity			Income			Gender		
	3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits	2.31	2.13	2.13	0.03	2.13	2.29	0.03	2.23	2.12	0.13	2.22	2.15	0.27
Vegetables	2.28	2.16	2.14	0.23	2.12	2.29	0.03	2.20	2.14	0.39	2.25	2.13	0.08

	Parent Survey												
	Grade Level				Race/Ethnicity			Income			Gender		
	3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits	1.94	1.91	1.89	0.76	1.88	2.02	0.06	1.94	1.89	0.41	1.88	1.95	0.22
Vegetables	1.70	1.73	1.65	0.55	1.67	1.78	0.12	1.66	1.70	0.52	1.71	1.68	0.63

\*Combined data from both control and intervention schools

<sup>1</sup>Other: American Indian, African American, Asian, Hispanic, and other

<sup>2</sup>Low-income: Students eligible for free or reduced priced school meals

<sup>3</sup>High-income: Students not eligible for free or reduced priced school meals

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Analysis of student data for demographic variations found that participants in grade three ( $\bar{x}=2.31$ ) were significantly less likely than students in grades four ( $\bar{x}=2.13$ ) and five ( $\bar{x}=2.13, p=0.03, df=527, F=3.58$ ) to have fruits available in the home. White students (fruits:  $\bar{x}=2.13$ , vegetables:  $\bar{x}=2.12$ ) were significantly more likely than non-white students (fruits:  $\bar{x}=2.29, p=0.03, df=493, t=2.25$  and vegetables:  $\bar{x}=2.29, p=0.03, df=493, t=2.14$ ) to have FVs available in the home. Analysis of parent data showed no significant results among demographic characteristics for availability of FVs in the home.

### Overall FV Consumption

To answer the third research question based on FV consumption throughout the day, paired t-tests were used to compare student and parent data from both schools (Table 7).

Table 7. Mean Student and Parent Scores for Overall Fruit and Vegetable Consumption – Intervention and Control School Comparison

	Student Survey			Parent Survey		
	Intervention	Control	<i>p</i>	Intervention	Control	<i>p</i>
Fruits	2.38	2.38	0.99	2.33	2.35	0.81
Vegetables	2.66	2.78	0.14	2.65	2.58	0.47

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Results from parent and student data found that the intervention had no significant effect on students' overall FV consumption. Subsequently, intervention and control school data were combined and additional tests were run to determine if overall FV consumption was affected by age, ethnicity, family income or gender of the students (Table 8).

Table 8. Mean Student and Parent Scores\* for Overall Fruit and Vegetable Consumption by Grade, Race, Income, and Gender

Student Survey													
	Grade Level				Race/Ethnicity			Income			Gender		
	3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits	2.39	2.38	2.36	0.94	2.36	2.37	0.87	2.28	2.40	0.12	2.45	2.30	0.03
Vegetables	2.75	2.70	2.77	0.73	2.73	2.64	0.34	2.59	2.77	0.04	2.87	2.60	0.00

Parent Survey													
	Grade Level				Race/Ethnicity			Income			Gender		
	3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits	2.37	2.38	2.29	0.62	2.32	2.42	0.31	2.27	2.37	0.27	2.48	2.22	0.00
Vegetables	2.68	2.55	2.59	0.44	2.57	2.69	0.25	2.45	2.66	0.02	2.72	2.49	0.01

\*Combined data from both control and intervention schools

<sup>1</sup>Other: American Indian, African American, Asian, Hispanic, and other

<sup>2</sup>Low-income: Students eligible for free or reduced priced school meals

<sup>3</sup>High-income: Students not eligible for free or reduced priced school meals

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Testing of student data showed that lower-income students ( $\bar{x}=2.59$ ) had significantly higher intakes of vegetables than did upper-income students ( $\bar{x}=2.77$ ,  $p=0.04$ ,  $df=439$ ,  $t=2.02$ ), and that females (fruits:  $\bar{x}=2.30$ , vegetables:  $\bar{x}=2.60$ ) had significantly higher intakes of FVs than did males (fruits:  $\bar{x}=2.45$ ,  $p=0.03$ ,  $df=525$ ,  $t=-2.20$  and vegetables:  $\bar{x}=2.87$ ,  $p<0.01$ ,  $df=526$ ,  $t=-3.27$ ).

Similarly, data from parent surveys showed that lower-income students ( $\bar{x}=2.45$ ) had significantly higher intakes of vegetables than did upper-income students ( $\bar{x}=2.66$ ,  $p=0.02$ ,  $df=313$ ,  $t=2.35$ ), and that females (fruits:  $\bar{x}=2.22$ , vegetables:  $\bar{x}=2.49$ ) had significantly higher intakes of FVs than did males (fruits:  $\bar{x}=2.48$ ,  $p<0.01$ ,  $df=323$ ,  $t=-3.09$  and vegetables:  $\bar{x}=2.72$ ,  $p=0.01$ ,  $df=323$ ,  $t=-2.57$ ).

### Willingness to Request FV from a Parent

To answer the fourth research question based on students' willingness to request FVs from a parent or guardian, paired t-tests were used to compare data from the intervention and control schools (Table 9).

Table 9. Mean Student and Parent Scores for Willingness to Request Fruits and Vegetables - Intervention and Control School Comparison

	Student Survey			Parent Survey		
	Intervention	Control	<i>p</i>	Intervention	Control	<i>p</i>
Fruits	2.86	2.74	0.17	2.60	2.62	0.85
Vegetables	3.09	3.07	0.85	3.20	3.19	0.92

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

Analysis of student and parent data revealed that the intervention had no significant effect on willingness to request FVs from a parent or guardian. Subsequently, intervention and control school data were combined and additional tests were run to determine if age, ethnicity, income or gender influenced student's willingness to request FVs (Table 10).

Evaluation of student data for demographic differences illustrated that lower-income participants (fruits:  $\bar{x}=2.65$ , vegetables:  $\bar{x}=2.94$ ) were significantly more willing than upper-income students (fruits:  $\bar{x}=2.85$ ,  $p=0.03$ ,  $df=439$ ,  $t=2.15$  and vegetables:  $\bar{x}=3.17$ ,  $p=0.02$ ,  $df=439$ ,  $t=2.27$ ) to ask a parent or guardian for FVs and girls (fruits:  $\bar{x}=2.59$ , vegetables:  $\bar{x}=2.85$ ) were significantly more willing than boys (fruits:  $\bar{x}=2.98$ ,  $p<0.01$ ,  $df=526$ ,  $t=-4.75$  and vegetables:  $\bar{x}=3.29$ ,  $p<0.01$ ,  $df=526$ ,  $t=-4.94$ ) to request FVs from a parent or guardian.

Analysis of parent data revealed similar results. Lower-income students ( $\bar{x}=2.91$ ) were significantly more willing than upper-income students ( $\bar{x}=3.39, p<0.01, df=313, t=4.73$ ) to ask a parent for vegetables, and girls (fruits:  $\bar{x}=2.44$ , vegetables:  $\bar{x}=3.00$ ) were significantly more willing than boys (fruits:  $\bar{x}=2.80, p<0.01, df=323, t=-3.99$  and vegetables:  $\bar{x}=3.40, p<0.01, df=323, t=-4.07$ ) to request FVs from a parent or guardian.

Table 10. Mean Student and Parent Scores\* for Willingness to Request Fruits and Vegetables by Grade, Race, Income, and Gender

		<b>Student Survey</b>												
		<u>Grade Level</u>				<u>Race/Ethnicity</u>			<u>Income</u>			<u>Gender</u>		
		3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits		2.81	2.74	2.81	0.73	2.82	2.65	0.08	2.65	2.85	0.03	2.98	2.59	0.00
Vegetables		3.04	3.04	3.15	0.51	3.11	2.96	0.15	2.94	3.17	0.02	3.29	2.85	0.00
		<b>Parent Survey</b>												
		<u>Grade Level</u>				<u>Race/Ethnicity</u>			<u>Income</u>			<u>Gender</u>		
		3	4	5	<i>p</i>	White	Other <sup>1</sup>	<i>p</i>	Low <sup>2</sup>	High <sup>3</sup>	<i>p</i>	M	F	<i>p</i>
Fruits		2.63	2.61	2.59	0.95	2.63	2.53	0.34	2.51	2.68	0.09	2.80	2.44	0.00
Vegetables		3.28	3.10	3.21	0.36	3.22	3.10	0.35	2.91	3.39	0.00	3.40	3.00	0.00

\*Combined data from both control and intervention schools

<sup>1</sup>Other: American Indian, African American, Asian, Hispanic, and other

<sup>2</sup>Low-income: Students eligible for free or reduced priced school meals

<sup>3</sup>High-income: Students not eligible for free or reduced priced school meals

Note: Response options: 1 = most often to 6 = least often (smaller mean values indicate higher scores)

## **CHAPTER 5 DISCUSSION**

In recent years, the prevalence of overweight has skyrocketed in both children and adolescents (US Department of Health and Human Services, 2001). Research has shown that often, a rise in body weight is accompanied by an increase in the incidence of weight-related diseases, even in young children. For the first time in history, life expectancy of children will be less than that of their parents (Institute of Medicine, 2009).

Modifying dietary intake may have strong positive or negative effects on overall health (WHO, 2003). Most policies that are designed to decrease the prevalence of disease focus primarily on reducing risk factors such as smoking and high-fat diets. However, something as simple as increasing FV consumption (up to 600 grams per day) could have a major impact on decreasing disease and preventing death (Lock et al, 2005).

By the time children are of preschool age, their dietary intake is influenced by a variety of environmental and social factors, not just hunger (Birch, 1999). In order to create effective interventions that increase FV intake, these factors must be determined and explored. Hence, this study sought to reveal whether simply expanding children's FV availability, accessibility, and intake at school would improve intake, as well as willingness to try new FVs, willingness to request FVs from a parent, and the overall availability of FVs in their home.

### **Research Outcomes**

The goal of this study was to assess the effectiveness of a Fresh Fruit and Vegetable Program (FFVP) on participants' fruit and vegetable behavior at school and at home. The evaluation addresses 2 questions: (1) Did the Fresh Fruit and Vegetable Program affect



students' availability of fruits or vegetable in the home, willingness to try or request fruits or vegetables from a parent, or fruit or vegetable consumption throughout the day? (2) Were any of these factors influenced by age, ethnicity, family income, or gender of the student?

In the current study, it was theorized that any variations in student behavior would likely be a result of the intervention. However, factors such as family income and gender had more bearing on differences in FV behaviors among participants than did the intervention. Similar to the evaluation done by Jamelske et al. (2008), which found no evidence that the Fresh Fruit and Vegetable Program (FFVP) positively influenced student food choices outside of school, we found little evidence that the current FFVP positively influenced any of the research variables when compared to the control school. This lack of evidence could have been due to many factors, including the newness of the program, the lack of supplemental nutrition education, the limited parental involvement, and the post-only survey design.

### **Willingness to Try New FVs**

An evaluation of a FFVP in Wisconsin schools found that when comparing student data from intervention and control schools, the program increased willingness to try new FVs during school, but not at home (Jamelske et al., 2008). Conflicting data were observed by Cullen et al. (2009) in an evaluation of a Houston-area FFVP which found that control-school students actually had higher FV exposure scores, as well as higher preferences for vegetables than the intervention students. Unlike either of the previous studies, the current research did not find that providing FVs to students at school made them more or less willing to try FVs throughout the day and/or at home.

According to Birch (1999), children may need to taste and experience a new food between 5 and 10 times before a preference is developed. While intervention students were exposed to new and different FVs at school, the number of exposures and the duration of the intervention may not have been significant enough for a real change in preference to occur. Also, kids tend to eat what they like, regardless of whether the food is healthy or unhealthy. Unfortunately, foods high in sugar, fat, salt, and energy are readily available, heavily advertised, and simply taste good to young children. Research has shown that exposure to healthy foods such as FVs, as well as unhealthy foods, may increase consumption of either or both options (Busick et al., 2008). Since there were no restrictions on snacks brought from home, and unhealthy snacks may have been readily accessible at home, students undoubtedly were exposed to unhealthy snacks, as well as healthy options like FVs. Furthermore, taste is a major determinant of intake. If kids simply don't like the taste of FVs, it is unlikely that they will choose them over other snacks that they find more appealing.

### **Availability and Accessibility**

Consumption of a healthy diet is greatly dependent upon which foods are made available and accessible to children. In fact, evidence from a review by Blanchette and Brug (2005) highlighted availability and accessibility as two of the most important determinants of FV intake in children ages 6-12. While the FFVP may have enhanced students' availability, accessibility and repeated exposure to FVs in school, the current study did not find that these factors helped to increase FV availability in the home. This may be due to many factors.

The current FFVP was focused predominately on FV distribution, and as such, the primary outcome was to create FV tasting opportunities and to increase consumption. However, with additional classroom education, the program may have provided the students with better asking skills to improve accessibility in the home, preparation skills to increase their own ability to make FV snacks, and knowledge of current FV recommendations to increase motivation and sustain behavior change (French & Stables, 2003). Also, there was not a major parental component included in the current FFVP. According to Neumark-Sztainer et al. (2003), home availability is directly associated with FV intake due to its assumed role in influencing food preference even when the food item isn't well liked. The addition of a parental component may have increased the number and variety of FVs that were made available in the home, opportunity for repeated FV exposure at home, as well as reinforcement and modeling from parents.

### **Overall FV Consumption**

Increasing availability and providing children with opportunities for tasting unfamiliar FVs was the primary goal of the current FFVP. However, the current study did not find significant differences between schools for overall FV intake. This is in contrast to results from similar FV-distribution programs which found significant improvements in FV intake as a result of the intervention (Davis et al., 2009; Jamelske et al. 2008).

The short duration and limited parent involvement of the current intervention may be partly to blame. Foremost, the current study evaluated the impact of the FFVP after just seven months of intervention. A study explaining school children's FV consumption by Reinaerts, de Nooijer, Candel, and de Vries (2007) determined that "habit" was a stronger predictor of FV intake than availability, parental consumption, and exposure. Because the

current assessment was completed following a relatively brief intervention period, it was unlikely that students had formed habitual FV behavior that influenced their intake away from school. In addition, the short duration of the program did not allow for implementation of nutrition education and other supplemental activities. According to Knai, Pomerleau, Lock, and McKee (2006), the most effective, school-based, FV interventions generally include many different components, including distribution, as well as classroom, parent, and food service elements.

It was assumed that because the intervention students were receiving FVs at school, their overall consumption of FVs would have been greater than that of students at the control school. Undoubtedly, intervention-school students increased FV intake during the day, but with little or no parental involvement in the program, direct impact on parental FV behavior was very limited. Therefore, children's FV consumption away from school likely did not change, causing FV intake throughout the day to remain similar to that of the control-school students.

### **Willingness to Request FVs from a Parent**

Social cognitive theory (SCT) has been used widely as a model for studying and understanding health behaviors, specifically FV consumption (Geller et al., 2009). One impact identified by SCT is proxy efficacy, defined as the belief that an individual can influence others to help them reach a desired outcome (Bandura, 2001). In most cases, parents, guardians, or other adults are responsible for providing FVs for their children, thus children may need to exert proxy-efficacy to influence the adults who are in charge of purchasing (Bandura, 2000). According to Geller et al. (2009), children are most likely to request FVs from a parent when proxy-efficacy is high. The current FFVP was

predominately focused on FV distribution, and as such, the primary outcome was to create FV tasting opportunities and to increase consumption.

He et al. (2009) found that Canadian students who were provided both free FVs at school and enhanced classroom nutrition education increased their consumption of FVs significantly over students in the control group. Students who did not receive the additional nutrition education had higher FV intakes than control students, but the differences were not significant. The addition of comprehensive classroom education to the current FFVP may have improved students' proxy-efficacy, which in turn may have increased their willingness to ask a parent or guardian for FVs at home.

### **Family Income**

Food choice is influenced by a wide range of social and economic factors, including family income. Traditionally, children from lower-income families tend to eat fewer FVs than children from upper-income families (Lorson et al., 2009). This trend has been observed in many studies including one done by Riediger, Shooshtari, and Moghadasian (2007), which found that FV intake by Canadian adolescents was positively correlated with total household income. This is not surprising as the relative price of FVs has increased in relation to the consumer price index in recent years (Riediger et al., 2007).

The current study revealed some interesting links between FV behavior and family income. Data from parent surveys found that lower-income students were more willing to try new FVs and more willing to request vegetables from a parent, and they had higher vegetable intake scores than students from upper-income families. Student data was similar, revealing that lower-income students had higher overall vegetable scores and were more willing to request FVs from a parent than students from upper-income families.

Surprisingly, no differences were observed for availability of FVs in the home when family income was tested. According to Bere, van Lenthe, Klepp, and Brug, (2008) low accessibility of FVs in the home was the main reason why students from low-income families consumed fewer FVs than those from upper-income families.

While most research has found a positive correlation between FV intake and family income, no trends have been uncovered for overall FV behaviors such as willingness to try or request FVs from a parent related to income.

### **Race/Ethnicity**

The current study found only one significant difference between white and non-white students. According to student data, white students were significantly more likely to have FVs available in the home than were non-white students. There were no ethnic/racial differences observed for willingness to try FVs, willingness to request FVs from a parent, or overall consumption of FVs. These findings appear to be in line with results from a 2009 study by Geller et al., which found that children attending lower-diversity schools were significantly more confident that they could influence their parents to provide FVs compared to children attending schools with higher racial/ethnic diversity. Similarly, Granner et al. (2004) found that white adolescents reported greater availability of FVs in the home, but no differences in the mean number of FVs consumed between students of different races. Riediger et al. (2007) also found no significant association between FV intake and racial origin in Canadian adolescents.

### **Gender**

A study on the influence of socio-demographic factors on patterns of FV consumption in Canadian adolescents found that intake of FVs was significantly higher

among girls than boys (Riediger et al., 2007). Similarly, the most dominant finding in the current study was the prevailing difference between males and females. In fact, the only variable that did not differ significantly between genders was availability of FVs in the home. Akin to the current study, Granner et al. (2004) found no difference in FV availability in the home between boys and girls.

Data from both parent and student surveys revealed that girls had significantly higher intakes of FVs and were significantly more willing to request FVs from a parent than were boys. In addition, parent data found that girls were significantly more willing than boys to try new FVs. Similar data from students revealed that girls were significantly more willing to try new vegetables, but not fruits, when compared to boys.

Conflicting data were observed in a recent study by Lorson et al. (2009) which found that boys consumed significantly more vegetables than girls; however, French fries were the leading source, accounting for more than 28% of total intake. The survey utilized in this study did not include French fries as a vegetable choice and that alone may explain the dissimilarity in results.

The current study reveals that while girls and boys have similar availability of FVs in their homes, girls are more likely to try, ask for, and consume FVs than are boys. These tendencies may be partially explained by the findings that boys eat fewer FVs than girls simply because they like FVs less than girls (Bere, Brug, & Klepp, 2007). Another possible explanation is that girls may feel more pressure to report having healthier FV behaviors than boys because of a perceived social stigma to weight control and diet, even at this young age (Bere et al., 2007).

## **Age/Grade Level**

In the current study, student data revealed that 3<sup>rd</sup> and 4<sup>th</sup>-grade students were significantly more willing than 5<sup>th</sup>-grade students to try new FVs. Similar results were observed in an evaluation of a FFVP in Mississippi, where 5<sup>th</sup>-grade students' willingness to try FVs and preferences for new FVs actually decreased from pre- to post-intervention (Coyle et al., 2009). The current study also found that 3<sup>rd</sup>-grade students were significantly less likely than those in grades 4 or 5 to have FVs available in the home. This difference may be more a function of capability than availability. As children get older, they become more skilled at choosing and preparing snacks or meals on their own, which may partly explain the variation. No differences, due to age, were observed for overall FV consumption or willingness to request FVs from a parent.

## **Limitations**

There were several limitations of this research. First, because this study utilized a post-only survey and no baseline data were collected, there were no results documenting behavior change from pre- to post-intervention within the school, only differences between schools. Next, both student and parent data were self-reported. Studies have found that neither parents nor children are reliable reporters of children's food intake (Livingstone, Robertson, & Wallace, 2004). Additionally, the study looked at only one control and one intervention school from the upper Midwest, which may limit the generalizability of the results. Finally, this evaluation was completed just 7-months post intervention. As such, supplemental program components like classroom education and parental involvement were not yet fully implemented.



## CHAPTER 6 CONCLUSIONS

As a consequence of the significant increase in overweight and obese children in recent years, it is essential that nutrition educators, school administrators, and parents engage children in an atmosphere that emphasizes increasing FV consumption as part of a healthful lifestyle. One of the primary goals of the Fresh Fruit and Vegetable Program (FFVP) is to create a healthier school environment by expanding variety and increasing familiarity of FVs offered to students (Buzby et al., 2003). The current FFVP attained this goal by providing students the opportunity to see and taste new fruits and vegetables during the school day. While this study found no evidence that the FFVP impacted students' home availability of FVs, willingness to try or request FVs, or overall consumption of FVs, factors such as student age, ethnicity, family income, and/or gender may have been influential. The lack of differences observed as a result of the intervention illustrate the need for further research to understand what factors such as gender, ethnicity, and family income have on children's FV intake.

Additionally, further research is necessary to evaluate the effectiveness of supplementing the FFVP with components such as parental involvement and classroom education. Furthermore, nutrition education must be geared towards students of different genders, ethnicities, and family incomes. Results from other distribution programs that included a nutrition education element have shown positive outcomes in increasing children's exposure to, preference for, and consumption of fruits and vegetables. To achieve this goal with the current FFVP, mandatory nutrition education may be needed as a requirement for acceptance into the program.

Finally, the current research assessed students at only two schools and was completed just 7-months post-intervention with no baseline data. Therefore, future research is necessary to compare changes within the school, after the program has been implemented more completely, and with a larger study population.

In conclusion, FV-distribution programs such as the FFVP support a healthful school food environment. However, further research is needed to identify barriers to FV intake and to develop programs that encourage children to increase their FV consumption at school and at home. Improving childrens' diets by increasing FV intake is an important and complex undertaking that may help deter or even eliminate diet-related diseases later in life.

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# APPENDIX A IRB APPROVAL

**NDSU**

**NORTH DAKOTA STATE UNIVERSITY**

701.231.8995

Fax 701.231.8098

*Institutional Review Board*

*Office of the Vice President for Research, Creative Activities and Technology Transfer*

*NDSU Dept. 4000*

*1735 NDSU Research Park Drive*

*Research 1, P.O. Box 6050*

*Fargo, ND 58108-6050*

*Federalwide Assurance #1-WA00002439*

*Expires April 24, 2011*

**March 5, 2010**

**Julie Garden-Robinson  
Department of Extension - Food and Nutrition  
351 E. Morrow Lebedeff Hall**

IRB Expedited Review of: "**Evaluation of a Fresh Fruit and Vegetable Program**", Protocol #**HE10181**  
Co-investigator(s) and research team: **Michelle Strang**

Research site(s): **LE Berger Elementary School**

Funding: **n/a**

The protocol referenced above was reviewed under the expedited review process (category # 7) on **2/25/2010**, and the IRB voted for:  approval  approval, contingent on minor modifications. These modifications have now been accepted. IRB approval is based on the original submission, with revised: protocol, parent permission form and child assent (received 3/5/2010).


**Approval expires: 2/24/2011**

**Continuing Review Report Due: 1/1/2011**

**Please note your responsibilities in this research:**

- All changes to the protocol require approval from the IRB prior to implementation, unless the change is necessary to eliminate apparent immediate hazard to participants. Submit proposed changes using the *Protocol Amendment Request Form*.
- All research-related injuries, adverse events, or other unanticipated problems involving risks to participants or others must be reported in writing to the IRB Office within 72 hours of knowledge of the occurrence. All significant new findings that may affect risks to participation should be reported in writing to subjects and the IRB.
- If the project will continue beyond the approval period, a continuing review report must be submitted by the due date indicated above in order to allow time for IRB review and approval prior to the expiration date. The IRB Office will typically send a reminder letter approximately one month before the report due date; however, timely submission of the report is your responsibility. Should IRB approval for the project lapse, recruitment of subjects and data collection must stop.
- When the project is complete, a final project report is required so that IRB records can be inactivated. Federal regulations require that IRB records on a protocol be retained for three years following project completion. Both the continuing review report and the final report should be submitted according to instructions on the *Continuing Review/Completion Report Form*.
- Research records may be subject to a random or directed audit at any time to verify compliance with IRB regulations.

Thank you for cooperating with NDSU IRB policies, and best wishes for a successful study.

Sincerely,  
  
Teryi Gresz, MS, CIP  
Manager, Human Research Protection Program  
To protect the privacy of individuals associated with the document, signatures have been removed from the digital version of this document.  
Last printed 03/05/2010 4:08:00 PM

NDSU is an equal opportunity institution

## **APPENDIX B PARENTAL CONSENT FORM**

NDSU North Dakota State University  
Department of Health, Nutrition, and Exercise Science  
Fargo, ND 58105  
701.241-5881

**If you would like your child to participate in this research study, please read carefully and keep this form for your records. Only sign and return this form if you do not want your child to participate in the research.**

**Title of Research Study:** Evaluation of a Fresh Fruit and Vegetable Program

**This study is being conducted by:** Michelle Strang, a graduate student and Registered Dietician at NDSU

**What is the reason for doing the study?** This study is being conducted to see if providing students with daily fruit and vegetable snacks in school changes behaviors related to fruit and vegetable intake away from school.

**What will my child be asked to do?** Your child will be asked to fill out a 5-minute survey inquiring about his/her fruit and vegetable intake away from school. A copy of the survey is available upon request. Your child may opt out if he/she does not want to participate.

**Where is the study going to take place?** The survey will be given during regular classroom hours at your child's school.

**What are the possible risks and discomforts?** There are no foreseeable risks involved.

**What are the potential benefits to my child?** Your child will receive a small prize as a token of appreciation.

**What are the benefits to other people?** Results from this study may be used to expand the USDA Fresh Fruit and Vegetable Program to other eligible schools in North Dakota. This program currently provides free fruit and vegetable snacks to eligible schools throughout the U.S.

**Does my child have to take part in the study?** It is you and your child's choice whether or not to take part in this research.

**What are the alternatives to taking the survey?** Children who do not participate in the survey will be asked to either sit quietly at his/her desk or complete a fun sheet until the other students have finished.

**Who will see the information that my child gives?**

We will keep private all research records that identify your child. Your child's information will be combined with information from other children taking part in the study. When we write about the study, we will write about the combined information that we have gathered. We may publish the results of the study; however, your child will not be identified in these written materials.

**What if I or my child has questions?**

Before you decide whether to accept this invitation to take part in the research study, please ask any questions that might come to mind now. Later, if you have any questions about the study, you can contact the researcher Michelle Strang at 701-241-5881.

**What are my child's rights as a research participant?**

Your child has rights as a participant in research. If you have questions about these rights, or complaints about this research, you may talk to the researcher or contact the NDSU Human Research Protection Program, by

- Telephone: 701.231.8908
- Email: [ndsuirb@ndsuh.edu](mailto:ndsuirb@ndsuh.edu)
- Mail: NDSU HRPP Office, 1735 NDSU Research Park Dr., NDSU Dept 4000. PO Box 6050 Fargo, ND 58108-6050

*The role of the IRB is to see that your child's rights are protected in this research; more information about your child's rights as a research participant can be found at: [www.ndsu.edu/research/irb](http://www.ndsu.edu/research/irb).*

**Signing this form means that you have read and understood this permission form and DO NOT want your child to participate.**

\_\_\_\_\_  
Your Signature (parent/guardian)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Your Printed name

\_\_\_\_\_  
Relationship to participant

\_\_\_\_\_  
Name of child/legal ward

\_\_\_\_\_  
Signature of researcher explaining study

\_\_\_\_\_  
Date

## APPENDIX C PARENT SURVEY

### Parent Survey

<b>What counts as fruit:</b> 100% fruit juice, frozen, fresh, dried, and canned fruit <b>What DOES NOT count as a fruit:</b> Fruit roll-up, fruit snacks, and drinks like “Sunny D”	
Please mark the box next to your answer	Student Number
1. My child usually eats fruit:  <input type="radio"/> More than once a day <input type="radio"/> Once a day <input type="radio"/> Several times per week <input type="radio"/> Once per week <input type="radio"/> Less than once per week <input type="radio"/> Almost never	6. I will prepare fruit for meals or snacks when my child asks.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
2. My child likes to try new fruits that he/she has never tasted before.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	7. At home, fruit is served with the evening meal.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
3. At home, there is fruit for my child to choose for a snack.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	8. If fruit is served with the evening meal, my child will eat it.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
4. My child will choose fruit for a snack instead of foods like chips and candy.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	9. My child asks me to buy fruit when I go grocery shopping.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
5. My child asks me to prepare fruit for meals or snacks.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	10. If my child asks me to buy fruit when I go grocery shopping, I will buy it.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me

## Parent Survey

<b>What counts as fruit:</b> 100% fruit juice, frozen, fresh, dried, and canned fruit <b>What DOES NOT count as a fruit:</b> Fruit roll-up, fruit snacks, and drinks like "Sunny D"	
Please mark the box next to your answer	Student Number
11. My child usually eats vegetables:  <input type="radio"/> More than once a day <input type="radio"/> Once a day <input type="radio"/> Several times per week <input type="radio"/> Once per week <input type="radio"/> Less than once per week <input type="radio"/> Almost never	16. I will prepare vegetables for meals or snacks when my child asks.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
12. My child likes to try new vegetables that he/she has never tasted before.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	17. At home, vegetables are served with the evening meal.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
13. At home, there are vegetables for my child to choose for a snack.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	18. If vegetables are served with the evening meal, my child will eat them.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
14. My child will choose vegetables for a snack instead of foods like chips and candy.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	19. My child asks me to buy vegetables when I go grocery shopping.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
15. My child asks me to prepare vegetables for meals or snacks.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	20. If my child asks me to buy vegetables when I go grocery shopping, I will buy them.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me

## APPENDIX D STUDENT SURVEY

### Student Survey

<b>What counts as fruit:</b> 100% fruit juice, frozen, fresh, dried, and canned fruit <b>What DOES NOT count as a fruit:</b> Fruit roll-up, fruit snacks, and drinks like “Sunny D”	
Please mark the box next to your answer	Student Number
1. I usually eat fruit:  <input type="radio"/> More than once a day <input type="radio"/> Once a day <input type="radio"/> Several times per week <input type="radio"/> Once per week <input type="radio"/> Less than once per week <input type="radio"/> Almost never	6. My parent/guardian will prepare fruit for meals or snacks when I ask.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
2. I like to try new fruits that I have never tasted before.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	7. At home, fruit is served with the evening meal.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
3. At home, there is fruit for me to choose for a snack.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	8. If fruits are served with the evening meal, I will eat them.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
4. I choose fruit for a snack instead of foods like chips and candy.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	9. I ask my parent-guardian to buy fruit when he/she goes grocery shopping.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
5. I ask my parent/guardian to prepare fruit for meals or snacks.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	10. If I ask my parent/guardian to buy fruit when they go grocery shopping, they will buy it.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me

## Student Survey

<b>What counts as fruit:</b> 100% fruit juice, frozen, fresh, dried, and canned fruit <b>What DOES NOT count as a fruit:</b> Fruit roll-up, fruit snacks, and drinks like “Sunny D”	
Please mark the box next to your answer	Student Number
11. I usually eat vegetables:  <input type="radio"/> More than once a day <input type="radio"/> Once a day <input type="radio"/> Several times per week <input type="radio"/> Once per week <input type="radio"/> Less than once per week <input type="radio"/> Almost never	16. My parent/guardian will prepare vegetables for meals or snacks when I ask.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
12. I like to try new vegetables that I have never tasted before.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	17. At home, vegetables are served with the evening meal.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
13. At home, there are vegetables for me to choose for a snack.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	18. If vegetables are served with the evening meal, I will eat them.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me
14. I choose vegetables for a snack instead of foods like chips and candy.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	19. I ask my parent-guardian to buy vegetables when he/she goes grocery shopping.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never
15. I ask my parent/guardian to prepare vegetables for meals or snacks.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never	20. If I ask my parent to buy vegetables when they go grocery shopping, they will buy it.  <input type="radio"/> Yes, always <input type="radio"/> Yes, most of the time <input type="radio"/> Sometimes <input type="radio"/> Almost never <input type="radio"/> Never <input type="radio"/> Does not apply to me



**APPENDIX E**  
**PARENT WRITTEN SCRIPT (Robert Asp)**

North Dakota State University  
Department of Health, Nutrition,  
and Exercise Science

To: Parents/guardians at Robert Asp Elementary  
From: Michelle Strang, LRD

Re: Parent survey

My name is Michelle Strang. I am a graduate student in the Department of Health, Nutrition, and Exercise Science at North Dakota State University, and I am conducting a research project to find out if providing children with fruit and vegetable snacks at school affects their fruit and vegetable intake away from school. I will use the results to evaluate the effectiveness of the Fresh Fruit and Vegetable Program currently being conducted at L.E. Berger Elementary in West Fargo.

You are invited to participate in this study by filling out the attached survey and sending it back to school with your child. Your child(ren) in grades 3, 4, and 5 have completed a similar survey, and data from both child and parent will be compare to that from children and parents at L.E. Berger Elementary. Your participation is voluntary and your identity will not be revealed, so please don't put your name on the survey. Your child's identification number, written on the top of the survey, is confidential and will only be used to access information that your child may not know, such as their race/ethnicity and whether they are eligible for free or reduced priced meals. The number will also be used to match your survey responses to your child's.

It should take about 5 minutes to complete the questionnaire. If the survey is completed and returned, your child's name will be entered into a drawing for a prize. If you have more than one child in 3<sup>rd</sup>, 4<sup>th</sup>, or 5<sup>th</sup> grade, please fill a survey out for each child according to that child's fruit and vegetable behavior.

If you have questions about this project, or if you would like a summary of the results, please call Michelle Strang at (701) 241-5881. For questions on the rights of human research participants, or to report a problem, please contact the NDSU IRB office at (701) 231-8908 or e-mail [ndsu.irb@ndsu.edu](mailto:ndsu.irb@ndsu.edu).

Thank you for your help in making this project a success!

## PARENT WRITTEN SCRIPT (L.E. Berger)

North Dakota State University  
Department of Health, Nutrition, & Exercise Sciences  
NDSU Dept 7270 P.O. Box 6050  
Fargo, ND 58108-6050

To: Parents/guardians of students at L.E. Berger Elementary  
From: Michelle Strang, LRD, Graduate Student  
Julie Garden-Robinson, PhD, LRD, Associate Professor  
Re: Parent survey

My name is Michelle Strang. I am a graduate student in the Department of Health, Nutrition, and Exercise Science at North Dakota State University. Together with my faculty advisor Dr. Julie Garden-Robinson, I am conducting a research project to find out if providing children with fruit and vegetable snacks at school affects their fruit and vegetable intake away from school. I will use the results to evaluate the effectiveness of the Fresh Fruit and Vegetable Program currently being conducted at L.E. Berger Elementary.

Because your child/children are currently participating in this program, you are invited to participate in this study by filling out the attached survey and sending it back to school with your child. Your participation is voluntary and your identity will not be revealed, so please do not put your name on the survey. Your child's identification number (on the top of the survey) is confidential and will only be used to access information that your child may not know, such as their race/ethnicity and whether they are eligible for free or reduced priced meals. The number also will be used to match your survey responses to your child's responses. The researchers will not have access to any identifying information.

It should take about 5 minutes to complete the questionnaire. If the survey is completed and returned, your child's name will be entered into a drawing for a prize. If you have more than one child in 3<sup>rd</sup>, 4<sup>th</sup>, or 5<sup>th</sup> grade, please fill out a survey for each child according to that child's fruit and vegetable behavior.

If you have any questions about this project, or if you would like a summary of the results, please call Michelle Strang at (701) 241-5881 or [Michelle.strang@ndsu.edu](mailto:Michelle.strang@ndsu.edu); or Julie Garden-Robinson at (701)231-7187 or [Julie.garden-robinson@ndsu.edu](mailto:Julie.garden-robinson@ndsu.edu). For questions on the rights of human research participants, or to report a problem, please contact the NDSU IRB office at (701) 231-8908 or e-mail [ndsu.irb@ndsu.edu](mailto:ndsu.irb@ndsu.edu).

Thank you for your help in making this project a success!

## **APPENDIX F**

### **STUDENT WRITTEN SCRIPT (Robert Asp)**

North Dakota State University  
Department of Health, Nutrition, & Exercise Sciences  
NDSU Dept 7270 P.O. Box 6050  
Fargo, ND 58108-6050  
(701)241-5881  
[Michelle.strang@ndsu.edu](mailto:Michelle.strang@ndsu.edu)

I am Michelle Strang from North Dakota State University. I am doing a study to find out if giving fruit and vegetable snacks to children in school makes a difference in what they eat when they are away from school. We are asking you to take part in this study to find out if your answers are different than those from kids who are getting fruit and vegetable snacks at school.

For this research, we will ask you to fill out a short survey. We will keep your answers private, and will not show them to your teacher or your parent(s)/guardian. Only people from NDSU working on this study will see your answers.

You should know that:

- You do not have to be in this study if you don't want to. If you don't want to participate, you can work on the handout or just sit quietly at your desk.
- You can stop filling out the survey at any time, or if there is a question you don't want to answer, just leave it blank.
- Your parents/guardians were asked if it is OK for you to be in this study. Even if they said it was OK, it is still your choice whether or not you want to take part.
- Each of you will receive a pencil or a tattoo as a thank you, even if you decide not to take the survey.

Survey Procedures:

- We will go over each question together so please don't read ahead.
- Don't put your name on the survey, but please write your school identification number at the top. The researchers at NDSU do not know which ID number is yours. The number will help us find out information that you may not know, like your ethnicity, and whether or not you receive free or reduced priced meals. This number will also help us to match your survey answers to your parent's.
- If you have any questions, please raise your hand and ask at any time.

If you think of a question later, you or your parents can call me at 241-5881 or Dr. Julie Garden-Robinson at 231-7187.

Thank you for helping us by taking this survey!

## STUDENT WRITTEN SCRIPT (L.E. Berger)

North Dakota State University  
Department of Health, Nutrition, & Exercise Sciences  
NDSU Dept 7270 P.O. Box 6050  
Fargo, ND 58108-6050  
(701)241-5881  
[Michelle.strang@ndsu.edu](mailto:Michelle.strang@ndsu.edu)

I am Michelle Strang from North Dakota State University. I am doing a study to find out if giving fruit and vegetable snacks to children in school makes a difference in what they eat when they are away from school. We are asking you to take part in this study because this is the first year that children at L.E. Berger are getting these fruit and vegetable snacks.

For this research, we will ask you to fill out a short survey. We will keep your answers private, and will not show them to your teacher or your parent(s)/guardian. Only people from NDSU working on this study will see your answers.

You should know that:

- You do not have to be in this study if you don't want to. If you don't want to participate, you can work on the handout or just sit quietly at your desk.
- You can stop filling out the survey at any time, or if there is a question you don't want to answer, just leave it blank.
- Your parents/guardians were asked if it is OK for you to be in this study. Even if they said it was OK, it is still your choice whether or not you want to take part.
- Each of you will receive a pencil or a tattoo as a thank you, even if you decide not to take the survey.

Survey Procedures:

- We will go over each question together so please don't read ahead.
- Don't put your name on the survey, but please write your school identification number at the top. The researchers at NDSU do not know which ID number is yours. The number will help us find out information that you may not know, like your ethnicity, and whether or not you receive free or reduced priced meals. This number will also help us to match your survey answers to your parent's.
- If you have any questions, please raise your hand and ask at any time.

If you think of a question later, you or your parents can call me at 241-5881 or Dr. Julie Garden-Robinson at 231-7187.

Thank you for helping us by taking this survey!

## APPENDIX G SURVEY READABILITY REVIEW

Please review this survey on fruit and vegetable intake and respond to the following questions below. This survey will be administered to students in grades 3-5.

1. My students could read these questions without difficulty.

1. strongly agree    2. Agree    3. neutral    4. disagree    5. strongly disagree

2. My students could understand these questions without difficulty.

1. strongly agree    2. Agree    3. neutral    4. disagree    5. strongly disagree

3. Which grade do you teach?

a. 3<sup>rd</sup> grade

b. 4<sup>th</sup> grade

c. 5<sup>th</sup> grade

4. Please provide any comments or suggestions on how to improve the readability of the survey.

5. Please note any information on the survey that may be confusing to your students.

## APPENDIX H DEMOGRAPHIC SURVEY QUESTIONS

### Student Survey

21. Are you a boy or a girl?
<input type="radio"/> Girl <input type="radio"/> Boy
22. What grade are you in?
<input type="radio"/> 3 <sup>rd</sup> grade <input type="radio"/> 4 <sup>th</sup> grade <input type="radio"/> 5 <sup>th</sup> grade
23. What is your ethnic origin or race? (check all that are true)
<input type="radio"/> White <input type="radio"/> American Indian/Native American <input type="radio"/> Asian or Pacific Islander <input type="radio"/> Hispanic <input type="radio"/> African American <input type="radio"/> Other _____ <input type="radio"/> I don't know
24. Do you have free, reduced priced, or full paid school meals?
<input type="radio"/> Free <input type="radio"/> Reduced <input type="radio"/> Full Paid <input type="radio"/> I don't know

### Parent Survey

21. Is your child a boy or a girl?
<input type="radio"/> Girl <input type="radio"/> Boy
22. What grade is your child in?
<input type="radio"/> 3 <sup>rd</sup> grade <input type="radio"/> 4 <sup>th</sup> grade <input type="radio"/> 5 <sup>th</sup> grade
23. What is your child's ethnic origin or race? (check all that are true)
<input type="radio"/> White <input type="radio"/> American Indian/Native American <input type="radio"/> Asian or Pacific Islander <input type="radio"/> Hispanic <input type="radio"/> African American <input type="radio"/> Other _____ <input type="radio"/> I don't know
24. Does your child have free, reduced priced, or full paid school meals?
<input type="radio"/> Free <input type="radio"/> Reduced <input type="radio"/> Full Paid <input type="radio"/> I don't know