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Grimes, Emily K. ***Determination of the Fruit Consumption and Purchasing Habits in First-Year College Students Participating in the University Dining Services Program***

Abstract

This study aimed to evaluate fruit consumption of first-year University of Wisconsin-Stout (UW-Stout) students who usually consume two or more meals per day from the University Dining Services Program. Objectives included identifying the form of fruit students typically consume, determining student satisfaction with quality and variety of fruit offered through the University Dining Services Program, and identifying additional sources of fruit for students. The study was also designed to relate gender to the adequacy of daily fruit intakes and objectives mentioned above. A total of 204 first-year students enrolled at the UW-Stout in the 2011-12 academic year completed a researcher designed survey through Qualtrics, an online survey tool. Findings showed that both male and female participants significantly exceeded the recommended daily fruit intake established by the USDA MyPlate guidelines. Students reported a greater intake of fruit from the University Dining Services Program than other sources. The most frequently consumed form of fruit was fresh fruit for both males and females. The greatest barrier towards fruit intake was cost followed by a limited access to fruit. Finally, students reported satisfaction ratings for quantity of fruit offered through the University Dining Services Program but were less satisfied with variety of fruit offered.

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Chapter I: Introduction

Fruit consumption is an important component of a healthy lifestyle, which many Americans are not taking advantage of the benefits. Fruits are naturally cholesterol free and low in fat and sodium, while rich in a variety of nutrients essential in a healthy diet, including vitamins, minerals, and dietary fiber (United States Department of Agriculture [USDA], 2011a). Increased fruit consumption has been linked to decreased chronic disease risk such as cardiovascular disease (CVD) and cancer. Therefore, dietary guidelines encourage Americans two years of age and older to increase their daily fruit consumption in order to decrease the risk of developing chronic diseases (Centers for Disease Control and Prevention [CDC], 2011; USDA & US Department of Health and Human Services [USDHHS], 2010).

When students attend their first year at college, it is oftentimes their first experience away from home for a long period of time. The student will be able to make many new decisions, by themselves, without the influence of their parents or guardians. These decisions include what the student eats daily. Unfortunately, because chronic diseases develop over a long period of time and the college-age population is generally healthy, a diet-related disease may only develop when the individual is much older. Therefore, it is important to establish positive eating habits at a young age so the individual can decrease their risk of disease in the future.

Consuming fruit out of habit leads to increased fruit consumption; thus, young populations are an essential group to target for nutrition education about increasing fruit consumption. Adults who habitually consume fruit are more likely to consume higher amounts of fruit than those who do not consume fruit out of habit (de Bruijn, 2010). Additionally, adults who consume higher amounts of fruits throughout their entire lives have lower healthcare costs associated with CVD and cancer (Daviglus et al., 2005). Therefore, it is important for college

students to reinforce or establish positive eating habits that include the recommended amount of fruits per day to maintain or promote development of a healthy lifestyle when they are older.

Americans are not consuming the recommended amount of fruit each day (Khare et al., 2009; Thompson & Demark-Wahnefried, 1999). The current quantities of fruit per day recommended by the USDA MyPlate guidelines for healthy eating are 1.5 cups for girls aged 14-18 years, 2 cups for women aged 19-30 years, and 2 cups for boys and men aged 14 years and older (USDA, 2011b). Perez, Phillips, Cornell, Mays, & Adams (2009) reported only 32.8% of adult participants ate two or more fruits a day. Blanck, Gillespie, Kimmons, Seymour, & Serdula (2008) found that only 24.7% of adult participants consumed fruits, or vegetables, or both five or more times per day. In fact, in the same study, total fruit and vegetable consumption was found to decline slightly from 3.43 times per day in 1994 to 3.24 times per day in 2005.

When evaluating the United States by region, the Midwest has the lowest percentages of male and female adults who consume five or more fruits and vegetables a day compared to the Northeastern, Southern, and Western regions (Blanck et al., 2008). In Wisconsin, only 15.4% of individuals aged 18-24 reported consuming five or more fruits and vegetables a day in 2009. National data indicate that this age group has the lowest reported consumption of fruits and vegetables (CDC, 2009). These data suggest that although the United States population on average may not be consuming enough fruits, the Midwest population and specifically individuals aged 18-24 years may be consuming the least amount of fruits.

Overweight and obesity have been linked to numerous health complications and individuals who consume more fruits and vegetables appear more likely to have a healthy weight. Elementary school-aged children who reported having high preferences for fruits and vegetables were 5.5 times less likely to be at risk of overweight or to be overweight than their

peers who had very low preferences for fruits and vegetables (Lakkakula, Zanovec, Silverman, Murphy, & Turri, 2008). This inverse relationship was also seen in female college students; those who ate five or more fruits and vegetables a day were less likely to be overweight or obese compared to those who did not eat this amount (Perusse-Lachance, Tremblay, & Drapeau, 2010).

Currently, young healthy adults may not be willing to improve their dietary intake unless an immediate health concern arises. A study investigating college students' dietary intake and exercise beliefs found that students did not consume the recommended amount of fruit, vegetables, and whole grains and consumed an excess amount of fat and sodium. These same students were interested in learning about eating healthfully and believed they were capable of doing so but only felt it would be necessary to change their eating and exercise habits with the onset of a diet-related disease or illness. The majority of the population studied was of a healthy weight (Strong, Parks, Anderso, Winett, & Davy, 2008). However, another study examining college students desire to eat fruits and vegetables found individuals who were overweight were more willing to change their eating habits to incorporate more fruits for weight management and appearance reasons, not for general health purposes (Chung, Hoerr, Levine, & Coleman, 2006). These data suggest that college-age students are either unaware of the relationship between their current diet and future health status or do not care or do not believe ill-health consequences related to their current actions might happen in the future. Therefore, it is essential for students to not only receive nutrition education but also be provided with the appropriate food options to succeed nutritionally.

Statement of the Problem

Currently, studies suggest Americans of all ages are not consuming the recommended amount of fruits each day. Regionally, the Midwest population is struggling the most to

consume recommended amounts of fruits (Blanck et al., 2008). Also, a negative correlation has been shown between fruit consumption and chronic diseases such as cancer, CVD, and obesity (Daviglus et al., 2005). The present study aims to examine the fruit consumption practices of first-year college students participating in a University Dining Services Program. Also, the students' satisfaction with fruit available through the University Dining Services Program will be investigated. Limited information is available on the fruit intakes of first-year college students, although the first year of college is an important transitional time that may have a lasting influence their healthful lifestyles, including fruit intakes. Data from this study will aid in promoting the understanding of fruit consumption rates of first-year college students who participate in campus dining programs, barriers to their fruit consumption, and sources of their fruit intakes. Additionally, this study may provide suggestions for improvements in fruit consumption and in the availability and variety of fruit offered through the University Dining Services Program.

Purpose of the Study

The purpose of this study is to determine daily fruit consumption, the perceptions of the availability of fruits and barriers to fruit consumption of first-year students who consume at least two meals per day at the University of Wisconsin-Stout (UW-Stout) University Dining Services Program. Specific research objectives are as follows:

1. Compare the average daily fruit consumption of students to the USDA MyPlate recommended intakes.
2. Determine the form of fruit students typically consume.
3. Determine satisfaction of students with the quantity and variety of fruit offered through the University Dining Services Program.

4. Identify additional sources of fruit for students other than the University Dining Services Program.

5. Determine possible barriers to fruit consumption of students.

6. Determine if any changes in the quantity of fruit consumption occurred after students started to utilize the University Dining Services Program.

7. Relate gender to the adequacy of daily fruit intakes, satisfaction ratings for fruit availability, sources and forms of fruit use, barriers to consumption, and change in fruit consumption associated with use of the University Dining Services Program.

Definition of Terms

The following items are defined to provide clarity to the content of this study:

Adolescent. The period of life beginning with the appearance of secondary sex characteristics and ending with the cessation of somatic growth, often considered to occur between the ages of 12 and 18 or 12 and 21 years old (Mahan, & Escott-Stump, 2008).

Body mass index (BMI). A mathematical formula that correlates with body fat and is expressed as body weight in kilograms divided by height in meters squared (BMI = kg/m^2) (Mahan, & Escott-Stump, 2008).

Cardiovascular disease. A heart and blood vessel disease, which includes numerous conditions including heart attack, stroke, heart failure, arrhythmia, and heart valve problems (American Heart Association, 2011a).

Dietary fiber. Intact and intrinsic plant material that is not digestible by human gastrointestinal tract enzymes, may be soluble or insoluble (Mahan, & Escott-Stump, 2008); usually a mixture of polysaccharides that are integral components of the plant cell wall or intercellular structure (American Dietetic Association [ADA], 2011).

Obesity. A state of adiposity in which body fatness is above the ideal; a body mass index of 30 to 39.9 or greater (Mahan, & Escott-Stump, 2008).

Overweight. A state in which weight exceeds a standard based on height; a body mass index of 25 to 29.9 (Mahan, & Escott-Stump, 2008).

Assumptions of the Study

Several assumptions were made in conducting this research. The researcher assumed that all participants accurately reported their class year and the University Dining Services Program participation. Also, it was assumed that participants accurately reported their consumption and beliefs regarding fruit and the fruit offered through the University Dining Services Program. In the survey, a table was presented to participants with examples of measurements of fruits. The researsher assumed the participants read and undrestood the table and were able to apply the examples of serving sizes to their usual intake of fruit.

Limitations of the Study

Limitations were determined throughout the implementation of this research. The first limitation to this study is the lack of a randomized method for choosing subjects. Subjects were self-selected, and consequently, may not be representative of the study population of interest. Also, subjects represented one Midwestern university, and may not reflect the population in the Midwestern region or other universities. An additional limitation is the possibility that the subjects failed to accurately report their daily fruit consumption, which would compromise the accuracy of the data collected.

Methodology

An email invitation to participate in the study was sent to first-year college students who were enrolled for their first fulltime semester at the UW-Stout. Data were collected using an

online survey, administered through Qualtrics, and analyzed to determine daily fruit intakes and differences between gender for fruit consumption and other variables studied.

Chapter II: Literature Review

This chapter will include a review of research regarding fruit consumption of college students and barriers to fruit intakes. Studies will be summarized that evaluate programs developed to increase fruit consumption among college students. This chapter concludes with a description of the beneficial components of fruits, specifically as related to cancer, CVD, overweight and obesity, and diabetes mellitus.

Fruit Consumption of College Students

When students first attend college, oftentimes they are no longer under the direct influence of their parents. This absence of parental influence may affect college students' fruit intakes. Studies show that parents' positive influence on fruit consumption is an essential component to increasing fruit consumption in their adolescent. Adolescents with parents who ate fruit in front of their child and supported their child eating fruit were more likely to consume a higher amount of fruit per day than adolescents who did not have parental support of their fruit intake. Similarly, adolescents with higher fruit consumption also had more fruit available to them in their home (Young, Fors, & Hayes, 2004).

Overall, students who transition from high school to college reported a decline in fruit intake for both males and females (Cullen et al., 1999). However, several factors influence the extent of the decline in fruit intakes. Adams and Colner (2008) reported that full-time students were more likely to have higher fruit consumption than part-time students. Additionally, the same study found that student's residential location influenced their fruit consumption. Students residing in a residence hall reported greater fruit consumption than students living in other campus housing, or those living off campus, or with parents. Students living in a fraternity or sorority house reported higher intake of fruit than students living off campus. Residence halls

and fraternity and sorority houses provide students with meal plans, which eliminate the need for students to cook for themselves and provide students with a variety of food options and the convenience of having pre-cut fruit available to them. These factors may account for the higher fruit consumption among student in housing locations with meal plans than students who live in housing without a meal plan.

Although students without a meal plan consumed less fruits than students participating in a meal plan, those with the meal plan still did not consume the recommended amount of fruit each day (Brown, Dresen, & Eggett, 2005; Harris and Murray, 1997). Other studies confirm low intakes of fruits among college students. Over the course of five months, female college freshmen decreased their daily servings of fruits and gained about two pounds of body weight even though 42.0% of these students reported attempting to lose weight sometime within the study period (Butler, Black, Blue, & Gretebeck, 2009). When evaluating the number of fruit, juice, and vegetable servings per day, 59% of the participants consumed 2.5 or fewer daily servings and only 7.4% consumed five or more fruit, juice, and vegetable servings per day. When these students were asked how many servings of fruit students should eat every day, approximately 70% believed that people their age should eat 3 to 4 servings of fruit a day (Evans, Sawyer-Morse, & Betsinger, 2000). These data suggest that students know how much fruit they should eat each day but do not follow the recommended guidelines.

Harris and Murray (1997) measured the relationship between the social cognitive model variables and the self-report of fruit and vegetable consumption among college students. The factors that showed the most influence on predicting fruit intake among college students include childhood and family practices, taste, price, availability, housing situation, campus dining participation, and stage of change in the person. This study confirmed that students who grew up

in a lifestyle that support fruit intake were more likely to eat more fruit than students who were not exposed to as much fruit as a child. Further, this study found that students who lived in dorms were more likely to consume greater quantities of fruit than students who lived in apartments or a fraternity or sorority house.

Students with different racial backgrounds also report differences in daily fruit consumption. African American and Hispanic students reported consuming fewer fruits than Caucasian or Asian students (Adams and Colner, 2008). Clarke, O'Malley, Johnston, Schulenberg, and Lantz (2009) investigated weight-related health behaviors in young adults over the course of 23 years and found that although fruit consumption among young adults did not change much over the 23 years, African Americans and Hispanics consumed consistently lower amounts of fruit each year.

Barriers to Fruit Consumption

An individual's exposure to food and nutrition education has an impact on consumption of fruits. College students who reported an increased knowledge of dietary guidelines consumed significantly more fruits than individuals who reported lower values of knowledge (Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007). In a study examining the association of nutrition knowledge and cancer, individuals with greater education on the relationship between nutrition and cancer consumed more fruit than individuals who had less knowledge on this topic. (Harnack, Block, Subar, Lane, & Brand, 1997).

Consumers' beliefs about the benefits of fruit consumption and the habitual use of fruits also influence daily fruit intakes. When researchers investigated the relation of habit to fruit consumption, results showed that people who consumed more fruits per day were more likely to be in a habit of consuming more fruits. These subjects reported not having to make a conscious

effort to add fruit into their diet because they had already incorporated fruit into their regular eating patterns. Additionally, these subjects believed fruit consumption was positively associated with heath status. Subjects who consumed the most fruit were more likely to believe that eating fruit maintains their health, helps them sustain or lose weight, and helps to decrease their consumption of high calorie snacks between meals (de Bruijn, 2010). In contrast, individuals who felt that eating a healthier diet was more challenging consumed more fat, less fiber, and fewer fruits and vegetables than those who felt eating healthy was easy (Harnack et al., 1997). This research suggests that people who have strong healthy opinions about the benefits of fruit consumption are more likely to incorporate higher amounts of fruit into their daily diets.

Programs Promoting Fruit Consumption among College Students

Several programs have been studied to evaluate the effectiveness of increasing fruit consumption among college students. Shive and Morris (2006) studied the change in fruit consumption of college students who were exposed to a social marketing campaign at school used to improve knowledge and attitudes of the students and increase their fruit consumption. The researchers developed a themed campaign that included a brochure, poster, and table tents, which explained the benefits of fruit, how to overcome barriers to intake, and a recipe for a fruit smoothie. The materials were placed on campus for a two-month intervention. Demonstrations on how to prepare fruit smoothies took place one or two times per week on campus. A pre-and post-test was given to students addressing knowledge and attitudes related to the benefits and barriers to fruit consumption, and food insecurity. Results indicated that students increased their typical daily fruit intake from pre- to post-test. Through this intervention, the campus dining program offered additional fruit options to students by stocking vending machines with fresh fruit and allowing fresh fruit as a substitute to French fries in the school dining hall.

Richards, Kattelmann, and Ren (2006) studied the effects of a four-month intervention using stage-based newsletters, motivational interviewing, computer-based follow-up, and a nutrition website on college student's fruit consumption. The intervention group received a personalized letter, four newsletters, one motivational interviewing session, and a minimum of two e-mail contacts. The personalized letter and newsletters were tailored to the participants' stage of change at baseline. Results showed that participants in the intervention group had significantly increased their fruit consumption by the end of the intervention compared to the participants who only took the pre- and post-test without any additional information on fruit.

Peterson, Duncan, Null, Roth, and Gill (2010) studied the changes in healthy meal selection of college students eating at the campus dining hall by incorporating table tents, posters, flyers, and point-of-selection symbols emphasizing healthy food choices. Pre- and -post intervention surveys were completed by students who consumed at least three meals per week at the dining hall. The intervention period lasted three weeks and results revealed no significant increase in fruit consumption; however, a trend towards more frequent fresh fruit consumption was observed. A longer intervention period than utilized may increase daily fresh fruit consumption.

These studies suggest that nutrition interventions with college students positively influence their daily fruit intake. The interventions that included participant interaction and were tailored to the direct needs of the participant showed greater increase in fruit consumption than the interventions that addressed everyone equally. Therefore, when designing an intervention program for college students, hands-on learning skills may result in the greatest improvements in students. Limitations to these studies include lack of information on the long-term effects of the interventions. The studies do not evaluate or report fruit intake of students after the interventions

were completed and time had passed. Therefore, it is unknown if the students incorporated increased fruit consumption into their diets long-term.

Beneficial Components of Fruits

Although it is unclear which components in fruits are most protective against diseases such as cancer and CVD, research suggests an overall link between increased fruit consumption and decreased disease risk. Some proposed theories regarding the reason for the beneficial effects of fruit include their high antioxidant concentration and fiber content. These antioxidants include but are not limited to carotenoids, vitamin E, and vitamin C. Carotenoids are suggested to protect against prostate, lung, and liver cancer (Tanaka, Shnimizu, & Moriwaki, 2012). Vitamin E has been linked to reducing the risk of stroke (Lee et al., 2005), whereas vitamin C helps protect the body against infection (Sasazuki et al., 2006).

Dietary fiber consists of many different nondigestible components found intact in plants that are important to human health. The Dietary Reference Intakes (DRIs) set the recommended daily intake of total fiber based on 14 g/1,000 kcal, which is the level shown to provide the greatest protection against coronary heart disease (Food and Nutrition Board, 2005; Slavin, 2008). Dietary fiber is often separated in two groups: soluble fiber and insoluble fiber. Soluble fiber is generally distinguished for its ability to lower blood lipid levels. Soluble fiber can be found in high concentrations in oat bran, barley bran, and psyllium. In contrast, insoluble fiber is generally linked to bowel movement and to laxation, and is heavily found in wheat bran (Slavin, 2008).

Dietary fiber and cardiovascular disease risk. Increased dietary fiber consumption has been positively correlated to decreased risk of CVD. In a position paper of the American Dietetic Association (ADA), now the Academy of Nutrition and Dietetics (AND), the AND

acknowledged that health benefits may occur with intakes of 12 to 33 grams fiber per day from whole foods (Slavin, 2008). Although soluble fiber is generally linked to protection against CVD (Slavin, 2008), Liu et al., (2002) found that insoluble fiber was more strongly associated with a reduced risk for CVD than soluble fiber. However, researchers agree that increased intakes of total dietary fiber reduce the risk of CVD (Wolk et al., 1999), regardless of its type (insoluble or soluble). Increased fiber consumption is also inversely associated with lower intake of total and saturated fats (Liu et al., 2002), which has been linked to lower CVD risk (American Heart Association, 2011b).

Research suggests adults consume approximately 22% of their daily fiber from fruits (Wolk et al., 1999) but still fail to meet the daily recommended amount of 25 grams per day for women and 38 grams per day for men (ADA, 2011). One long-term evaluation reported that women only consume approximately 18.0 grams of the recommended amount a day (Wolk et al., 1999). By offering additional fruits to consumers who eat in a cafeteria like setting, their daily consumption of fruits increases beyond the daily national average of consumers who do not eat in a cafeteria like setting (Di Noia, & Contento, 2010). Therefore, it appears important to ensure that all cafeterias, and in this case college dining halls, offer a wide variety of fruits so that consumers are better able to meet their fiber requirements.

Fruit consumption and cancer. Eating a variety of fruits is linked with a lower risk of many cancers including prostate, lung, and liver cancer (Tanaka, Shnimizu, & Moriwaki, 2012), as well as cancer of the oral cavity and pharynx, esophagus and colorectal cancer (Key, 2011). Unfortunately, it is after cancer diagnosis when individuals change their eating habits. Women diagnosed with breast cancer reported eating a significantly larger amount of fruit per day than the amount they consumed pre-diagnosis. Forty-five percent of these women also decreased

their daily consumption of fat after diagnosis (Wayne et al., 2004). When dietary changes, including increased fruit consumption, occurred at a younger age, life expectancy begins to increase. When fruit and vegetable consumption increased from 250 grams per day to 400 grams per day and 500 grams per day, the life expectancy increased by 0.8 and 1.3 years, respectively, and cancer free life expectancy increased by 1.1 years and 1.9 years, respectively (Gundgaard, Nielsen, Olsen, & Sorensen, 2002). Increasing fruit consumption at a younger age could potentially increase one's life expectancy and life free of cancer.

Fruit consumption and excess body weight. Being overweight or obese plays a major role in the risk of developing a disease and the prevalence of overweight and obesity is increasing. The AND suggests maintaining a healthy weight to decrease the risk of developing heart disease and cancer and reports that maintaining a healthy weight is one of the most important prevention methods for disease risk (Slavin, 2008). Approximately 20% of college students are overweight or obese (Butler et al., 2009; Kolodinsky et al., 2007). Unfortunately with this age group, the trend to become more overweight or obese may only grow when students associate with peers who are overweight or obese. One investigation found that healthy weight students who are friends with obese students increased their risk of becoming obese by 57% because of the peer influence of food choices and time spent participating in sedentary activities (Strong, Parks, Anderson, Winett, & Davy, 2008).

Studies of various populations indicate that people who are a normal weight consume more fruits than people who are overweight or obese. When examining children and their parents, normal weight children ate more fruits than overweight children and normal weight parents ate more fruits than overweight or obese parents (Vanhala, Laitinen, Kaikkonen, Keinanen-Kiukaanniemi, & Korpelainen, 2010). This study also found that mothers with an

overweight child consumed less fruits than mothers with a normal weight child. Additionally, when studying an older population of middle aged women, those who increased their fruit intake had a 25% lower risk of becoming obese compared to their peers who did not increase their fruit intake (He et al., 2004).

These data suggest the influence of peer and parental lifestyle factors on individuals fruit consumption and weight history. When parents and peers make positive lifestyle choices, then the individual is more likely to make the similar positive lifestyle choices. In regards to college students, it seems important to make sure that they are able to consume enough fruits to adopt or continue a healthy lifestyle of fruit consumption.

Further, research indicates that adults who consume more fruits daily were less likely to be overweight or obese and had lower annual Medicare charges compared to their counterparts (Daviglus et al., 2005). When comparing an overweight or obese individual to a healthy weight individual with the same age, height, and gender, the healthy weight individual consumed about one more serving of fruit per day than their overweight counterpart (Davis, Hodges, & Gillham, 2006). Adults with higher fruit consumption throughout their life were more likely to have lower mean annual Medicare charges for CVD, cancer, and total charges (Daviglus et al., 2005). These data suggest that the fruit consumption choices adults make when they are younger will influence their weight and medical costs in later life. Therefore, it is essential that young adults are provided with the appropriate education and fruit availability to encourage and increase fruit consumption.

Fruit consumption and diabetes mellitus. In its critical analysis of literature related to dietary fiber and chronic diseases, the AND recognized dietary fiber as a component which reduces the risk of developing type 2 diabetes mellitus (Slavin, 2008). In an analysis of the Nurses' Health Study, researchers found that the type of fruit consumed impacted the chance of developing type 2 diabetes mellitus. Participants who consumed more servings of fruit from juice, which contains a lower concentration of fiber, were more likely to develop type 2diabetes mellitus than those who consumed more servings from whole fruit. Similarly, an inverse relationship existed between those who consumed whole fruits and the risk of developing diabetes (Bazzano, Li, Joshipura, & Hu, 2008). Additionally, a study examining the long-term effect of food choices found that after a 23 year follow-up, participants who developed diabetes were more likely to have a higher BMI, were older, and more likely to be hypertensive than their counterparts. Additionally, an increased consumption of vegetables, fruit and berries, and poultry was associated with a reduced risk of developing diabetes (Montonen et al., 2005).

Chapter III: Methodology

This chapter will include a description of the sample, the sample selection process, the instrument, and the procedures of data collection and analyses for this study. This chapter ends with a discussion of the limitations of the methodology for conducting this study, particularly in regards to the sampling techniques, the instrument used, and data collection procedures.

Subject Description and Selection

Prior to initiation of this study, the research procedures were evaluated and approved by the Institutional Review Board for the Protection of Human Subjects at the UW-Stout (Appendix A). The population for is study was full-time students at the UW-Stout in the Spring 2012 semester who had first enrolled for full-time status at the University in the Summer 2011, Fall 2011, Winter-Term 2012, or Spring 2012. In addition to time of enrollment as a full time student, other eligibility criteria to participate in the study were: being 18 years old or older and usually consuming two or more meals per day from the University Dining Services Program.

The study population was determined and selected in February 2012 using the records for time of enrollment as a full-time student and assistance of the Planning, Assessment, Research and Quality Department (PARQ) at the UW-Stout. A random sample of about 65% of students who met the full-time enrollment requirement for the study was selected. Through the UW-Stout online survey tool, Qualtrics, each student was sent an email invitation to participate in the online survey developed by the researcher. An informed consent was included at the beginning of the survey. Therefore, participants had to read and agree to the informed consent before answering any survey questions. Also, the survey included questions that further screened the sample according to the selection criteria for the study. There were no identifying factors to determine which students completed the survey and which students chose not to. All students

were selected as participants who completed the survey and reported eating two or more meals per day from the University Dining Services Program, confirmed their age of 18 years old or older, and confirmed their current status as a first-year student. Participation in this study was voluntary and by submitting a survey, students gave their implied consent to participate. No compensation was offered to students who participated.

Instrumentation

A survey (Appendix B) was developed by the researcher and administered using the Qualtrics online survey tool to measure students' perceptions of the quantity and variety of fruits offered as well as their overall satisfaction with the type of fresh fruit offered to them through the University Dining Services Program. Additionally, the survey measured students' daily quantity of fruit consumed from the University Dining Services Program and from other sources. The survey consisted of 16 questions.

Before students could begin the survey, they had to agree to the consent form (Appendix C). This form was placed within the survey before the first question. By clicking next, students agreed to the materials within the consent form. The consent form gave the title of the study followed by a description of the purpose of the study, risks and benefits of completing the survey, the survey population, and the time commitment for participation. A confidentiality statement and the right to withdraw guidelines were described next. Finally, the IRB approval statement, the investigator and advisors contact information and the final statement of consent was given. By proceeding to the next question, the participant agreed to the statements within the consent form.

The first four questions on the survey screened students according to the eligibility criteria for the study: full-time status of enrollment at the UW-Stout, age, and participation in the

University Dining Services Program. If a student's answer did not meet a requirement, then the student was unable to proceed to answer any additional survey questions. In such instances, the survey was designed to automatically skip to the end, requiring ineligible students to submit without completion.

The next set of questions ascertained gender and the quantity of fruit the student perceived to be eating from the University Dining Services Program and other sources. A table with examples of one-cup fruit servings adapted from the USDA MyPlate was presented with these questions to help students better understand how much fruit they were eating per day. Students were asked how many times per day they consume fruit from the University Dining Services Program and then how many cups they typically eat at one time from the University Dining Services Program. The same two questions were asked for other sources of fruit.

Then, the survey evaluated the student's satisfaction with the quantity and variety fruit offered by the University Dining Services Program. A four-point Likert scale was used to evaluate satisfaction of quantity and variety. Students could choose: very dissatisfied, dissatisfied, satisfied, or very satisfied.

Next, two questions were asked to evaluate the sources of fresh fruit other than the University Dining Services Program. Students were asked what other sources they used to receive fruit, and which source do they used most often. The listed sources were: chain grocery stores, local grocery stores, convenience stores, farmers' markets, family members, food shelf/food pantry, home, and I do not receive or purchase fruit from other sources. Examples of chain grocery stores, local grocery stores, and convenience stores found within the city of Menomonie were listed on the instrument to describe the difference between the types of stores/locations. Specifically, Wal-Mart and Marketplace were listed as chain grocery stores,

Lammer's and Menomonie Market Food Co-op were listed as local grocery stores, and KwikTrip or other gas station stores were listed as convenience stores. This question included an "other" category, which allowed students to write-in any additional sources not listed on the instrument.

Finally, questions determined the type of fruit consumed most often, barriers towards fruit intake, and the change in quantity of fruit consumed. Options for the type and amount of fruit consumed most often were: 100% fruit juice, fresh fruit, canned fruit, cooked fruit, and dried fruit. Options listed on the questionnaire for the barriers were: fruit costs too much money to purchase, I have an allergy to fruits, I do not have access to fruits, I do not have any barriers towards eating fruit and an "other" category where students were given the chance to write-in any other barrier they had towards eating fruit. Finally, change in quantity of fruit consumed by utilizing the University Dining Services Program was evaluated on a five-point Likert scale. Students were able to choose from the following list: much less, less, the same, more, and much more.

No measures of validity or reliability of the instrument have been documented because this survey was designed specifically for this study. The survey was piloted prior to administering to five individuals to evaluate their understanding of each question.

Data Collection Procedures

Data were collected in February 2012. An initial email was sent using the UW-Stout Qualtrics survey software to 938 students on February 1, 2012. A reminder email was sent on February 6, 2012 through Qualtrics to the remaining 783 students who did not complete the survey. A final reminder email was sent to the 727 students who did not complete the survey on February 13, 2012. A total of 243 students completed the survey. Thirty-nine responses were

omitted due to failure to meet eligibility requirements or incomplete responses. Therefore, a total of 204 surveys were used in the data analysis.

Students were allowed to withdraw from the study at anytime during completion of the survey. Once students submitted the survey online, participants were unable to withdraw their answers due to the inability to identify the anonymous completed surveys.

Data Analysis

Data were coded and analyzed using the Statistical Program of Social Sciences, version 18.0. The analyses consisted of frequency of responses, mean, median, and standard deviation to examine general trends. Correlational analyses were completed to examine relationships between variables and included t-tests, Fisher's exact test, and Chi-square tests. A standard of $p < .05$ was used as the significance level for all tests conducted.

To determine fruit consumption, students were asked to report how many times they consumed fruit from the University Dining Services Program and from other sources. They were given the choices of 1 time per day, 2 times per day, 3 times per day, 4 or more times per day, or I do not consume fruit from this source. Then, they were asked how much do they typically eat at one time from one source. Students could choose from ½ cup, 1 cup, 1 ½ cup, or 2 or more cups. These results were used to calculate the quantity of fruit they ate from each source and total for one day. The average total quantity for the day was compared to a minimum two-cup daily recommendation for fruit. To evaluate the statistical significance between average daily fruit intakes and the recommendation, one-sample t-tests were used. Independent sample t-tests were used to evaluate the difference between fruit consumption and gender.

A Chi-square test was used to determine which type of fruit students were more likely to consume. When statistical significance was not found, descriptive statistics were used to

examine intakes of males and females and type of fruit consumed most often. Descriptive statistics were also used to evaluate students reported barriers to fruit intake.

The sources used to receive or purchase fruit most often were analyzed using Fisher's Exact Test. Descriptive statistics were used to evaluate which one source students reported using most often.

An independent sample t-test was used to evaluate student satisfaction with quantity and variety of fruit offered. When statistical significance was not found, descriptive statistics were used to show trends. Independent sample t-tests were used to evaluate change in quantity of fruit consumption after utilizing the University Dining Services Program.

Limitations

The study included students who volunteered to complete the survey. Therefore, the sample selection may be biased, and fail to represent the study population.

The small pilot-test of the instrument was also a limitation of this study. Some students who did not fit the eligibility criteria completed the pilot study to give their input on clarity of questions; however, students who fit the eligibility criteria may have understood the questions differently than those in the pilot study.

Self-reported data were collected from this survey which is another limitation, particularly with respect to fruit consumption. Students may have under estimated or over estimated their fruit intakes. Also, this study utilized a minimum two- cup recommendation for fruit intake as standard, which may not be the precise recommended amount for all subjects, depending upon their age and physical activity level. MyPlate recommends at least two cups of fruit daily for sedentary males 18 – 50 years, and females 19 - 50 years old. For women 18 years old, MyPlate recommends a daily intake of 1.5 cups. Finally, students completed the survey in a

location of their choosing; therefore, students may have been in a distracting environment while completing the survey.

Chapter IV: Results

This chapter will begin with a review of the objectives of the present study followed by a description of the participants and then an explanation of the results. The results will include the participants' quantity of fruit consumed, form of fruit consumed, and barriers to fruit consumption. Finally, results regarding fruit consumption from other sources and fruit consumption from the University Dining Services Program will be discussed.

This study presents findings of an evaluation of fruit consumption and purchasing habits of first-year, full-time college students participating in the Dining Services Program at UW-Stout. The study aimed to determine daily quantity of fruit consumed by students, satisfaction with the amount and variety of fruit offered through the University Dining Services Program, other sources of fruit than the University Dining Services Program, types of fruit consumed most often, barriers towards eating fruit and change in quantity of fruit consumed by utilizing the University Dining Services Program. Findings are presented for the following seven specific objectives of the study:

1. Compare the average daily fruit consumption of students to the USDA MyPlate recommended intakes
2. Determine the form of fruit students typically consume.
3. Determine satisfaction of students with the quantity and variety of fruit offered through the University Dining Services Program.
4. Identify additional sources of fruit for students other than the University Dining Services Program.
5. Determine possible barriers to fruit consumption of students.

6. Determine if any changes in the quantity of fruit consumption occurred after students started to utilize the University Dining Services Program.

7. Relate gender to the adequacy of daily fruit intakes, satisfaction ratings for fruit availability, sources and forms of fruit use, barriers to consumption, and change in fruit consumption associated with use of the University Dining Services Program.

Data were gathered using an online survey administered through the UW-Stout Qualtrics software program. A total of 243 students returned the survey. Thirty-nine surveys were omitted from the final analysis due to failure to meet the eligibility criteria or incomplete survey results. Therefore, a total of 204 surveys were used in the data analysis.

Description of the Participants

The subjects consisted of 204 students who were first enrolled for full-time student status at UW-Stout during the Summer 2011, Fall 2011, Winter-Term 2012, or Spring 2012. All participants were 18 years old or older and used the University Dining Service on average two or more times per day. Eighty males (39.2%) and 124 females (60.8%) participated in the study. This distribution reflects a higher proportion of females in the study compared to The University of Wisconsin Board of Regents reported distribution for the total UW-Stout undergraduate population of 51% males and 49% females (The Board of Regents, 2011).

Quantity of Fruit Consumption

Findings for average daily fruit intakes for males, females and all subjects (males and females combined) are presented in Figure 1 in comparison with the MyPlate recommendation. Data show that the average amount of fruit consumed per day by all students (males and females) was 3.3 cups, which was significantly higher than the MyPlate standard of 2 cups utilized in this study [$t(202) = 8.006$, $p<0.01$] (USDA, 2011b).

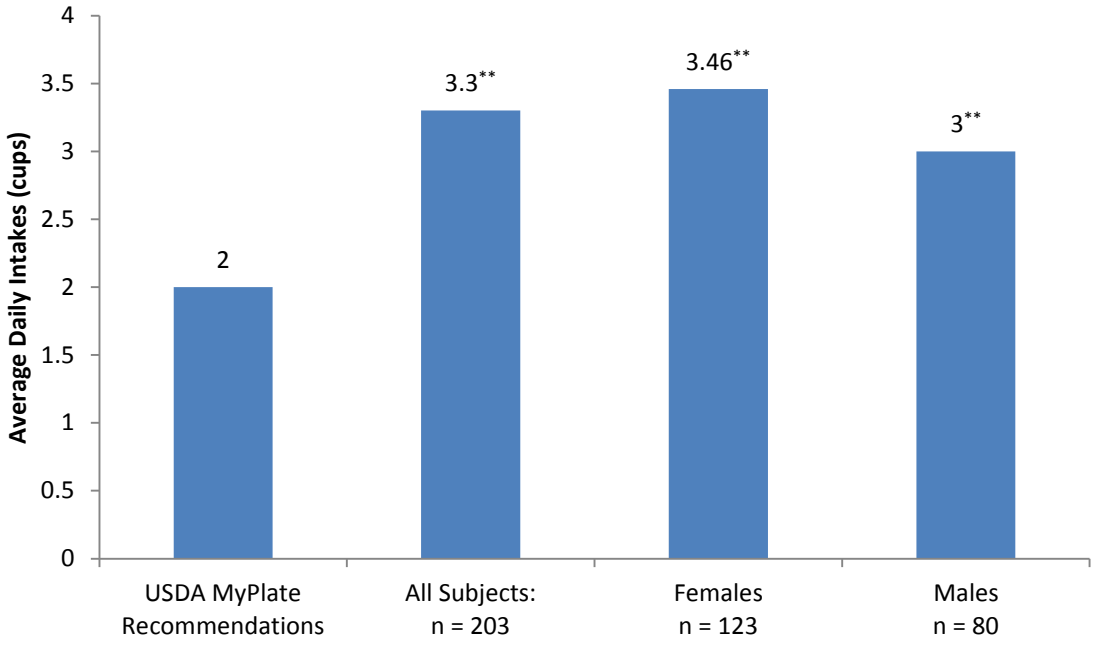

Figure 1. Comparison of daily fruit intakes with recommended intakes.
**Significant at the $p<0.01$ level, compared to MyPlate recommendation

Additionally, subjects reported the amount of fruit they consumed daily from the University Dining Services and for other sources. Table 1 shows the average daily intakes from each source for males and females. Analysis of these data showed no significant difference between intakes of males and females from the two sources.

Table 1

Averages and Standard Deviation for Daily Fruit Consumption in Cups from Dining Services and Other Sources by Gender

Source	Females (n = 124)	Males (n = 80)
Dining Services	2.44 ±1.74	2.43 ±1.81
Other Sources	1.0 ±1.06	.65 ±1.15
Total Intake	3.46 ±2.18	3.0 ±2.4

However, when data for the genders were analyzed to determine the contribution of each source to the MyPlate recommendation, significant differences were found (Table 2). Females ate significantly more fruit from the dining services than the two-cup MyPlate recommendation [$t(122) = 7.405$, $p<0.01$]. Both females [$t(122) = -10.447$, $p<0.01$] and males [$t(80) = -10.514$, $p<.01$] ate a significantly lower amount from other sources than the two-cup MyPlate recommendation. Although males ate more than the MyPlate two-cup the recommendation for fruit consumption from the University Dining Services Program, they did not eat significantly more than two cups [$t(80) = 1.754$, $p>.05$]. However, total fruit consumption by males was significantly higher than the two-cup recommendation [$t(79) = 3.745$, $p<0.01$].

Table 2

Averages and Standard Deviations for Daily Fruit Consumption in Cups compared to the two-cup MyPlate Recommendation by Gender and Source of Fruit

Source	Females (n = 124)	Males (n = 80)
Dining Services	2.44** $\pm$1.74	2.43 $\pm$1.81
Other Sources	1.0** $\pm$1.06	.65** $\pm$1.15
Total Intake	3.46** $\pm$2.18	3.0** $\pm$2.4

Note: **Significant at the $p<0.01$ level, compared to the two-cup MyPlate recommendation

Form of Fruit Consumption

When students were asked to report the form of fruit consumed most often, 73% reported fresh fruit, 13.2% reported 100% fruit juice, and 11.8% reported canned fruit. Subjects were significantly more likely to report fresh fruit as their main type of fruit than any other type [$c^2(2, N = 200) = 9.53$, $p = .009$]. No student reported consuming cooked fruit or dried fruit as the form most frequently used.

When evaluating findings for the form of fruit consumed most often, no significant relationship was observed for gender. Fresh fruit was reported as the form used most often by 63.3% of males, whereas 81.8% of females reported consuming fresh fruit most often. Among males, 100% fruit juice (21.5%) was the second most frequently reported form, followed by canned fruit (15.2%). Females reported canned fruit (9.9%) as the second most common fruit followed by 100% fruit juice (8.3%).

Barriers to Fruit Consumption

Table 3 shows the barriers to fruit intake reported by the participants. Most participants (57.4%) reported no barrier. Cost was the most frequently reported barrier and no access to fruit was the second most frequently reported barrier. Allergy to fruit was reported the least often by only three subjects. Several participants selected "Other" as a barrier and had the option to write-in a barrier if they desired. These participants reported a wide variety of barriers including: "I don't like the texture of fruit," "It goes bad easily therefore harder to buy," "Not my favorite food," "Picky about fruits," and "Not always available."

Table 3

Barriers to Fruit Consumption[a]

Barrier	Frequency	Percent
Fruit costs too much money to purchase	63	30.9
I have an allergy to fruits	3	1.5
I do not have access to fruits	29	14.2
Other	16	7.8
I do not have any barriers towards eating fruit	117	57.4

Note: $n = 197$

[a]Frequencies and percents are based on multiple responses.

When evaluating barriers to fruit consumption and gender, no statistical significance was found as shown in Table 4. The majority of both males and females reported have no barriers to fruit intakes. For both genders, cost was the most frequently reported barrier, followed by lack of access to fruits. Participants had the opportunity to write in any additional barriers they had towards fruit consumption. Participants wrote: “I don’t like the texture of fruit”, “The kinds I like are not offered”, “Not always available”, “Picky about fruits”, “The quality of the fruit doesn’t meet my standards: over/under ripe”, and “Not my favorite food”.

Table 4

Barriers to Fruit Consumption by Gender[a]

Barrier	Males (Percent)	Females (Percent)
Fruit costs too much money to purchase	27.6	34.7
I have an allergy to fruits	1.3	1.7
I do not have access to fruits	11.8	16.5
Other	9.2	7.4
I do not have any barriers towards eating fruit	63.2	57.0

Note: $n = 197$
[a]Frequencies and percents are based on multiple responses.

Fruit Consumed from Other Sources

Participants were asked to report the sources they received or purchased fruit other than the University Dining Services Program. They selected from a list of different options of sources included on the instrument. Table 5 reports the number and percentages of males and females who selected each source. Females were significantly more likely than males to report purchasing fruit from a chain grocery store [p=0.00, Fisher's Exact Test (FET)], or report receiving fruit from a family member (p=0.00, FET) or from home (p=0.00, FET). Females were also more likely than males to purchase fruit from a convenience store (p=0.03, FET). On the other hand, males were more likely than females to not receive fruit from any source other than the University Dining Services Program (p=0.00, FET).

Table 5

Sources of Fruit Other than the University Dining Services Program[a]

Source	Male (n = 80)		Female (n = 122)		All Subjects (n = 202)
	Frequency	Percent	Frequency	Percent	
Chain Grocery Store	32**	40.0	86**	70.5	58.4
Local Grocery Store	11	13.8	29	23.8	19.8
Convenience Store	19*	23.8	47*	38.5	32.7
Farmers Markets	8	10.0	10	8.2	
Family Members	9**	11.3	35**	28.7	21.8
Food Pantry	2	2.5	2	1.6	2.0
Home	18**	22.5	58**	47.5	37.6
Other	1	1.3	3	2.5	2.0
Do Not Receive Fruit from Other Sources	33**	41.3	7**	5.7	19.8

Note: [a]Frequencies and percents are based on multiple responses.
*Significant difference between the genders at the $p<0.05$ level
**Significant difference between the genders at the $p<0.01$ level

Students were also asked to report which one source they use the most often. Table 6 reports the frequencies of responses for which source participants reported using the most. Both males and females reported using chain grocery stores the most (47.8% and 66.7%, respectively). Males reported convenience stores (19.6%) as the second most frequently used, whereas, females reported home (14.0%) as the second most frequently used source for fruit.

Table 6

Sources of Fruit Other than the University Dining Services Program Used Most Often

Source	Male (n = 46)		Female (n = 114)		All Subjects (n = 160)
	Frequency	Percent	Frequency	Percent	
Chain Grocery Store	22	47.8	76	66.7	61.3
Local Grocery Store	5	10.9	8	7.0	8.1
Convenience Store	9	19.6	7	6.1	10.0
Farmers Markets	1	2.2	2	1.8	1.9
Family Members	4	8.7	4	3.5	5.0
Food Pantry	0	0.0	1	.9	.6
Home	5	10.9	16	14.0	13.1

Satisfaction with Fruit Offered by the University Dining Services Program

Participants were asked to describe their level of satisfaction with the quantity and variety of fruit offered in the University Dining Program, using a four-point Likert scale. Figure 2 presents the satisfaction ratings for the quantity of fruit offered. Overall, 63.2% of all students reported being either very satisfied or satisfied with the quantity of fruit. Similarly, the majority of males and females reported being satisfied with the quantity of fruit they received from the University Dining Services (66.3% and 61.3%, respectively). No significant relationship between gender and satisfaction ratings was found based on an independent sample t-test [$t(200) = -0.63$, $p > .05$].

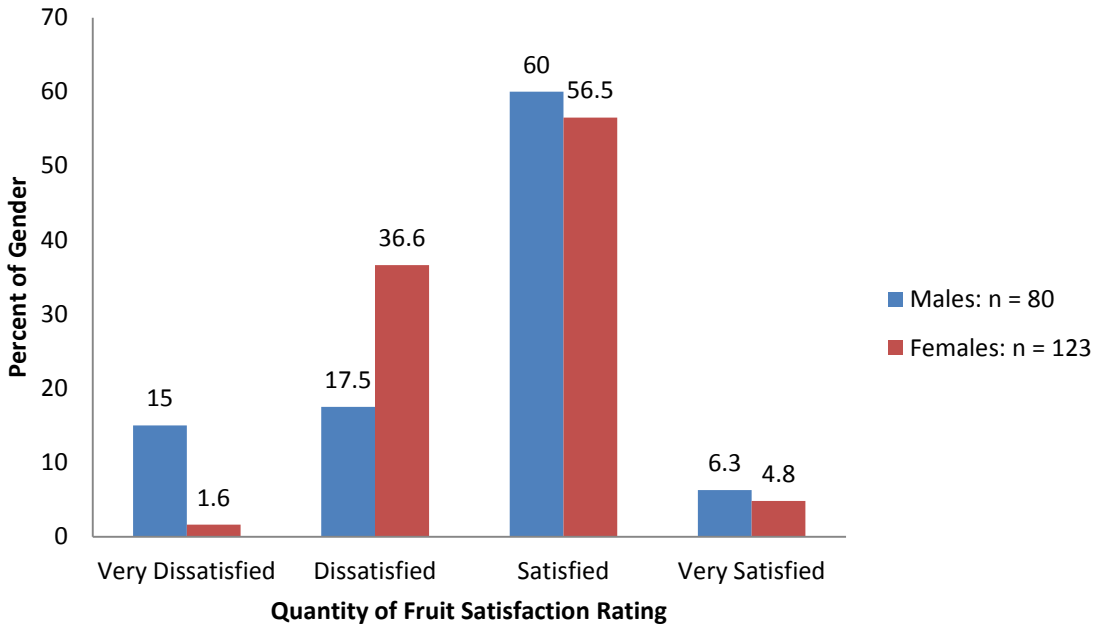

Figure 2. Satisfaction with the quantity of fruit offered through the University Dining Services Program by gender.

When asked about satisfaction with the variety of fruit offered by the University Dining Services Program (Figure 3), participants tended to be dissatisfied. About 55% of students reported being either very dissatisfied or dissatisfied with the variety of fruit offered. The majority of both males and females reported being very dissatisfied or dissatisfied with the variety of fruit (53.8% and 55.7%, respectively). However, the relationship between gender and satisfaction ratings was not statistically significant [$t(201) = -.33$, $p > .05$].

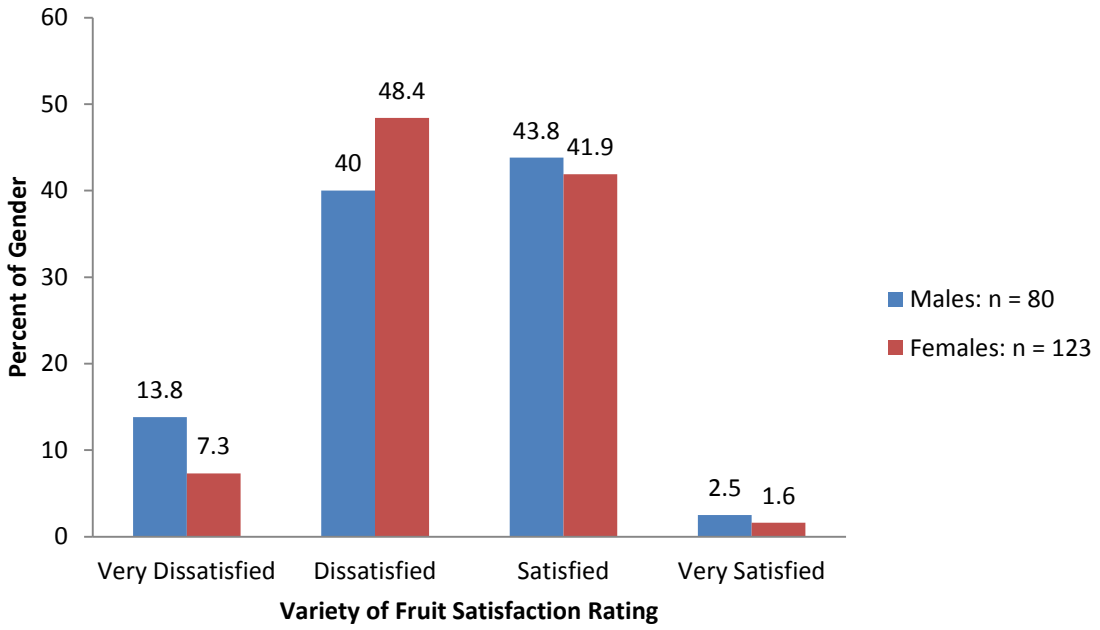

Figure 3. Satisfaction with the variety of fruit offered through the University Dining Services Program by gender.

When participants were asked to report if their quantity of fruit has changed by using the University Dining Services Program, a general bell shaped curve was found as shown in Figure 4. Overall, the majority of all participants reported consuming the same amount of fruit, indicating no change in fruit intakes by using the dining services. Males and females generally reported similar changes; therefore, no statistically significant difference was found between the change in fruit consumption by using the University Dining Services Program and gender [$t(199)=-0.63$, $p > .05$].

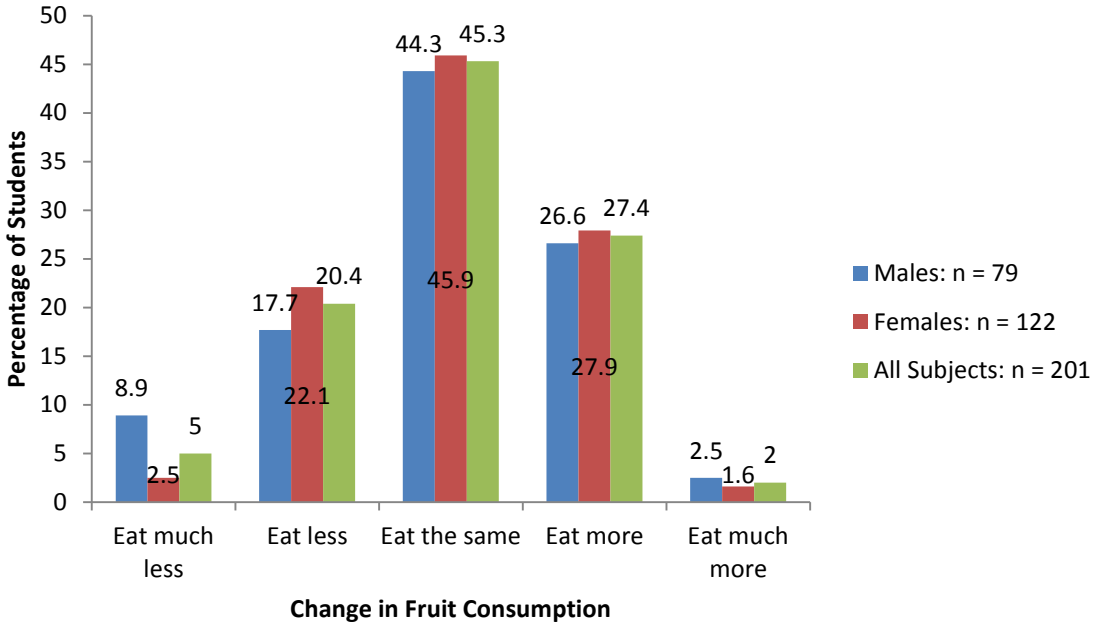

Figure 4. Change in quantity of fruit consumed by utilizing the University Dining Services Program.

Chapter V: Discussion

This study was completed to evaluate fruit consumption of student who participated in the UW-Stout Dining Services Program. Also, the study determined students' satisfaction with the variety and quantity of fruits offered through the University Dining Services Program as well as other sources of their fruit intakes and barriers towards fruit consumption. This chapter begins with a discussion of the limitations of the study followed by a discussion of the conclusions of the study. The findings of this study will be related to findings from previous research on this topic. Recommendations for future research and for the UW-Stout Dining Services Program will end this chapter.

Limitations

Limitations of this study were previously discussed in Chapter 3. Sampling and data collection limitations are particularly relevant to the interpretation of data and conclusions that may be made. The sample consisted of self-selected students who volunteered to complete the survey. This selection procedure may contribute to a biased sample that fails to represent the study population, and consequently, findings should not be generalized to other universities or university dining programs. Self-reported data were collected and could not be verified; therefore, it cannot be determined or assumed that students were entirely accurate in their responses.

Although a pilot-test of the researcher designed instrument was given to five individuals for clarity and understanding of the questions, the individuals may have interpreted the questions differently than the participants in this study. The small pilot sample did not consist of students who met all eligibility criteria, and therefore, may have understood the questions differently.

Students completed the survey in a location of their choosing; they could have been in a distracting environment while completing the survey. Also, students were unable to ask the researcher questions during the administration of the survey. If they did not understand a question correctly, they were unable to obtain clarification.

Finally, the fact MyPlate recommendations are based on age, physical activity as well as gender should be taken into account in comparisons of fruit intakes to the standard utilized in the present study. This study gathered no information on the physical activity levels or specific ages of subjects.

Conclusions

The current study evaluated how many cups of fruit students consume each day. One major finding is that students reported consuming significantly more fruit than the two-cup standard utilized in this study. On average, all participants (males and females) reported eating about 3.3 cups of fruit per day. Females reported an average daily intake of 3.46 cups while males reported eating 3.0 cups per day. Two cups is the minimum daily amount recommended by the USDA MyPlate food plans for sedentary women aged 19-30 years, and for sedentary boys and men aged 14 years and older. Consequently, depending on their activity level, individuals in this sample who were 18 years of age and older could have a higher recommended intake than two cups. MyPlate recommendations range from two to two-and one-half cups for persons 18 years and older, depending upon activity level. Consequently, average intakes of both males and females in the current study exceeded the maximum recommended daily intake for fruit.

No studies were available in the literature that presented data on the cups of fruit consumed per day by college-age students, and data available have utilized different standards. . The CDC has tracked trends in fruit intakes of American adults, using two or more servings a

day as a standard. Data show that only 32.5% of adults consumed fruit two or more times a day in 2009, the latest year data are available. Overall, the CDC reported a slight, but insignificant decrease, in the percent of adults consuming two or more servings of fruit a day from 2000 to 2009 (34.4% to 32.5%, respectively). In Wisconsin, the CDC found a slight increase in the percent of adult residents consuming two or more servings of fruit per day from 2000 to 2009 (34.0% to 34.9%) (Grimm et al., 2010).

Additionally, Brown, Dresen, and Eggett (2005) evaluated the difference in fruit consumption between college students participating in a meal plan and those not participating. Of the students with a meal plan, 35% met the recommended guidelines for fruit intake, based on the USDA MyPyramid Food Guide recommended servings, which is now replaced by the MyPlate guidelines. Only 20% of students without a meal plan consumed the recommended amount of fruit daily which was statistically significantly lower than the number of students who met the recommendation for fruit intake with a meal plan.

In contrast to the findings of the present study, earlier studies suggest a prevalence of low fruit intakes among adults, including college students. Differences may be related to the standards used for determining the adequacy of fruit intakes. This study utilized daily amounts in cups, as recommended by the most recent USDA MyPlate guidelines as well as the 2010 Dietary Guidelines for Americans (USDA, 2011b; USDHHS, 2010). Earlier studies utilized the number of servings a day (2 or more a day), which is consistent with previous standards for recommended fruit intakes. Differences in the sample population and methodologies may also contribute to observed variances in findings of this study compared to earlier ones.

Barriers to Fruit Consumption

Although most participants (57.4%) in the current study reported no barrier to fruit consumption, cost (30.9%) was the most frequently reported barrier followed by no access to fruits (14.2%). Other research has shown cost and limited access to fruits as barriers.

Like the current study, cost was the most frequently reported barrier in multiple other studies. Ming-Chin et al. (2008) developed focus groups with African American, Hispanic, and Caucasian men and women to evaluate their barriers towards fruit and vegetable consumption. The majority of participants reported high cost and high spoilage rates of fruits and vegetables as their main barrier. Eikenberry and Smith (2004) found cost to be the second most frequently reported barrier to fruit and vegetable consumption, behind time. They also reported that higher-income Caucasians were less likely to report cost as a barrier than other racial groups.

The USDA studied the average cost of fresh fruit, canned fruit, frozen fruit, fruit juice, and dried fruit in 2008. On average, fruit juice was the least expensive form of fruit consumed at a price ranging from less than $0.30 to $0.50 per one cup serving. Next, dried fruit was reported to cost $0.39 up to $1.08 per cup serving. Canned fruit ranged in price from $0.46 to $1.60 per cup of fruit. Fresh fruit had the largest range of cost per cup of the various forms of fruit examined, with averages ranging from $0.50 to $2.06 per cup of fresh fruit. The least expensive fresh fruit was reported as watermelon, whereas the most expensive fresh fruit was raspberries. The frozen fruit studied consisted mainly of strawberries, blueberries, and blackberries and were priced between $1.14 per cup of frozen strawberries to $1.86 per cup of frozen raspberries (Stewart, Hyman, Buzby, Frazao, & Carolson, 2011). The present study found that participants reported eating fresh fruit most often followed by fruit juice and then canned fruit. Also, the participants in the current study reported cost as the greatest barrier to fruit intake. This finding

may be related to the observation that the form of fruit most frequently consumed by participants was fresh fruit, which has been shown to be the most costly form. Students who reported cost as a barrier to fruit consumption and consumed fresh fruits could modify the form of fruit they consume most often to a less expensive fruit. Therefore, they may be able to afford to consume more fruit and increase their intake.

Other research studies report limited access to fruit as a barrier. Ming-Chin et al. (2008) had participants who reported challenges to purchasing fruits when living in rural communities because of the distance to the grocery store. When Ming-Chin et al. (2008) analyzed barriers to fresh fruit by ethnic groups, Hispanic immigrants to the USA reported fruits to be less accessible than in their original country. Additionally, African American participants were more likely to report limited access to fresh fruits as a barrier. No similar comparisons could be made in the present study as race, ethnicity, and rural residence were not examined.

Recommendations for Future Research

Future research on fruit consumption and barriers to consumption of fruits within the college student population is recommended. Although, on average, students met the recommended guidelines for fruit intake in this study, additional data are needed using a randomized sample of the population to better understand the fruit intakes and barriers to fruit consumption among college students.

Further research on the specific characteristics of their barriers would help the University Dining Services Program to meet the students' needs and satisfaction. Specifically, students input on the exact factors that contribute to their dissatisfaction with fruit offerings would help the University Dining Services Program meet the direct needs and preferences of the students.

Research using a more accurate method to evaluate students' daily fruit intake is needed in future research. Procedures that may enhance accuracy of methods used in the present study include: conducting training sessions with students for determining the quantities of fruit they eat, and using a food record to estimate intakes, which allows students to write down the amount consumed at the time the fruit is eaten. Validated methods of frequency of fruit consumption include food frequency questionnaires, which could be used within this population to examine the frequency and variety of fruit use. A more personalized approach to estimating daily fruit intakes of students for comparison to the MyPlate recommendations is needed. Precise data for age and gender and an evaluation of activity level would provide more comprehensive information for evaluating intakes in relation to MyPlate recommendations for fruit.

Finally, further studies regarding the nutrient contribution of fruits consumed at the University Dining Services Program appear beneficial based on findings of this study. Data suggest that many students who eat two or more meals at the University Dining Program are consuming more than two cups of fruit a day. Also, students in this study were generally satisfied with the quantity of fruit offered through the University Dining Program; however many reported being dissatisfied with the variety of fruit offered. A limited variety of fruit, although adequate in amount, may provide a limited contribution of essential nutrients to daily diets of students.

Recommendations to the UW-Stout Dining Services Program

College students participating in a meal plan need to be given the resources for adequate fruit consumption. Although the University Dining Services Program provides adequate amounts of fruit, students still reported barriers towards fruit consumption. An adequate

university meal plan where the students are receiving majority of their meals should allow students to feel that they can meet all of their food group needs without any restrictions.

To help increase or maintain the amount of fruit students consume from the UW-Stout Dining Services Program, a few modifications could be made based on the students' reported barriers. The two most frequently reported barriers to fruit consumption in this study were cost and limited access to fresh fruits. Ko et al. (2011) found that the more barriers participants listed for fruit and vegetable consumption the less likely they were to meet consumption recommendations. Therefore, the UW-Stout Dining Services Program should attempt to improve the most frequently reported barriers: cost and access to fruit. Depending on the profit margin from the fruit offerings on campus, the University Dining Services Program could examine ways to lower the cost of fruit to make fruit more affordable to more students. To increase the access of fruits to students on campus, vending machines could be stocked with fresh fruits. Therefore, students will have quick and easy access to fruits when the university dining facilities are closed. This approach may also increase the variety of fruit offered to students.

Students tended to be satisfied with the quantity of fruit offered and were not as satisfied with the variety of fruit offered. Therefore, improvements in the variety of fruit offered on a regular basis could be made. Overall, 63.2% of students reported either very satisfied or satisfied with the quantity of fruit available. Students (55%) tended to be more dissatisfied with the variety of fruit offered. Improving the variety of fruits offered may be an important strategy for improving the overall satisfaction of students with the University Dining Services Program.

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Appendix A: Institutional Review Board Approval Letter

Research Services
152 Voc Rehab Building

University of Wisconsin-Stout
P.O. Box 790
Menomonie, WI 54751-0790

715/232-1126
715/232-1749 (fax)
http://www.uwstout.edu/rs/

December 23, 2011

Emily Grimes
UW-Stout

Title: "Determination of Fruit Consumption and Purchasing Habits in First Year College Students participating in the University Dining Services Program"
Subject: Protection of Human Subjects

Dear Emily,

In accordance with Federal Regulations, your project, "*Determination of Fruit Consumption and Purchasing Habits in First Year College Students participating in the University Dining Services Program*" was reviewed on **December 23, 2011,** by a member of the Institutional Review Board and was approved under Expedited Review through **December 22, 2012.**

If your project involves administration of a survey or interview, please copy and paste the following message to the top of your survey/interview form before dissemination:

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

If you are conducting an **online** survey/interview, please copy and paste the following message to the top of the form:
"This research has been approved by the UW-Stout IRB as required by the Code of Federal regulations Title 45 Part 46."

Responsibilities for Principal Investigators of IRB-approved research:

1. No subjects may be involved in any study procedure prior to the IRB approval date or after the expiration date. (Principal Investigators and Sponsors are responsible for initiating Continuing Review proceedings.)
2. All unanticipated or serious adverse events must be reported to the IRB.
3. All protocol modifications must be IRB approved prior to implementation, unless they are intended to reduce risk.
4. All protocol deviations must be reported to the IRB.
5. All recruitment materials and methods must be approved by the IRB prior to being used.
6. Federal regulations require IRB review of ongoing projects on an annual basis.

Thank you for your cooperation with the IRB and best wishes with your project.

Should you have any questions regarding this letter or need further assistance, please contact the IRB office at 715-232-1126 or email foxwells@uwstout.edu.

Sincerely,

Susan Foxwell
Research Administrator and Human Protections Administrator,
UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB)

***NOTE: This is the only notice you will receive – no paper copy will be sent.**

C: Dr. Esther Fahm

Appendix B: Survey

Q1 Determination of Fruit Consumption and Purchasing Habits in First Year College Students Participating in the University Dining Services Program. Do NOT write your name, student ID, or any other identifying information on this survey.

Q2 Are you 18 years of age or older?

- ❍ Yes (1)
- ❍ No (2)

If No Is Selected, Then Skip To End of Survey

Q19 Do you use the University Dining Service?

- ❍ Yes (1)
- ❍ No (2)

If No Is Selected, Then Skip To End of Survey

Q3 When did you first enroll at UW-Stout?

- ❍ Summer 2011 (1)
- ❍ Fall 2011 (2)
- ❍ Winter-Term 2012 (3)
- ❍ Spring 2012 (4)
- ❍ Other (5)

If Other Is Selected, Then Skip To End of Survey

Q4 In a typical day, what meals do you eat from the University Dining Service? Check all that apply.

- ❑ Breakfast (1)
- ❑ Lunch (2)
- ❑ Dinner (3)

If QID4 (Count) Is Less Than or Equal to 1, Then Skip To End of Survey

Q5 What is your gender?

- ❍ Male (1)
- ❍ Female (2)

Q10 In a typical day, how many times do you consume fruit from the University Dining Service?

- ❍ 1 time per day (1)
- ❍ 2 times per day (2)
- ❍ 3 times per day (3)
- ❍ 4 or more times per day (4)
- ❍ I do not consume fruit from the campus dining program. (5)

If I do not consume fruit from... Is Selected, Then Skip To In a typical day, how many times do y...

Q6 **For the following question, please examine Table 1 below.**

Table 1: Examples of One Cup Fruit Servings

Fruit	Amount that counts as 1 cup of fruit
Vitality Apple or Orange Juice or other 100% Fruit Juice	1 cup
Grapes	32 seedless grapes
Fresh Whole Fruit (eg, banana, orange, apple, pear, peach, and other)	1 large
Cooked/Canned Fruit	1 cup
Dried Fruit	½ cup = 1 cup

Note: Adapted from USDA MyPlate: What counts as a cup of fruit?

Q8 How many cups do you typically eat at one time from the University Dining Service? See Table 1 above.

- 1/2 cup (1)
- 1 cup (2)
- 1 1/2 cup (3)
- 2 or more cups (4)

Q9 In a typical day, how many times do you consume fruit obtained from a source other than the University Dining Service?

- 1 time per day (1)
- 2 times per day (2)
- 3 times per day (3)
- 4 or more times per day (4)
- I do not consume fruit obtained from a source other than the campus dining program (5)

If I do not consume fruit obta... Is Selected, Then Skip To Are you satisfied with the AMOUNT of ...

For the following question, please examine Table 1 below.

Table 1: Examples of One Cup Fruit Servings

Fruit	Amount that counts as 1 cup of fruit
Vitality Apple or Orange Juice or other 100% Fruit Juice	1 cup
Grapes	32 seedless grapes
Fresh Whole Fruit (eg, banana, orange, apple, pear, peach, and other)	1 large
Cooked/Canned Fruit	1 cup
Dried Fruit	½ cup = 1 cup

Note: Adapted from USDA MyPlate: What counts as a cup of fruit?

Q11 How man cups of fruit do you typically eat at one time from a source other than the University Dining Service? See Table 1 above.

- ❍ 1/2 cup (1)
- ❍ 1 cup (2)
- ❍ 1 1/2 cup (3)
- ❍ 2 or more cups (4)

Q12 Are you satisfied with the AMOUNT of fruit offered by the University Dining Service?

- ❍ Very Dissatisfied (1)
- ❍ Dissatisfied (2)
- ❍ Satisfied (3)
- ❍ Very Satisfied (4)

Q13 Are you satisfied with the different kinds of fruit offered by the University Dining Service?

- ❍ Very Dissatisfied (1)
- ❍ Dissatisfied (2)
- ❍ Satisfied (3)
- ❍ Very Satisfied (4)

Q14 If you receive or purchase fruit from other sources than the University Dining Service, what sources do you use? Check all that apply.

- ❑ Chain Grocery Stores Ex. Walmart, Marketplace (1)
- ❑ Local Grocery Stores Ex. Lammer's, Menomonie Market Food Co-op (2)
- ❑ Convenience Stores Ex. KwikTrip, or other gas station stores (3)
- ❑ Farmer Markets (4)
- ❑ Family Members (5)
- ❑ Food Shelf/Food Pantry (6)
- ❑ Home (7)
- ❑ Other (8) _____
- ❑ I do not receive or purchase fruit from other sources (9)

If I do not receive or purchas... Is Selected, Then Skip To What kind of fruit do you consume mos...

Q15 Select the one source you use the most often.

- ❍ Chain Grocery Stores Ex. Walmart, Marketplace (1)
- ❍ Local Grocery Stores Ex. Lammer's, Menomonie Market Food Co-op (2)
- ❍ Convenience Stores Ex. KwikTrip, or other gas station stores (3)
- ❍ Farmer Markets (4)
- ❍ Family Members (5)
- ❍ Food Shelf/Food Pantry (6)
- ❍ Home (7)
- ❍ Other (8) _____

Q16 What kind of fruit do you consume most often?

- ❍ 100% fruit juice (1)
- ❍ Fresh fruit (2)
- ❍ Canned fruit (3)
- ❍ Cooked fruit (4)
- ❍ Dried fruit (5)

Q17 Do you experience any barriers towards eating fruit? Check all that apply.

- ☐ Fruit costs too much money to purchase (1)
- ☐ I have an allergy to fruits (2)
- ☐ I do not have access to fruits (3)
- ☐ Other (4) _____
- ☐ I do not have any barriers towards eating fruit (5)

Q18 Has the quantity of fruit you eat changed by using the University Dining Service?

- ❍ Much Less (1)
- ❍ Less (2)
- ❍ The Same (3)
- ❍ More (4)
- ❍ Much More (5)

Appendix C: Implied Consent Statement

Consent to Participate in UW-Stout Approved Research Study

Title: Determination of Fruit Consumption and Purchasing Habits in First Year College Students Participating in the University Dining Services Program

Purpose:
This study aims to determine the daily fruit consumption of first year UW-Stout students living on campus who usually eat two or more meals per day at the University Dining Services Program. The results of this survey will be used to help make suggestions for developing a University Dining Services Program to better suit students' needs and expectations for fruit offerings.

Risks and Benefits:
There are no anticipated risks to participate in this survey. You will be asked questions about your gender, age, grade level, number of meals eaten per week from the campus dining program, and fruit consumption rates. To keep your identity a secret, you will ***NOT*** include your name, student ID number, or any identifying information on the survey.

Survey Populations:
To participate in this survey, you must be 18 years of age or older, a current full time student who first enrolled for full time student status at the University of Wisconsin –Stout during the Summer 2011, Fall 2011, Winter-Term 2012, or Spring 2012 term, and usually consume two or more meals per day from the University Dining Services Program. Students who meet these requirements and volunteer to complete a survey will be selected.

Time Commitment:
You will be asked to complete a 15 question survey, which will take about 5-7 minutes of your time.

Confidentiality:
You will ***NOT*** include your name or any identifying information on the survey. We do not believe that you can be identified from any of this information. Data from this research will not be released in any manner to identify you as only group data will be reported. The "read receipt" function of the email you received for this survey has been turned off so the researcher will not know if the email has been read by the recipients. Additionally, all email addresses used were placed in the "bcc" line so no other students know who is receiving the email invitation. Once you submit the survey, there will be no way to recover your survey or identify you because no personal identifiers will be obtained.

Right to Withdraw:
You have to right to withdraw from this survey at any time and your participation in this survey is entirely voluntary. You many choose to not participate without any consequences to you. You may refuse to answer any questions on the survey. Should you choose to participate and later wish to withdraw from the study, there is no way to identify your survey after it has been submitted.

IRB Approval:
This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

Investigator: Emily Grimes
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Statement of Consent:
By completing the following survey you agree to participate in the project entitled, "Determination of Fruit Consumption and Purchasing Habits in First Year College Students Participating in the University Dining Services Program".