NUTRIENT INTAKE OF COLLEGE STUDENTS FOLLOWING INTRODUCTION OF A CAMPUS FOOD SCHOLARSHIP PROGRAM

A THESIS

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ABSTRACT

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The objective of this study was to assess the efficacy of the Texas Woman's University's Food Scholarship Program on changes in students' food security status, nutrient intake, and food group servings over a 10-week period. Students received fresh fruits and vegetables, dairy and meat products, as well as non-perishable foods, twice a month. Baseline and 10-week data were collected. Food security was measured using the United States Department of Agriculture 6-question survey. Nutrient intake and number of food group servings were analyzed using 3-day food records. Paired *t*-tests were performed (SPSS v25) to assess changes from baseline to 10-weeks. Significance was set at an alpha of 0.05. At 10-weeks, there was a significant increase in intake of protein, niacin, pantothenic acid, magnesium, and potassium intake, and in servings of vegetables.

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LIST OF ABBREVIATIONS

AI	Adequate Intake
AND	Academy of Nutrition and Dietetics
DFE	Dietary Folate Intake
DRI	Dietary Reference Intake
FINI	Food Insecurity and Food Incentives
Gm/d	Grams/day
Kcals	Kilocalories
LSU	Louisiana State University
MANOVA	Multiple Analysis of Variance
Mcg/d	Micrograms/day
NE	Niacin Equivalents
RAE	Retinol Activity Equivalents
RDA	Recommend Daily Allowance
RDN	Registered Dietitian Nutritionist
RM MANOVA	Repeated Measures Multiple Analysis of Variance
Sig.	Significance
SNAP	Supplemental Nutrition Assistance Program
Std. Dev.	Standard Deviation
SWAP	Supporting Wellness at Pantries
TWU	Texas Woman's University
UC	University of California
U.S.	United States
USDA	United States Department of Agriculture
% E	Percentage of Energy Intake

CHAPTER I

Literature Review

Introduction

Food insecurity is a global concern throughout college campuses.[1] The United States Department of Agriculture (USDA) defines food insecurity as limited or uncertain access to food.[2] Food insecurity is categorized into low food security and very low food security. Low food security (previously known as food insecurity without hunger) is associated with reduced quality, variety or desirability in the diet, but does not show any or little indication of a reduction in food intake.[2] Very low food security (previously known as food insecurity with hunger) is associated with multiple indications of disrupted eating patterns and reduced food intake. An estimated 11.8 percent of American households were food insecure at least some time during the year in 2017.[3] A significant number of individuals from food insecure households acquire food through the Emergency Food Assistance Program via food pantries, to help with their monthly food supply.[4]

Research has demonstrated a consistent association between food insecurity and overweight, obesity, and nutrition-related chronic diseases among children, adolescent, and adult populations.[5] In fact, based on the Hunger in America Study-2014 conducted by Feeding America Inc., 84 percent of the clients served through their network of food banks were food insecure and more than half of food pantry clients had a household member with hypertension, and one-third had a member with diabetes.[6] Thus, in

addition to the socioeconomic impacts, food insecurity is also associated with physical and psychological health.[1]

Different segments of the population experience food insecurity. Reports suggest that food insecurity is increasing among college students nationally.[7] Globally, the prevalence of food insecurity on college campuses is estimated to be 42 percent.[7] In the United States (U.S.), the average rate of food insecurity on college campuses is estimated to be 32 percent.[7] With 1 out of 3 students experiencing some level of food insecurity in the U.S. awareness of the situation has increased significantly.[7] Although there are nutrition assistance resources available for students experiencing food insecurity, many students may not be aware of these food resources and other barriers may hinder students from accessing these resources.

The transition from high school to college can be a time of increased stress. This phase is also associated with increased health risk factors such as consumption of a poor diet that eventually increases the risk of obesity and other chronic diseases. As students pursue higher education, they may lack the time and/or resources necessary for maintaining a healthy diet.[9] Many undergraduate and graduate students may not have money to afford nutrient dense foods such as fruits and vegetables that are costly food purchases for individuals with limited resources.[10] Studies indicate that students who experience food insecurity may already be from underserved populations, such as African Americans, Hispanics, and Latinos/Latinas. In addition, a study by Martinez et al. showed that undergraduate students experience food insecurity more than graduate students.[11] Finally, food insecurity can affect students' behavior and overall wellness, and

influence student retention and graduation rates.[9] Typically, when students simply cannot get enough food to eat, academic performance tends to decrease, and students may even need to withdraw from school.[9]

College Food Insecurity

Food security has been identified in college clinical settings. A food insecurity screening and referral program was implemented in a Student-run Free Clinic in San Diego, CA to document the prevalence of food insecurity screening in this low-income student population. The study utilized the 6-item USDA food security survey. Of the 430 students screened, 74 percent were food insecure, of which 30 percent reported experiencing very-low food insecurity.[12] The severity of this problem would have remained unknown in San Diego without implementing the screening.[12] The authors concluded that screening and referral programs should be conducted regularly in student-run free clinics, as a way to assess the level of food insecurity. Once food security has been identified, nutrition education programs and advocacy of healthy eating by healthcare practitioners can be implemented; however, purchasing healthy foods may not be feasible for this student population.[12]

A study by Patton-Lopez et al. assessed the prevalence of food insecurity in a college population from a rural university in Oregon. A total of 354 students at a midsize, rural university in Oregon completed the USDA Food Security Survey: 6-item short form.[13] Fifty-nine percent of the students reported being food insecure.[133] Twenty-seven percent of the students surveyed utilized one or more of the nutrition assistance

programs.[13] The study also found that food insecurity was associated with having an income of less than $15,000/year, being employed, and having fair/poor health.[13] Moreover, food insecurity was inversely associated with better academic performance among the students.[13]

Some studies have focused on how education intervention may aid in improving food security within the college environment. A cross-sectional survey study of 1,093 students at the University of Appalachia was conducted to identify predictors of food insecurity.[14] Results indicated that 21.9 percent of the students experienced food insecurity over the past 12 months, and 66 percent of the students reporting to be food insecure were female.[14] The high number of female participants being food insecure could be attributed to the fact that about 70 percent of the participants were females.[14] Additional predictors of food insecurity included students who received financial aid, fair to poor health status, and lower grade point averages.[14] Many of the food insecure students used coping strategies, such as purchasing inexpensive and processed foods, while also stretching meals to make them last longer.[14] Education intervention should inform students on resources that may help improve their food security.

Students attending post-secondary education campuses tend to experience food insecurity nationally.[8] In the systematic review article, *The Struggle is Real*, nine peer-reviewed studies focused on the food insecurity of graduate and undergraduate students. Students who identified as food insecure were associated with financial independence, poor health, and adverse academic outcomes. The review also noted how food insecurity

may decrease students' and adults' productivity.[8] Clearly, food insecurity is a concerning problem for post-secondary students and further research is warranted.[8]

In 2014, the University of California (UC) examined the prevalence of food insecurity on their campuses.[11] Two surveys were provided to 66,000 students (undergraduate and graduate), with 8,932 students completing the survey.[11] Findings indicated that many students had to reduce meal sizes or lacked money to purchase adequate food over a 12-month period. The survey reported that 19 percent of students experienced "very low" food insecurity, with 23 percent of the students experiencing "low" food insecurity. [11,14] To address the severity of the situation, the president of UC funded the UC Nutrition Policy Institute (NPI) and provided 3.3 million dollars of support over two years for the institute.[11] The primary goal of the NPI was to study the impact of food insecurity on students, and how to effectively address the problem. However, the study only focused on addressing the problem and did not include any kind of post-assessment improvement in food security status following implementation of the program.[11]

Secondary Food Insecurity

Another population at risk for food insecurity is high school students. A recent study assessed how resources and health risks can influence younger students' lives and how food security and health outcomes may be impacted. A sample population of 1,493 high school students assessed food security status.[16] Boys were more likely to be food insecure than girls.[16] Results showed that separated families and depression were all

positively associated with food insecurity.[16] In contrast, higher self-esteem, eating meals with family, and good peer connections are inversely associated with food insecurity. This study emphasized how though high schoolers' lives can be influenced by their family, other environmental factors such as their peers, schooling, and communities can impact their lives during this developing period.[16] It is important to focus on aiding this population as this age group is in a vulnerable life period, which can have long-term consequences.

Female Food Insecurity

Studies show that food insecurity is associated with a poor diet in adult women; however, in boys and girls the data is mixed. Differences in food insecurity and food intake of fourth and fifth-grade boys and girls (n = 3,547) in the San Diego area were sampled from 44 elementary schools.[17] Results showed that food insecurity was more prevalent in girls than in boys.[17] Interestingly, girls who were food insecure consumed more calories than girls who were food secure. This relationship was not observed in boys.[17] The authors suggested that girls who are food insecure should exercise to prevent weight gain due to the increased caloric intake.[17]

Associated Food Insecurity Risk Factors

Several factors have been found to be associated with food insecurity. One study focused on predictors of food insecurity that included socioeconomic factors, demographics, and availability of food.[18] Adults from 10 difference Chicago communities (n = 1,543) completed the Household Food Security Survey.[18] The rate of

food insecurity was 33 percent of the surveyed population.[18] An unadjusted model showed a strong relationship of race and ethnicity with food insecurity; however, race, ethnicity and socioeconomic factors were not associated with food insecurity.[18] Participants who relied on emergency nutrition assistance programs, such as the Supplemental Nutrition Assistance Program (SNAP), were more likely to be food insecure.[18] People who felt lonely had higher odds of being food insecure, and those who spoke English had lower odds of being food insecure.[18] The Chicago study concluded that with a national rate of household food insecurity in America at 13.1 percent in 2016, a nutrition assistance intervention was needed for the Chicago communities due to a 33 percent food insecurity prevalence.[18]

In the university setting, certain factors associated with food insecurity may be more prevalent than in the general population. University of Alabama students (n = 368), who lived off campus (alone, or with roommates) were a potentially at-risk population, were given an online survey to assess their cooking efficacy and food security status.[19] Of the students surveyed, 37 percent of students were food secure.[19] The percentage of the student population identified as food insecure was 38.3 percent (16.6 percent low and 21.7 percent very low, respectively).[19] Students who were food secure had a significantly higher cooking self-efficacy than those who were food insecure, and would prepare and cook food more often.[19] Students with very low food security had low cooking self-efficacy, and tended to not prepare meals as much as those who were food secure.[19] Similar to the Chicago community study, demographics such as race, sex, and ethnicity were not associated with food insecurity at the University of Alabama.[19] In the future,

more student self-efficacy studies are needed for a better understanding of the relationship of self-efficacy with food security status among college students.

Another study conducted in Illinois universities explored sociodemographic factors and how they may be associated with food insecurity. An undergraduate population of 1,882 students at four Illinois campuses was surveyed to assess their food security status.[20] The results indicated that 35 percent of the students surveyed were food insecure.[20] Also, food insecurity was found to be strongly related with certain sociodemographic factors.[20] Constant factors among food insecure students were race, loan use, lower grade point average, and housing arrangements.[20] A common theme found in the Illinois study, in contrast to the University of Alabama study, was that students living off campus were more food secure than students who lived on campus.[19,20] The study concluded that understanding food insecurity among students and identifying risk factors can help in developing plans to assist university students.

Food Insecurity and Physical Health Outcomes

Obesity is a major concern when it comes to health outcomes in food security studies. A large study (n = 66,553 adults), conducted over 12 U.S. states, explored the relationship between food stress (worrying about food) and obesity with food insecurity.[21] The overall rate of obesity was 27.1 percent for the total sample; the rate of obesity among food secure adults was 25.2 percent and that for food insecure adults was 35.1 percent.[21] Food insecurity was more prevalent among overweight/obese, adult, and African American females.[21] Food insecure adults had a 32 percent higher risk of being

obese compared to food secure adults.[21] In the food stressed population,19 percent of people often worried about how they could afford food.[21] Another point the authors made is that food stress and depression were more prevalent in females, specifically in obese females.[21] In contrast, males demonstrated little to no prevalence of food stress and depression.[21] The authors concluded that obesity is associated with being food secure and can be associated with stress as well.

Wu et al. assessed socioeconomically challenged youth in Taiwan to understand the associations between food insecurity, dietary behaviors, and weight status. A total sample of 1,356 children (ages 10-18 y/o) was assessed.[22] Results showed that being food insecure was associated with being obese or overweight.[22] Male participants who consumed sugary drinks and female participants that skipped breakfast were at higher risk of being obese/overweight.[22] Food insecurity also was associated with unhealthy dietary choices.[22] Economically challenged children were more susceptible to food insecurity and obesity, and likelihood of obesity increased when economically challenged and food insecure.[22] Dietary choices somewhat mediated the association between food insecurity and obesity/overweight.[22] This Taiwan study may aid in a better understanding of food insecurity and obesity of underprivileged populations in the U.S.

Psychosocial Impact of Food Insecurity

Students who are food insecure have higher odds of being depressed compared to students who were food secure.[23] A study at Arizona State University (ASU) measured the prevalence of food insecurity among 209 college freshmen. Thirty-two percent of the

students reported inconsistent access to food in the past month that increased to 37 percent over the past three months.[23] The study at ASU with 209 college freshman assessed the association of weight status, health behaviors, access of food from parents, and poor mental health with food insecurity.[23] The authors concluded that there needs to be an implementation of nutrition programs to aid the students.[23]

Food security can affect college students' academic performance and overall health. Some students may experience psychological and social problems that attribute to being food insecure. College students were interviewed to understand how food insecurity affected their academic performance and psychosocial health.[24] A total of 25 undergraduate students from the University of California at Berkeley participated in detailed, open-ended interviews.[24] Of the 25 students interviewed, seven students (28 percent) experienced low food security, and 15 students (60 percent) experienced very low food insecurity.[24] Results identified that the stress of being food insecure had a severe impact on academic performance, fear of disappointing their family, and many other negative outcomes.[24] Other findings included peer resentment, frustration, hopelessness, and isolation from others.[24] Thus, universities should work towards alleviating food insecurity on their campus to help students thrive academically.

Food Resource Barriers

Many barriers keep people from utilizing food pantries or from making healthy choices. Studies have examined barriers that may cause people to not use food pantries or make healthy food choices while being at high risk. A recent focus group study was the

first to discuss the barriers to eating healthy of food pantry clients. Participants were interviewed to assess barriers that may influence them from making healthy food choices.[25] Focus groups and interviews were used to gain information about some of the barriers preventing healthy eating. Participants were given the 6-item USDA Food Security Survey.[25] A total of 54 participants completed the survey, 60 percent were experiencing very low food insecurity.[25] Some of the barriers identified during the focus groups interviews included the cost of healthy foods, lack of nutritional knowledge, lack of transportation, and the lack of equipment to prepare the foods.[25]

Young adults are often an at-risk group for making unhealthy food choices. Focus groups with young adults (18-30 y/o) were conducted to understand barriers or circumstances that may influence food choices.[26] Young adults were selected utilizing social media sites in Sydney, Australia (n = 14), and in Glasgow, Scotland (n = 16).[26] These locations were chosen due to their geographical differences to determine if food choices were consistent in this age group.[26] The focus group discussions addressed the appeal of the food, value of the food, and the emotional connection to the foods. Some of the feedback provided included lack of time, cost of the food, and how appealing the foods were that impacted their food choices.[26] Some participants were very aware of how they should be eating, but realized they were not eating healthy due to the reported barriers.[26] Some of the perceived barriers listed were universal, noted as occurring in both Australian and Scottish young adults.

One important barrier that people face is simply fact of being unaware of availability of nutrition assistance programs. There is limited information for students to

seek for food pantries (nutrition assistance programs), such as SNAP in the U.S.[27] However, more food pantries are being implemented on universities to alleviate food insecurity. University of Florida students (*n* = 899) were surveyed using the 10-item USDA Adult Food Security Survey.[27] The results showed that 15.4 percent of the students were experiencing low food insecurity, and 16.1 percent experienced very low food insecurity.[27] Many University of Florida students were aware of the existence of a food pantry on their campus. Students who were food insecure were more likely to utilize the pantry compared to food secure students.[27] About 35 percent of the food insecure population stated that the food pantry was their sole source of food. Barriers to utilizing the food pantry at the University of Florida were a lack of information about the program and how to apply.[27] Some of the students were afraid of the social stigma of using the food pantry, were experiencing a self-identity crisis, and had conflicting class schedules of the food pantry hours of operations.[27] This study indicated the need for more administrative intervention to improve the food pantry's usage and reduce negative social stigmas.

In higher income countries, food security is usually aided by implementing food pantries, but criticism for utilizing them can be a barrier for some. In 2018, a review of 20 studies focused on how food pantries help clients improve food security and well-being.[28] Inclusion criteria for the review included qualitative studies or qualitative studies with quantitative aspects.[28] From the review, many clients noted that pantries have limited choices, poor quality of foods, with a stigma associated with utilization.[28] Some people reported feeling humiliated and embarrassed using food pantries.[28] Even though many

people enjoy the pantries, others have a negative perception of the food pantries.[28] According to the Committee of the World's Food Security definition, food banks are not meeting all clients' needs, which are nutritious, sufficient, and safe foods.[28] The authors state that improving foods provided by food banks may possibly reduce negative perceptions of those utilizing them.

Improving Food Security

As food insecurity becomes more prevalent, there are many ways that students and even the general public may be able to improve their own food security. In 2018, the Farm Bill, which includes the Food Insecurity and Food Incentives Grant Program (FINI), was finalized with many implications for food-insecure and low-income people.[29] This grant program addresses best practices and promising findings addressing food insecurity and food incentives projects to help inform and influence future policy decisions.[29] FINI has helped stakeholders by increasing production of fresh produce and increasing sales within the grocery stores that participated in FINI programs.[29] Clients needing nutrition assistance when they participated in FINI have reported improvements in diets, overall health, and even their food security.[29] FINI has been permanently funded since 2018, and similar policies such as this should be implemented.

Many students may be eligible for food assistance programs, such as SNAP. The Government Accountability Office (GAO) reached out to 14 universities to address food insecurity on their campuses.[30] The purpose was to educate students about availability of food assistance programs.[30] The 14 universities included in the GAO project all had food

pantries located on their campuses. The majority of the universities even offered for-credit courses in nutrition and distributed information regarding nutrition assistance programs.[30] As of September 2018, 656 colleges are currently developing or have developed food pantries.[30] This effort demonstrates that food pantries on campus are becoming more common. Although this effort is admirable, this trend also confirms the growing food insecurity problem in the U.S.

Food Pantries and Diet Quality

Food banks are non-profit organizations that collect and distribute food to hunger relief charities/organizations and food pantries. Feeding America is the largest emergency food provider organization in the country that helps distribute food to those in need via a network of food banks across the U.S.[31] In 2014, Feeding America served an estimated population of 46 million people, representing a 25 percent increase since 2009.[31] In the Houston metro area, the Houston Food Bank is the largest food bank in the network of Feeding America, serving more than 900,000 individuals annually to help alleviate food insecurity.[31] Having access to an emergency food system provides people with the ability to improve their food security and nutrition intake. Increasing the self-efficacy of an individual using food pantries can increase food security.

Food banks can have a nutrition impact on their community when given the opportunity. Food banks in the U.S. are trying to educate and provide food pantry clients with nutritious food options. Feeding America food banks (n = 20) were selected for a study based on location within the country, size, and the amount of nutrition-based

initiatives being utilized.[32] Food banks were surveyed to determine what kind of nutrition policies and practices were being implanted in their locations.[32] Food banks identified concerns related to donors-partner relationships that could impact the number of foods distributed.[32] For example, one of the nutrition policies that affects donor-partner relations is eliminating the distribution of unhealthy products such as candy, sugar sweetened soda, and improving the quality of foods distributed. However, food banks were open to implementing more nutrition policies to provide more fresh produce for their clients, even with the relatively high prices of produce.[32]

Food pantries can serve as a model for healthy food choices and healthy eating patterns. In 2017, Shank proposed that nutrition and health care professionals should work with food pantries to improve the overall diet quality of the food distributed.[7] Nevertheless, nutritional foods are often limited in food pantries and dependent on the nutritional quality of foods donated to food banks. Policies are needed to aid in improving the provisions of nutritious foods to food banks for distribution to food pantries.

The Academy of Nutrition and Dietetics (AND) introduced their future foods program in 2012 to address food security globally and nationally.[33] In 2015, the AND created the Healthy Cities initiative in Oakland, Chicago, and Newark.[33] The goal was to determine how local community food banks can best serve as lead coordinators of school-based community programs.[33] Food banks in the Healthy Cities pilot were required to provide nutrition education, health screens, safe places to play, and food for 13 months.[33] The impact of the program was very positive, offering thousands of

nutrition educational messages and health screens.[33] Large quantities of food (74 percent produce and 26 percent shelf goods) were distributed as well.[33] The AND investigators concluded that dietitians can be very influential in helping improve community members nutrition education to access healthy food choices of food banks.[33]

Many other programs aim to improve nutrition education and foods within food pantries. Supporting Wellness at Pantries (SWAP) is one of these programs. SWAP ranks foods in food pantries and food banks by nutrition criteria.[34] They used a color system and ranked items by saturated fat, sugar, and sodium content. [34] A SWAP pilot study was undertaken at six pantries, before and after two months of the program.[34] Volunteers and staff (n = 54) participating in the SWAP study were surveyed.[34] About 68 percent said the program was easy to use, and 70 percent said they like the system.[34] Thus, implementing programs similar SWAP may be an effective way to improve the nutritional experience of clients at food pantries and food banks.

Freshplace may serve as a model for food pantries to increase food security for their clients. Freshplace examined the impact of food pantries on improving food security. A total of 228 adults were recruited from traditional food pantries.[35] More than half of the study sample experienced food insecurity (low and very low food security) at baseline.[35] Participants were randomized and put into the Freshplace intervention group or the control group. The Freshplace group was provided motivational interviews, client-choice pantry, and referrals to community services, while the control received the traditional distribution of food. Over the 12 months, the Freshplace participants

experienced a significant decrease in very low food security status (56 percent decrease) compared to the control group.[35]

Implementation of a College Food Pantry

In 2016, Student Life at Texas Woman's University's (TWU) Houston Campus distributed the USDA Household Food Security six-item short form questionnaire survey to several students (n = 126) to assess the degree of food security.[36] The results of the survey revealed that 25 percent of the students were skipping meals, eating less, and reducing the sizes of their meals. The probable cause for the food insecurity at TWU was the lack of necessary finances to purchase enough food, or at all.

Because of the severity of the food insecurity observed in TWU students, actions were taken to assist the students. Carolyn Moore, PhD, RDN on the faculty of the Department of Nutrition and Food Science, underwrote expenses associated with implementing the TWU Houston Campus Food Scholarship Program. In October 2017, TWU was approved to participate in the Houston Food Bank's Food for Change Scholarship Program for two years. The Food for Change Scholarship Program provides food to students as a motivation to complete college programs that can potentially lift them out of poverty or improve their lives.[37]

Hypotheses

The purpose of this research study was to assess the effectiveness of the TWU Food Scholarship Program over a 10-week period. The objectives of the research study were to demonstrate reduced food insecurity among students utilizing the Food

Scholarship Program and document improved nutrient intake and increased consumption of fruits and vegetables among students utilizing the program. The study null hypotheses were:

1. Participants in the TWU Food Scholarship Program will not increase their dietary intake of macronutrients, fiber, vitamins, or minerals over the course of 10-weeks.
2. Participants in the TWU Food Scholarship Program will not increase their consumption of fruits and vegetable.
3. The Food Scholarship Program will not improve food security status.

CHAPTER II

Methodology

Participants

Available participants are TWU Houston Campus students is comprised of 1,277 students.[38] Student eligibility in the Food Scholarship program was based on completing the Houston Food Bank Food Scholarship Baseline Survey (no exclusion criteria are utilized) (Appendix D). Students completing The Food Scholarship Baseline Survey were invited to participate in the completely voluntary research study. Informed consent was obtained for data collection from all who volunteered. Participation in the TWU Food Scholarship Program included men, women, different race/ethnicities, and college students of all ages. Confidentiality of student information was maintained through de-identification of personal information by assigning code numbers to all measurement records. This study was approved by the TWU Institutional Review Board (Appendix A and B).

Intervention

The Houston Food Bank delivered food twice a month on the first and third Monday to TWU. Participants were provided with approximately 38 pounds of food in two tote bags – one nonperishable, and one perishable providing fruits, vegetables, meat, and dairy products.

Data Collection

The Houston Food Bank baseline survey consisted of 19 questions that collected demographic, personal and financial information, employment status, food assistance participation, and a brief baseline assessment of food insecurity status (Appendix D). In addition, students completed three 24-hour food records (two weekdays and one weekend) (Appendix J), a fruit and vegetable food frequency questionnaire (Appendix I), and the USDA Six-Item Short Food Insecurity Questionnaire (Appendix F).[36]

At the end of 10 weeks, the Food Scholarship Final Survey (Appendix E) was administered and participants again completed three 24-hour food records (two weekdays and one weekend), the fruit and vegetable questionnaire, and the USDA Six-item Short Food Insecurity Questionnaire.[37] Food records are analyzed utilizing the University of Minnesota 2017 Nutrient Data System for Research to estimate energy intake of macronutrients, fiber, vitamins, and minerals. The number of servings from each food group was determined from the three 24-hour food records, and the frequency of consumption of specific fruits and vegetables was summarized. In addition, participants were classified as food secure or insecure (low and very low) based on responses from the USDA Six-item Short Food Security Questionnaire.

Statistical Analysis

To determine the sample size of the study, a *priori* power analysis was performed using G*Power version 3.1.9. Using a moderate effect size ($f = 0.25$), power of 0.8, alpha of 0.05, and correlation among the repeated measures of 0.3, a minimum sample size of 46 for repeated measures multivariate analysis of variance (RM MANOVA) was determined.

Normality assumption and outliers were first tested for the parametric tests. Descriptive statistics (mean + standard deviation) were calculated for study variables. Pearson's correlations were conducted to assess the relationships between the nutrient outcomes. A series of paired *t*-tests was conducted to examine changes on each of the nutrient outcomes. Marginal homogeneity analysis was also used to compare food security changes from pre-intervention to 10 weeks post-intervention. All analyses were conducted using IBM SPSS Statistics v25, and a $p < 0.05$ was set as significant.

CHAPTER III

Results

Sample Characteristics

Participants (*n* = 49) ranged between ages 20 and 58 years old (27 ± 8 years). The participants consisted of 38 females (78 percent) and 11 males (22 percent). Participants were White (*n* = 24, 49 percent), Black (*n* = 10, 20%), Asian (*n* = 13, 27 percent), and other (*n* = 2, 4%) (Table 1). Marital status of participants was categorized as single (*n* = 37, 76 percent), married (*n* = 10, 20 percent), or living with partner (*n* = 2, 4 percent) (Table 1).

Table 1. Demographics and socioeconomic characteristics of food scholarship participants

Characteristics	***n* (%)**
Sex:	
Male	11 (22)
Female	38 (78)
Age (yrs.) (Mean ± *SD*):	28 ± 8
Race:	
Black	10 (20)
White	24 (49)
Asian	13 (27)
Other	2 (4)
Marital Status:	
Married	10 (20)
Single	37 (76)
Living with Partner	2 (4)
Income	
None	7 (19)
< $20,000	29 (81)
$20,000 - $30,000	0 (0)
≥ $36,000	0 (0)

Employment	
Employed	20 (41)
Out of Work < 1 year	13 (27)
Out of Work > 1 year	7 (14)
Stay at Home Parent	1 (2)
Unable to Work	8 (16)
Current Assistance:	
WIC	2 (4)
SNAP	5 (10)
Medicaid	1 (2)
Free/Reduced Meals at School	5 (10)
No Assistance	36 (74)

Food Security

Food security scores range from food secure (0-1), low food security (2-4), or very low food security (5-6) (Table 2). Participant food security at baseline was 48 percent food secure, 33 percent low food security, and 20 percent very low food security. The average food security status at baseline was 2.28 ± 1.9 (Table 2).

Participant food security status at 10 weeks was 52 percent food secure, 30 percent low food security, and 17 percent very low food security. Average food security status at 10 weeks was 2.02 ± 2 (Table 2).

There was no significant change in food security among the participants from baseline to 10 weeks (p = .266) (Table 2).

Table 2. Food Security Pre-Intervention and Post Intervention

Food Security	***n* (%)**
Baseline	
Secure	22 (48)
Low Security	15 (33)
Very Low Security	9 (20)
10 Weeks	
Secure	24 (52)
Low Security	14 (30)
Very Low Security	8 (18)

Nutrient Intake

On average, students received 38 pounds of food twice a month comprised of 7.4 pounds of meat/fish or dairy, 7.5 pounds of fresh fruit, 10 pounds of fresh vegetables, and 13.2 pounds of shelf-stable goods (cereal, pasta, canned fruits, and vegetables, etc.). Overall, fresh produce represented 46 percent of the food distributed during the food scholarship program.

Average energy intake at baseline was 1757 ± 713 kcals, which moved to an average energy at 10 weeks of 1939 ± 640 kcals. Overall average energy intake significantly increased by 182 ± 573 kcals (p = .038) (Table 3).

Average carbohydrate intake at baseline was 202 ± 80 grams, and at 10 weeks was 227 ± 85 grams, while the average carbohydrate intake increased by 25 ± 94, the increase was not significant (p = .081). The average fat intake at baseline was 73 ± 34 grams, and at 10 weeks was 77 ± 33 grams. Overall, average intake of fats increased by 4 ± 28 grams; however, there was no significant increase (p = .308). Average protein intake

at baseline was 75 ± 29 grams, and at 10 weeks was 91 ± 34 grams. Overall, average intake of protein significantly increased by 16 ± 25 grams ($p < .001$) (Table 3).

Table 3. Macronutrient Intake and Percent of Energy of Food Scholarship Participants at Baseline and 10 Weeks

Macronutrients/ Energy Percentage	**Baseline**	**10 Weeks**	***P*-value**
Energy (kcals/day)	1757 ± 713	1939 ± 640	.038***
Carbohydrates (gm/d)	202 ± 80	227 ± 85	0.081
Carbohydrates % E Intake (%)	46 ± 8	47 ± 10	0.724
Protein (gm/d)	75 ± 29	91 ± 34	< .001***
Protein % E Intake (%)	17 ± 4	19 ± 6	0.045***
Fats (gm/d)	73 ± 34	77 ± 33	0.308
Fats % E Intake (%)	35 ± 6	34 ± 7	0.249
Alcohol (gm/d)	3 ± 10	1 ± 6	.271
Alcohol % E Intake (%)	.8 ± 2	.7 ± 3	.845
Total Added Sugars (gm/d)	33 ± 23	31 ± 26	.568
Total Added Sugars % E Intake (%)	8 ± 5	7 ± 6	.779

Note: *** signifies significant $p < 0.05$

Average intake of niacin at baseline was 36 ± 15 NE/d and at 10 weeks was 43 ± 15 NE/d. Participant niacin intake significantly increased by 7 NE/d (p = .001). Average pantothenic acid intake at baseline was 5 ± 2 mg/d and at 10 weeks was 7 ± 12 mg/d. Participant intake of pantothenic acid significantly increased by 2 ± 10 mg/d (p = .045). Average magnesium intake baseline was 249 ± 98 mg/day and at 10 weeks was 283 ± 104 mg/d. Participant intake of magnesium significantly increased by 34 ± 6 mg/d (p = .017) Average potassium intake at baseline 2 ± 1 gm/d and at 10 weeks was 4 ± 9 gm/day (p = .01). There was also a significant increase in the dietary reference intakes (DRI) in certain micronutrients. Average niacin recommended dietary allowances (RDA) increased by 39 ± 9 percent (p = .001). Average magnesium RDA increased by 14 ± 4 percent (p = .021). Average phosphorus RDA increased by 43 ± 53 percent (p = .021) (Table 4).

Table 4. Micronutrient Intake and Dietary Reference Intakes of Food Scholarship Participants at Baseline and 10 Weeks

Micronutrients/ DRI Percentage	**Baseline**	**10 weeks**	***P*-Value**
Vitamin A (mcg RAE)	685 ± 543	659 ± 464	0.806
Vitamin A RDA (%)	97 ± 70	95 ± 70	0.772
Vitamin D (mcg/d)	4 ± 3	5 ± 7	0.907

Vitamin D RDA (%)	26 ±19	27 ± 19	0.78
Vitamin E (mg/d)	9 ± 4	9 ± 5	0.259
Vitamin E RDA (%)	55 ± 29	60 ± 35	0.189
Folate (mcg DFE/d)	462 ± 237	503 ± 278	0.403
Folate RDA (%)	117 ± 60	131 ± 78	0.603
Niacin (NE/d)	36 ± 15	43 ± 15	0.001***
Niacin RDA (%)	251 ± 96	290 ± 105	0.001***
Vitamin C (mg/d)	77 ± 66	106 ± 81	0.064
Vitamin C RDA (%)	96 ± 80	135 ± 106	0.043***
Pantothenic Acid (mg/d)	5 ± 2	7 ± 12	0.045***
Pantothenic Acid AI (%)	94 ± 36	103 ± 35	0.056
Calcium (mg/d)	713 ± 350	769 ± 395	0.192
Calcium RDA (%)	71 ± 35	82 ± 51	0.19
Magnesium (mg/d)	249 ± 98	283 ± 104	0.017***
Magnesium RDA (%)	76 ± 30	90 ± 34	0.021***
Phosphorus (mg/d)	1181 ± 718	1230 ± 443	0.395
Phosphorus RDA (%)	154 ± 61	197 ± 114	0.021***
Iron (mg/d)	13 ± 6	15 ± 7	0.12
Iron RDA (%)	95 ± 69	104 ± 68	0.333
Potassium (gm/d)	2 ± 1	4 ± 9	0.01***

Potassium AI (%)	26 ± 5	53 ± 21	0.4
Sodium (gm/d)	5 ± 15	3 ± 1	0.363
Sodium AI (%)	215 ± 86	200 ± 68	0.236
Total Fiber (gm/d)	19 ± 10	21 ± 9	0.23
Fiber AI (%)	67 ± 34	77 ± 32	0.077

Note: *** signifies significant $p < 0.05$

Average vegetable intake at baseline was 3.0 ± 2 servings and at 10 weeks was 3.8 ± 2 servings. Overall average intake of vegetable servings significantly increased by .8 ± 2 servings ($p = .025$) Average fruit intake fruit intake at baseline was 2 ± 2 servings and at 10 weeks was 2 ± 2 servings. Participant intake remained the same throughout the intervention ($p = .906$). Average grains intake at baseline was 6 ± 3 servings and at 10 weeks was 7 ± 4 servings. Participant grains intake increased by 1 ± 1 servings but was not significant ($p = .572$). Average dairy intake at baseline was 1 ± 1 servings and at 10 weeks was 1 ± 1 servings. Participant dairy intake remained almost the same during the intervention ($p = .293$). Average intake of meats, fish, poultry, eggs, and nuts at baseline was 7 ± 3 servings and at 10 weeks was 8 ± 5 servings. Participant meats, fish, poultry, eggs, and nuts intake significantly increased by 1 ± 2 servings ($p = .033$) Average intake of fats at baseline was 3 ± 3 servings and at 10 weeks was 3 ± 3 servings. Participant intake of fats remained almost the same throughout the intervention ($p = .902$) (Table 5).

Table 5. Servings of Food Groups of Food Scholarship Participants at Baseline and 10 Weeks

Food Group	Baseline	10 Weeks	*P*-value
Vegetables	2.5 ± 1.8	3.3 ± 1.9	0.025***
Fruits	2 ± 2	2 ± 2	0.906
Grains	6 ± 3	7 ± 4	.572
Dairy	1 ± 1	1 ± 1	.572
Meats, Fish, Poultry, and Nuts	7 ± 3	8 ± 5	.033***
Fats	3 ± 3	3 ± 3	.902

Note: *** signifies significant $p < 0.05$. Food group units are based on servings. Exact values of vegetables are provided in the table to show significance.

Chapter IV

Discussion

To the best of our knowledge, our study is the first to assess the effectiveness of a food scholarship program on improving nutrient intake of college students. Overall, the results of the study demonstrated that the new TWU Food Scholarship Program improved intake of energy and some macronutrients and micronutrients among the participating students. However, the intervention did not significantly improve the participants' food security status over the 10-week period.

The first null hypothesis that participants in the TWU Food Scholarship Program will not increase their dietary intake of macronutrients, fiber, vitamins, or minerals over the course of 10-weeks was partially rejected due to improved nutrient intake of protein, niacin, pantothenic acid, magnesium, and potassium. The only macronutrient that showed a significant improvement was protein intake and the percent energy intake of caloric intake. Micronutrient intakes that significantly increased included niacin, potassium, pantothenic acid, and magnesium. In comparison to the percent of DRIs, the micronutrient intakes that significantly increased included niacin, vitamin C, magnesium, and phosphorus.

The second hypothesis that participants in the TWU-Houston Food Scholarship Program will not increase their fruits and vegetable consumption was also partially rejected with the increased intake of vegetables. The TWU participants did show a

significant improvement in their overall servings of vegetables and servings of meats, poultry, fish, and nuts intake, but not their servings of fruits, dairy, grains, and fats.

The third hypothesis that the Food Scholarship Program will not improve the food security of the participants over 10-weeks was accepted although there was a trending decrease in food insecurity.

The participants did show a slight improvement in their food security, but overall, it was not significant. About 48 percent of the TWU participants remained food insecure at 10 weeks. In comparison, University of Illinois surveyed undergraduate students at 35 percent.[20]

In this study, the majority of the participants were female most likely because TWU is attended predominantly by females. Also, mostly female students utilized the TWU food pantry which was similar to the University of Appalachia study.[14] They were also found to be more food insecure than their male counterparts. Students all lived off the TWU campus. The participants were from diverse backgrounds and different ages.

Another example of a similar food pantry program on a college campus is found at Louisiana State University. In 2017, an LSU established food pantry began as a small project with 50 people utilizing the pantry per semester.[40] By 2018, the program rapidly increased to over 250 students a semester, requiring relocation of the pantry to the Student Union. Dr. Mari Martin, Student Dean of LSU described how the organization of the campus pantry operation differed from the TWU Food Scholarship Program. At LSU, students were allowed to freely use the pantry during the hours of operation. In

comparison, TWU students were distributed a set amount of food in tote bags while LSU study were allowed to choose their foods. Thus, results from the TWU study suggest the need for an examination of the impact of the LSU pantry model on nutrient intake and food security status of students.

This study points to the need to promote food security and healthful eating behaviors among college students. SNAP is the major safety net to reduce food insecurity and to improve intake of healthful foods. Students participating in SNAP can select foods for purchase based on cultural backgrounds and dietary needs. Though nutrition assistance programs exist, many students may not be familiar with these food resources and barriers may hinder access. When TWU students were initially surveyed, only 8 percent were utilizing SNAP and 74 percent were not accessing any type of food assistance. Minimal use of SNAP by TWU students was likely due to unfamiliarity with the program and lack of time to shop and prepare food. As a result of these findings, the TWU food scholarship program will incorporate a SNAP enrollment component in the foods scholarship program over the summer of 2019.

Several positive features of the food scholarship research study should be noted. The design was an observational intervention study and not a cross sectional study design used extensively in previous food security studies.[8] Food distribution also was conveniently located within the TWU Health Sciences campus building where students attended classes. Food distribution took a minimal amount of time because food was ready for pick up in tote bags. The wide variety of nutrient-dense foods distributed was comprised of nearly 50 percent produce and 20 percent high protein foods. Students

were also introduced to unfamiliar foods such as kohlrabi, golden beets, cabbage, and pinto beans. Furthermore, preparation directions and recipes of unusual foods were inserted into tote bags on the day of distribution and posted on the food scholarship website. Another strength of the study was the use of the USDA's 6-item food security survey which has been widely used in other studies with food pantry clients.[12,13,25]

This study was primarily limited to assessing changes in food insecurity and diet quality over a relatively short time. However, food insecurity can be a transient condition especially for college students. The use of three-day food records may not approximate the usual nutrient and diet quality. Using an average of at least three 24-hour dietary recalls has been used by many researchers and has been shown to be a valid estimate of nutrient intake.[15] Limitations of the study included some missing student data, attrition of some participants, the USDA Six-item Food Security questionnaire asked for past history of one year and not 10 weeks over the intervention, and no studies were available to compare changes of nutrient intake with the implementation of a campus food pantry program.

Chapter V

Conclusion

This study pointed to the need for future institution research regarding food security status of students in higher education. The TWU Food Scholarship Program did help participants on the TWU campus by providing foods and recipes for improving their dietary intake. Although students did not significantly improve their food security, the intervention increased intake of several nutrients and vegetables. A longer intervention may aid in helping students improve their food security. More research is needed as to why the female population was more likely to experience low food security. Food pantries and SNAP programs may be able to help many higher education students throughout the country. Campus wide efforts marketing food resources and establishing food pantries may help increase retention and improve graduation rates.

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APPENDICES

APPENDIX A

IRB Study Approval Letter

Institutional Review Board

Office of Research
6700 Fannin, Houston, TX
77030
713-794-2480 irb-houston@twu.edu http://www.twu.edu/irb.html

DATE: January 19, 2018

TO: Dr. Carolyn Moore
Nutrition & Food Sciences - Houston

FROM: Institutional Review Board (IRB) - Houston

Re: Approval for Nutrient Intake of College Students Following Introduction of a Campus Food Scholarship Program (Protocol #: 19874)

The above referenced study has been reviewed and approved by the Houston IRB (operating under FWA00000178) on 1/18/2018 using an expedited review procedure. This approval is valid for one year and expires on 1/18/2019. The IRB will send an email notification 45 days prior to the expiration date with instructions to extend or close the study. It is your responsibility to request an extension for the study if it is not yet complete, to close the protocol file when the study is complete, and to make certain that the study is not conducted beyond the expiration date.

If applicable, agency approval letters must be submitted to the IRB upon receipt prior to any data collection at that agency. A copy of the approved consent form with the IRB approval stamp is enclosed. Please use the consent form with the most recent approval date stamp when obtaining consent from your participants. A copy of the signed consent forms must be submitted with the request to close the study file at the completion of the study.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any adverse events or unanticipated problems. All forms are located on the IRB website. If you have any questions, please contact the TWU IRB.

cc. Ms. Rose Bush, Nutrition & Food Sciences – Houston

APPENDIX B

IRB Study Extension Letter

Institutional Review Board
Office of Research
6700 Fannin, Houston, TX 77030
713-794-2480 irb-houston@twu.edu
https://www.twu.edu/institutional-review-board-irb/

DATE: December 21, 2018

TO: Dr. Carolyn Moore
Nutrition and Food Sciences - Houston

FROM: Institutional Review Board (IRB) - Houston

Re: Extension for Nutrient Intake of College Students Following Introduction of a Campus Food Scholarship Program (Protocol #: 19874)

The request for an extension of your IRB approval for the above referenced study has been reviewed by the TWU IRB (operating under FWA00000178) and appears to meet our requirements for the protection of individuals' rights.

If applicable, agency approval letters must be submitted to the IRB upon receipt prior to any data collection at that agency. If subject recruitment is on-going, a copy of the approved consent form with the IRB approval stamp is enclosed. Please use the consent form with the most recent approval date stamp when obtaining consent from your participants. A copy of the signed consent forms must be submitted with the request to close the study file at the completion of the study.

This extension is valid one year from January 18, 2019. Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any unanticipated incidents. All forms are located on the IRB website. If you have any questions, please contact the TWU IRB.

cc. Ms. Rose Bush, Nutrition and Food Sciences - Houston

APPENDIX C

Study Consent Form

TEXAS WOMAN'S UNIVERSITY CONSENT TO PARTICIPATE IN RESEARCH

Title: Nutrient intake of college students following introduction of a campus food scholarship program

Investigator: Carolyn Moore, PhD, RDN_____cmoore8@twu.edu 713-794-2377

Explanation and Purpose of the Research

You have been asked to join this study because you have indicated a desire to participate in the Texas Woman's University (TWU) Food Scholarship Program research study. Inadequate intake of energy and essential nutrients is negatively associated with lower academic performance, poor health and decreased psychosocial function. The purpose of this research is to evaluate the utilization and effectiveness of the new TWU Food Scholarship Program to help address food insecurity among students. This study will determine if there is an improvement in nutrient intake and increased consumption of fruits and vegetables following the implementation of the TWU Food Scholarship Program.

Description of Procedures

In order to be a participant in this 10-week research study, you must be at least 18 years of age or older and be enrolled as a student at TWU on the Houston campus. Before participating in the research study, you will meet with the Principal Investigator, Carolyn Moore, PhD, RDN, to review the study components and requirements. Any students enrolled in the TWU Food Scholarship Program may volunteer for the research study prior to their first food distribution.

Enrollment in the research study requires:

- providing demographic information
- answering a United States Department of Agriculture (USDA) six-item short form food security survey o completing a short food frequency questionnaire o recording three 24-hour dietary recalls (two weekdays and one weekend).

Once the demographic information, survey, questionnaires, and dietary recalls are completed, you will be assigned a study identification number. The first time you pick up food from the "TWU Student Market" will become your start date in the research study. Your end date in the research study will be 10 weeks later.

You will pick up food twice a month on Mondays or Tuesdays (the first and third Monday or Tuesday of the month) from 4:00 — 7:00 p.m. from the TWU Student Market located on the first floor in rooms 1245 and 1245A (across from the Cyber Café, past the restrooms, and on the right). You will be given approximately 50 pounds of perishable (fruits, vegetables, dairy, and meat) and non-perishable foods divided into 2 tote bags on each distribution day,

Approved by the Texas Woman's University Institutional Review Byrd Date U/-

Initials Page I of 3

Ten weeks after enrolling in the research study, you will again complete the food security survey, the food frequency questionnaire, and the three 24-hour dietary recalls (two weekdays and one weekend).

Thereafter, you may continue to participate in the TWU Food Scholarship Program and receive food twice a month until you graduate.

Throughout the research study the Principal Investigator (Carolyn Moore, PhD, RDN) will be available by phone or email to answer any questions.

Potential Risks

There exists the risk of accidental loss of personal information. All procedures to minimize risk according to law will be followed. All records of data will be stored in a limited access, locked file cabinet in room 7017 of the Nutrition and Food Sciences Department, Texas Woman's University Institute of Health Sciences Building. There is a potential risk of loss of confidentiality in all email, downloading, and internet transactions. Confidentiality will be protected to the extent that is allowed by law.

There may be some emotional discomfort or awkwardness with participation in the TWU Food for Change Scholarship Program.

There is a risk of loss of time. The study will involve preliminary paper work to complete the demographic information, consent form, survey, food frequency questionnaire, and food records. Review of this study protocol and signing the consent form will take about 30 minutes. Completing the demographic information, the USDA six-item food security survey, the food frequency questionnaire, and the three 24hour dietary recalls (two weekdays and one weekend) will take about two hours. Picking up the food twice a month will take about 15 minutes. At the conclusion of the study, completing the survey, questionnaire, and dietary recalls will take about one hour. Therefore, the total estimated time commitment to the TWU Food Scholarship research study is estimated to be about 5 - 6 hours: 3.5 — 4.5 hours to

collect the research data collection plus 1.5 hours total for the bi-monthly pick-up of food distribution bags over three months.

Another potential risk will be exposure to food allergies. You will need to be responsible to avoid foods that may cause an allergic reaction. The TWU Food Scholarship Program is not able to control the specific foods donated to TWU. Therefore, if you have specific food allergens, please be cautions and review the foods in the distribution tote bags before you leave to assess if any of items are of concern. Return these to the TWU Food Market volunteers before departing.

The researchers will try to prevent any problem that could happen because of this research. You should let the researchers know at once if there is a problem and they will help you. However, TWU does not provide medical services or financial assistance for injuries that might happen because you are taking part in this research.

Approved by the Texas Woman's University Institutional Review Board Date O/ - 18-2018

Initials _____ Page 2 of 3

Participation and Benefits

Your involvement in this research study is voluntary and you may discontinue your participation in the study at any time without penalty. You will continue to receive food from the TWIJ Food Scholarship Program even if you withdraw from the study. During the research study, an analysis of your nutrient intake at the start and end of the study will be given to you. Once the research study is over, you can continue to receive food twice a month through the TWU Food Scholarship Program.

Questions Regarding the Study

If you have any questions about the research study, you may ask the researcher; her phone number and email address are at the top of this form. If you have any questions about your rights as a participant in this research or the way this study has been conducted, you may contact the Texas Woman's University Office of Research and Sponsored Programs at 713-794-2480 or via e-mail at IRB@twu.edu. You will be given a copy of this signed and dated consent form to keep.

Agree/Disagree (circle) to receive text messages as a reminder of the TWU Food Scholarship Program distribution days.

Preferred method of contact during the study (circle one) and provide information:		
Email	Cell Phone	Postal Service

_____ _____

Signature of Participant Date

*If you would like to know the results of this study and your nutrient analysis tell us where you want them to be sent:

Email:

_____

or

Address:

_____

_____

_____

Approved by the
Texas Woman's
University
Institutionar Review Boerd
Date 01-18-2018

APPENDIX D

Food Scholarship Baseline Survey

FoodScholarshipProgram

In partnership with houston foodbank

Food Scholarship Baseline Survey

*Please note that all information will be kept **confidential**. If there is a question you prefer not to answer, please skip it, but the more information you provide the better the Food Scholarship Program experience can be. Thank you for your participation!*

Today's Date (MM/DD/YYYY):_____

Name of Current Program:_____Current Program ID (if any): _____

1. Gender (please circle one):
   - ○ Male
   - ○ Female
   - ○ Other:_____
2. Your Age: _____
3. Do you identify yourself as Hispanic and/or Latino:
   - ○ Yes
   - ○ No
4. Which of the below best describes your race/ethnicity?
   - ○ White (i.e.: European, Australian, or Middle East ancestry)
   - ○ Black
   - ○ Asian
   - ○ American Indian / Native American
   - ○ Other:
5. What is your marital status?
   - ○ Married
   - ○ Living with a Partner
   - ○ Divorced
   - ○ Separated

- ○ Widowed
- ○ Single (Never Married)

Average household income (per month): _____

6. What was the total average household income during the last 12 months (Including wages, salaries, self-employment, and any other source of income):
   - ○ No income
   - ○ Less than $20,000
   - ○ $20,000-35,000
   - ○ $36,000 or more
7. How many total people live in your household: _____
8. How many children (less than 18 years old) live in the household: _____
9. How many seniors (over the age of 65) live in the household: _____
10. Are you the head of your household:
    - ○ Yes
    - ○ No
11. What is the highest grade or year of school you completed?
    - ○ Never attended school or only attended kindergarten
    - ○ Grades 1 through 8 (Elementary)
    - ○ Grades 9 through 11 (Some high school)
    - ○ Grade 12 or GED (High school graduate)
    - ○ College 1 year to 3 years (Some college or technical school)
    - ○ College 4 years or more (College graduate)
12. Are you currently (select one):
    - ○ Employed (for wages)
    - ○ Self-employed
    - ○ Out of work for less than 1 year
    - ○ Out of work for more than 1 year
    - ○ Homemaker/stay at home parent
    - ○ Employed in seasonal labor
    - ○ Retired
    - ○ Unable to work

13. Are you or have you ever worked in the Unites States Armed Forces?

- ○ Currently Serving
- ○ Reserve / Guard
- ○ Veteran / Retired
- ○ Have not Served

14. Does your family currently receive any of the following types of assistance (circle all that apply):

- ○ WIC (Woman, Infants, and Children)
- ○ SNAP TX Benefits/Lone Star EBT
- ○ Double Dollars Incentive Program
- ○ Medicaid/Texas Health Steps
- ○ Medicare
- ○ Free/Reduced meals at school
- ○ CHIP (Children's Health Insurance Program)
- ○ No, my family does not receive assistance

15. Has your family received any of the following types of assistance in the past 12 months (circle all that apply):

- ○ WIC (Woman, Infants, and Children)
- ○ SNAP TX Benefits/Lone Star EBT
- ○ Double Dollars Incentive Program
- ○ Medicaid/Texas Health Steps
- ○ Medicare
- ○ Free/Reduced meals at school
- ○ CHIP (Children's Health Insurance Program)
- ○ No, my family does not receive assistance

16. If you receive the Food Scholarship, how will the Scholarship be used in your household?

- ○ As extra or supplemental food for my family
- ○ As food I give away to others that I know (example: relatives not in the household)
- ○ As food that will be thrown away and unneeded
- ○ As food that really helps my household have enough to eat

17. Which of these statements best describes the food in your household for the last 12 months:

- ○ There is enough food we can & want to eat
- ○ There is enough food but not always the types we want to eat
- ○ Sometimes there is not enough food to eat
- ○ Often there is not enough food to eat

18. Do you currently have reliable form of transportation?

- ○ I have a reliable vehicle
- ○ I borrow a reliable vehicle
- ○ I use Public Transportation
- ○ I use Share Riding Apps (example: Uber & Lyft)
- ○ I have no transportation available

19. Within the past 12 months, I worried whether my food would run out before I got money to buy more.

- ○ Often true
- ○ Sometimes true
- ○ Never true
- ○ Don’t know or refuse to answer

20. Within the past 12 months, the food that I bought just didn’t last and I didn’t have money to get more.

- ○ Often true
- ○ Sometimes true
- ○ Never true
- ○ Don’t know or refuse to answer

APPENDIX E

Food Scholarship Final Survey

Food Scholarship Final Survey

*Please note that all information will be kept **confidential**. If there is a question you prefer not to answer, please skip it, but the more information you provide the better the Food Scholarship Program experience can be. Thank you for your participation!*

Today's Date (MM/DD/YYYY):_____ Unique ID:_____

Name of Current Program: ____TWU_____ Current Program ID (if any): _____

1. How many total people live in your household?: _____
2. How many children (less than 18 years old) live in your household?: _____
3. How many seniors (over the age of 65) live in your household?: _____
4. Are you currently (select one):
   - ○ Employed (for wages)
   - ○ Self-employed
   - ○ Out of work for less than 1 year
   - ○ Out of work for more than 1 year
   - ○ Homemaker/stay at home parent
   - ○ Employed in seasonal labor
   - ○ Retired
   - ○ Unable to work
5. Does your family currently receive any of the following types of assistance (circle all that apply):
   - ○ WIC (Woman, Infants, and Children)
   - ○ SNAP TX Benefits/Lone Star EBT
   - ○ Double Dollars Incentive Program
   - ○ Medicaid/Texas Health Steps
   - ○ Medicare

- ○ Free/Reduced meals at school
- ○ CHIP (Children's Health Insurance Program)
- ○ No, my family does not receive assistance

6. How many times did you access the Food Scholarship Market?
    - ○ Max number of times (Click here to enter text.)
    - ○ Click here to enter text.times
    - ○ Twice
    - ○ Once
    - ○ Zero, I did not pick up my food from the Food Scholarship Market
7. If you did not utilize your Food Scholarship Market, why not?
    - ○ I did not qualify
    - ○ I did not apply
    - ○ I did not need the Food Scholarship
    - ○ I did not want the Food Scholarship
    - ○ I could not access the pantry
    - ○ Other: _____
    - ○ I did use the Food Scholarship Market
8. Did you have any issues accessing the Food Scholarship Market or picking up food from the Food Scholarship Market?
    - ○ I did not have reliable transportation
    - ○ The Food Scholarship Market hours did not match with my schedule
    - ○ Other: _____
    - ○ I did not have any issues accessing the Food Scholarship Market
9. If you picked up your Food Scholarship food, how was the food used in your household?

- ○ As food that helped my household have enough to eat
- ○ As extra or supplemental food for my family
- ○ As food I gave away to others that I know (example: relatives or friends not in the household)
- ○ As food that was thrown away and was not needed

10. If you did pick up food, how long did the food last?
    - ○ 1-3 days
    - ○ 1 week
    - ○ 2 weeks
    - ○ I still have items left
    - ○ I did not pick up food from the Food Scholarship Market
11. Did the Food Scholarship save you and your family money that would have been otherwise spent on groceries?
    - ○ Yes
    - ○ No
12. Please estimate how much money you saved using the Food Scholarship:
    - ○ The scholarship did not save me money
    - ○ It saved me around $_____
13. If the Food Scholarship did not save you money, can you tell us why not (example: the food provided was not enough, not the right items available, etc.):

_____

_____

_____

14. What item(s) did you find the most useful from the Food Scholarship Market?:

_____

15. What item(s) did you find the least useful from the Food Scholarship Market?:

_____

16. What item(s) would you like to see at the Food Scholarship Market?:

_____

17. Do you currently have a reliable form of transportation?
    - ○ I have a reliable vehicle
    - ○ I ask for a ride or borrow a vehicle
    - ○ I use Public Transportation
    - ○ I use Share Riding Apps (example: Uber & Lyft)
    - ○ I do not have reliable transportation available
18. Within the past 12 months, I have worried whether food would run out before I got money to buy more.
    - ○ Often true
    - ○ Sometimes true
    - ○ Never true
    - ○ Don’t know or refuse to answer
19. Within the past 12 months, the food I bought just didn’t last and I didn’t have money to get more.
    - ○ Often true
    - ○ Sometimes true
    - ○ Never true
    - ○ Don’t know or refuse to answer

APPENDIX G

USDA Six-item Short Food Security Questionnaire

Food Security Survey Code No.:_____

Please respond to the following questions based on your food security/needs in the last 12 months .

1. In the last 12 months did you/other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

_____Yes _____No _____Decline Comment

2. If yes above: How often did this happen?

_____Almost every month
_____Some months but not every month
_____Only one or two months
_____Decline Comment

3. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

_____Yes _____No _____Decline Comment

4. The food that I/we bought just didn't last, and I/we didn't have enough money to get more.

_____Often True _____Sometimes True _____Never True _____Decline Comment

5. I/We could afford to eat balanced meals.

_____Often True _____Sometimes True _____Never True _____Decline Comment

6. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?

_____Yes _____No _____Decline
Comment

Source: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/

APPENDIX H

Coding the U.S. Household Food Security Survey Module

Coding the U.S. Household Food Security Survey Module: Six-Item Short Form

Economic Research Service, USDA

September 2012

Revision Notes: The food security questions in the 6-item module are essentially unchanged from those in the original module first implemented in 1995 and described previously in this document.

September 2012:

- Added coding specification for "How many days" for 30-day version of AD la. July 2008:
- Wording of resource constraint in AD2 was corrected to, . because there wasn 't enough money for food" to be consistent with the intention of the September 2006 revision. January 2008:
- Corrected user notes for coding AD la. September 2006:
- Minor changes were introduced to standardize wording of the resource constraint in most questions to read, ". . .because there wasn't enough money for food. "
- Question numbers were changed to be consistent with those in the revised Household Food Security Survey Module.
- User notes following the questionnaire were revised to be consistent with current practice and with new labels for ranges of food security and food insecurity introduced by USDA in 2006.

Overview: The six-item short form of the survey module and the associated Six-Item Food Security Scale were developed by researchers at the National Center for Health Statistics.

Background: The six-item short fonn of the survey module and the associated Six-Item Food Security Scale were developed by researchers at the National Center for Health Statistics in collaboration with Abt Associates Inc. and documented in "The effectiveness of a short fom of the household food security scale," by S.J. Blumberg, K. Bialostosky, W.L. Hamilton, and R.R. Briefel (published by the American Journal ofPublic Health, vol. 89, pp. 1231-34, 1999). ERS conducted additional assessment of classification sensitivity, specificity, and bias relative to the 18-item scale.

If respondent burden permits, use of the 18-item U.S. Household Food Security Survey Module or the 10-item U.S. Adult Food Security Survey Module is recommended. However, in surveys that cannot implement one of those measures, the six-item module may provide an acceptable substitute. It has been shown to identify food-insecure households and households with very low food security with reasonably high specificity and sensitivity and minimal bias compared

with the 18-item measure. It does not, however, directly ask about children's food security, and does not measure the most severe range of adult food insecurity, in which children's food intake is likely to be reduced.

[Begin Six-Item Food Security Module]

Transition into Module :

These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year and whether you were able to afford the food you need.

NOTE: If the placement of these items in the survey makes the transition/introductory sentence unnecessary, add the word "Now" to the beginning of question HH3: "Now I'm going to read you...."

FILL INSTRUCTIONS: Select the appropriate fill from parenthetical choices depending on the number of persons and number of adults in the household.

HH3. I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last (name of current month).

The first statement is, "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes or never true for (you/your household) in the last 12 months?

[ ] Often true
[ ] Sometimes true
[ ] Never true
[ ] DK or Refused

HH4. "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

[ ] Often true
[ ] Sometimes true
[ ]
[ ] Never true

DK or Refused

ADI. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

[ ] Yes
[ ] No (Skip ADIa)

[ ] DK (Skip ADIa)

ADIa. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only I or 2 months?

[ ] Almost every month

[ ] Some months but not every month

[ ] Only I or 2 months

AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

[ ] Yes

[l No

AD3. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

[ ] Yes

[l No

[End of Six-Item Food Security Module]

User Notes

(1) Coding Responses and Assessing Households' Food Security Status:

Responses of "often" or "sometimes" on questions HH3 and HH4, and "yes" on ADI, AD2, and AD3 are coded as affirmative (yes). Responses of "almost every month" and "some months but not every month" on AD la are coded as affirmative (yes). The sum of affirmative responses to the six questions in the module is the household's raw score on the scale.

Food security status is assigned as follows:

- Raw score 0-1—High or marginal food security (raw score I may be considered marginal food security, but a large proportion of households that would be measured as having marginal food security using the household or adult scale will have raw score zero on the six-item scale)
- Raw score 2-4—Low food security
- Raw score 5-6—Very low food security

For some reporting purposes, the food security status of households with raw score 0-1 is described as food secure and the two categories "low food security" and "very low food security" in combination are referred to as food insecure.

For statistical procedures that require an interval-level measure, the following scale scores, based on the Rasch measurement model may be used:

Number of affirmatives	Scale score
1	2.86
2	4.19
3	5.27
4	6.30
5	7.54
6 (evaluated at 5.5)	8.48

However, no interval-level score is defined for households that affirm no items. (They are food secure, but the extent to which their food security differs from households that affirm one item is not known.)

(2) Response Options: For interviewer-administered surveys, DK ("don 't know") and "Refused" are blind responses—that is, they are not presented as response options but marked if volunteered. For self-administered surveys, "don 't know" is presented as a response option.

(3) Screening: If it is important to minimize respondent burden, respondents may be screened after question ADI. Households that have responded "never" to HH3 and HH4 and "no" to ADI may skip over the remaining questions and be assigned raw score zero. In pilot surveys intended to validate the module in a new cultural, linguistic, or survey context, however, screening should be avoided if possible and all questions should be administered to all respondents.

(4) 30-Day Reference Period: The questionnaire items may be modified to a 30-day reference period by changing the "last 12-month" references to "last 30 days." In this case, item ADIa must be changed to read as follows:

ADIa. [IF YES ABOVE, ASK] In the last 30 days, how many days did this happen?

_____ days

Responses of 3 days or more are coded as "affirmative" responses.

(5) Self Administration: The six-item module has been used successfully in mail-out, takehome, and on-site self-administered surveys. For self-administration, question ADIa may be presented in one of two ways:

- Indent ADIa below ADI and direct the respondent to ADIa with an arrow from the "Yes" response box of ADI . In a parenthetical following the "No" response box of ADI , instruct the respondent to skip question ADI and go to question AD2.
- Present the following response options to question ADI and omit question ADI a: o Yes, almost every month o Yes, some months but not every month o Yes, only 1 or 2 months o No
  In this case, either of the first two responses is scored as two affirmative responses, while "Yes, only I or 2 months" is scored as a single affirmative response.

The two approaches have been found to yield nearly equal results. The latter may be preferred because it usually reduces the proportion of respondents with missing information on how often this behavior occurred.

U.S. Household Food Security Survey Module: Six-Item Short Form
Economic Research Service, USDA
September 2012

Revision Notes: The food security questions in the 6-item module are essentially unchanged from those in the original module first implemented in 1995 and described previously in this document.
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- Added coding specification for "How many days" for 30-day version of AD la.

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- Wording of resource constraint in AD2 was corrected to, ' . . because there wasn't enough money for food" to be consistent with the intention of the September 2006 revision. January 2008:
- Corrected user notes for coding ADI a.

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- Minor changes were introduced to standardize wording of the resource constraint in most questions to read, ". .because there wasn't enough money for food."
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Background: The six-item short form of the survey module and the associated Six-Item Food Security Scale were developed by researchers at the National Center for Health Statistics in

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[Begin Six-Item Food Security Module]

Transition into Module :

These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year and whether you were able to afford the food you need.

NOTE: If the placement of these items in the survey makes the transition/introductory sentence unnecessary, add the word "Now" to the beginning of question HH3: "Now I'm going to read you...."

FILL INSTRUCTIONS: Select the appropriate fill from parenthetical choices depending on the number of persons and number of adults in the household.

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The first statement is, "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

[ ] Often true

[ ] Sometimes true

[ ] Never true

[ ] DK or Refused

HH4. "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

[ ] Often true
[ ]
[ ] Sometimes true
[ ] Never true

DK or Refused

ADI. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

[ ] Yes

[ ] No (Skip ADIa)

[ ] DK (Skip ADIa)

ADIa. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only I or 2 months?

[ ] Almost every month

[ ] Some months but not every month

[ ] Only I or 2 months

AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

[ ] Yes
[ ] No

AD3. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

[ ] Yes
[ ] No

[End of Six-Item Food Security Modulel

User Notes

(1) Coding Responses and Assessing Households' Food Security Status:

Responses of "often" or "sometimes" on questions HH3 and HH4, and "yes" on ADI, AD2, and AD3 are coded as affirmative (yes). Responses of "almost every month" and "some months but not every month" on ADIa are coded as affirmative (yes). The sum of affirmative responses to the six questions in the module is the household's raw score on the scale.

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For some reporting purposes, the food security status of households with raw score 0-1 is described as food secure and the two categories "low food security" and "very low food security" in combination are referred to as food insecure.

For statistical procedures that require an interval-level measure, the following scale scores, based on the Rasch measurement model may be used:

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However, no interval-level score is defined for households that affirm no items. (They are food secure, but the extent to which their food security differs from households that affirm one item is not known.)

(2) Response Options: For interviewer-administered surveys, DK ("don't know") and "Refused" are blind responses—that is, they are not presented as response options but marked if volunteered. For self-administered surveys, "don 't know" is presented as a response option.

(3) Screening: If it is important to minimize respondent burden, respondents may be screened after question ADI. Households that have responded "never" to HH3 and HH4 and "no" to ADI may skip over the remaining questions and be assigned raw score zero. In pilot surveys intended to validate the module in a new cultural, linguistic, or survey context, however, screening should be avoided if possible and all questions should be administered to all respondents.

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ADIa. [IF YES ABOVE, ASK] In the last 30 days, how many days did this happen?

days

_____

Responses of 3 days or more are coded as "affirmative" responses.

(5) Self Administration: The six-item module has been used successfully in mail-out, take home, and on-site self-administered surveys. For self-administration, question ADIa may be presented in one of two ways:

- Indent ADIa below ADI and direct the respondent to AD la with an arrow from the "Yes" response box of ADI . In a parenthetical following the "No" response box of AD l , instruct the respondent to skip question ADI and go to question AD2.
- Present the following response options to question ADI and omit question AD la: o Yes, almost every month o Yes, some months but not every month o Yes, only I or 2 months o No
  In this case, either of the first two responses is scored as two affirmative responses, while "Yes, only I or 2 months" is scored as a single affirmative response.

The two approaches have been found to yield nearly equal results. The latter may be preferred because it usually reduces the proportion of respondents with missing information on how often this behavior occurred.

APPENDIX I

Food Frequency Questionnaire

Food Frequency Questionnaire Code Number: _____

This questionnaire is to help assess changes in your fruits and vegetables intake. For each food item, check the box that most closely corresponds to your current consumption pattern.

Food Item	6 + per day	4-6 per day	2-3 per day	1 per day	5-6 per week	2-4 per week	1 per week	1-3 per month	Almost never
Prunes									
Bananas									
Cantaloupe									
Watermelon									
Fresh Apples or Pears									
Apple Juice or Cider									
Oranges									
Other Fruit Juices									
Strawberries									
Blueberries									
Peaches, Apricots, or Plums									
Tomatoes									
Tomato Juice									
String Beans									
Broccoli									
Cabbage or Coleslaw									
Cauliflower									
Carrots, raw									
Carrots cooked									
Corn									
Peas or Lima beans									
Mixed Vegetables									
Beans or Lentils									

Spinach									
Food Item	6 + per day	4-6 per day	2 -3 per day	1 per day	5 – 6 per week	2 – 4 per week	1 per week	1 – 3 per month	Almost never
Spinach									
Yellow (winter) Squash									
Eggplant, Zucchini, Summer Squash									
Yams or Sweet Potatoes									
Iceberg or head Lettuce									
Celery									
Beets									

APPENDIX J

Food Record Form

FOOD RECORD FORM

SUBJECT ID:_____ DATE: _____PAGE:_____ of_____

TIME	FOOD DESCRIPTION	HOW MANY/PORTION