

© Ashley L. Wheeler. All rights reserved.

INTAKE OF AND ATTITUDES TOWARD SOY MILK AND FRUITS AND VEGETABLES
IN SPECIAL SUPPLEMENTAL NUTRITION PROGRAM FOR WOMEN INFANTS AND
CHILDREN (WIC) PARTICIPANTS

BY

ASHLEY L. WHEELER

THESIS

Submitted in partial fulfillment of the requirements
for the degree of Master of Science in Food Science and Human Nutrition
with a concentration in Human Nutrition
in the Graduate College of the
University of Illinois at Urbana-Champaign, 2012

Urbana, Illinois

Adviser:

Professor Karen Chapman-Novakofski, PhD, RD

ABSTRACT

Background: The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is the third largest food assistance program administered by the United States Department of Agriculture. Women and children participating in the WIC program receive vouchers from local clinics for supplemental food as well as nutrition and breastfeeding education and referrals to health and social services. In 2009, revisions were made to the WIC-approved foods list to include fruits, vegetables, whole grains, and soy foods. Knowledge of the consumption patterns of WIC participants could guide decisions for future WIC packages and education.

Objective: To examine soy milk, fruit, and vegetable intake and influencing factors in WIC participants in two Illinois counties.

Methods: Two cross-sectional surveys using self-administered questionnaires to examine soy milk and fruit and vegetable intake and influencing factors were utilized. The questionnaire used to assess soy milk intake was based in the Theory of Planned Behavior (TPB). The questionnaire used to assess fruit and vegetable intake was based in the Social Cognitive Theory (SCT). The effect of the WIC Farmers' Market Nutrition Program (FMNP) on fruit and vegetable intake was evaluated, and a cost comparison between Central Illinois farmers' markets and grocery stores was performed.

Results: Soy milk intake was low. Most lacked knowledge about the health benefits of soy milk and cooking with it. Many (40%) didn't know soy milk was WIC-approved. Intention to drink soy milk was correlated with TPB variables. Fruit and vegetable intake was higher than the national average but was not significantly different between FMNP users and non-users.

Participation in the FMNP was associated with stronger psychosocial variables associated with intake: Stages of Change for vegetable intake, willingness to use the FM voucher in the subsequent year, planning meals or snacks with vegetables, planning meals or snacks with more fruits, and eating two or more servings of vegetables at dinner. Factors explaining variance in fruit and vegetable intake included eating more than one type of fruit or vegetable a day, Stages of Change for fruit and vegetable intake, gender, perceived quality of diet, willingness to use farmer's market vouchers in the subsequent year, and self-efficacy to eat a variety of vegetables at meals. Cost of fruits and vegetables was significantly higher at farmers' markets than grocery stores.

Conclusion: Many felt soy milk is a healthy food, but the percentage of participants who consumed soy milk was low. Efforts to increase knowledge of soy milk in WIC packages and knowledge of soy health benefits and cooking skills could help address these issues. Most participants associated positive health outcome expectancies with fruit and vegetable consumption.

DEDICATION

I dedicate this to Chivas Regal, the best friend a girl could have possibly asked for.

January 20, 2000- September 19, 2011. RIP.

ACKNOWLEDGEMENTS

I would first like to express my sincere gratitude to my advisor, Dr. Chapman-Novakofski for all of the support she has provided me academically, professionally, and personally. Thank you for the opportunity to be a part of your lab even though you were concerned that I wouldn't be able to handle the cold Illinois winter. I would also like to thank my advisory committee, Dr. Donovan, Dr. Grigsby, and Dr. Brewer for the guidance and input you provided during my thesis research. Your expertise in the fields of nutrition and community health provided invaluable depth to my project and helped me achieve results that I am truly proud of. To my labmates, thank you for being such a fun and supportive group. I am truly blessed to have had the pleasure of working with such talented and driven women, and I will always be grateful that you put up with the vegan at lab lunches.

To my family, thank you for the emotional support through the thick and thin of grad school. Thanks for being there as sounding boards and voices of reason. Mom, there were times that I lived off of the snacks you sent me in the gift baskets. Dad, I will never be able to thank you enough for showing me that Excel *can* make life easier. Birgit and Scott, I was incredibly lucky to have you only two hours away when things got hectic or I needed weekend of family time. Birgit, you helped me more than you know by always being on the other end of the phone and giving me advice when it comes to "making grown-up decisions." Robbie and Reiss, thank you for being so darn adorable and always making me laugh. Whitney, even though you are my little sister, I have always looked up to your ability to balance academics, career, and a (fun) personal life. I am proud that I have a sister in Texas who is a dean *and* carries a permit.

Finally, to my friends, thank you for being my cheerleaders for the past three years. To everyone in Illinois, I couldn't have asked to meet such an amazing group of people in such a

short period of time. I am forever grateful for the motivation you provided and will never forget some of the amazing times we have had in Champaign. To my friends from Florida, thanks for always being a text, call, or Gchat away. Even though we would go for months without seeing each other, it felt like no time had passed at all when we did get together. Mike, thanks for sending that second message. You were right. You couldn't possibly have done any worse.

I couldn't have done with without y'all. You are the best!

TABLE OF CONTENTS

List of Tables	ix
List of Figures	xii
Chapter 1: Introduction	1
Chapter 2: Review of Literature.....	5
Chapter 3: Hypotheses	32
Chapter 4: Women Infant and Children Program Participants’ Beliefs and Consumption of Soy Milk: Application of the Theory of Planned Behavior	36
Chapter 5: Women Infant and Children Program Participants Usage of and Attitudes Towards The WIC Farmers’ Market Nutrition Program: Application of The Social Cognitive Theory	74
Part I: Cost of Fruits and Vegetables Found at Farmers’ Markets versus Commercial Grocery Stores.....	76
Part II: Intake of Fruits and Vegetables and Social Cognitive Theory Constructs Associated with Intake of Fruits and Vegetables in WIC Participants.....	87
Chapter 6: Implications and Future Directions	128
Appendix A: Soy Milk- Informed Consent to Participate in Research	131
Appendix B: Soy Milk- Survey Used in Research	133
Appendix C: Fruits and Vegetables- Expert Content Reviewer Information Sheet and Evaluation Form.....	146
Appendix D: Fruits and Vegetables- Survey with Social Cognitive Theory Constructs Defined.....	149

Appendix E: Fruits and Vegetables- Informed Consent for Face Validity and Reliability Testing.....	157
Appendix F: Fruits and Vegetables- Reminder Postcard for Reliability Retest.....	159
Appendix G: Fruits and Vegetables- Informed Consent to Participate in Research	161
Appendix H: Fruits and Vegetables - Survey Used in Research.....	163

LIST OF TABLES

Table 4.1: Required Nutrient Composition of Soy Milk Compared to Cow's Milk	49
Table 4.2: Theory of Planned Behavior Constructs Related to Soy Milk Intake.....	50
Table 4.3: Cronbach alpha for Theory of Planned Behavior Constructs	52
Table 4.4: Description of WIC Participants' Demographics	53
Table 4.5: Descriptive Statistics for Theory of Planned Behavior Variables Related to Soy milk in WIC Participants	55
Table 4.6: Percentage of WIC Participants Consuming Soy Products	57
Table 4.7: Percentage of WIC Participants Responding to Subjective Norm and Normative Beliefs Items	58
Table 4.8: Percentage of WIC Participants Responding to Behavioral Control (Perceived Environment and Outcome Expectancies) Items.....	60
Table 4.9: Percentage of WIC Participants Responding to Intention Items	62
Table 4.10: Percentage of WIC Participants Responding to Items Describing Flavor and Texture of Soy Milk (Attitudes).....	63
Table 4.11: Percentage of WIC Participants Responding to Items Describing Attitudes Towards Soy Milk.....	64
Table 4.12: Bivariate Correlations of Theory of Planned Behavior Constructs in WIC Participants.....	65
Table 4.13: Stepwise Multiple Regression Analyses of Relationship Between Theory of Planned Behavior Composites and Intention to Consume Soy Milk	66
Table 5.1: Descriptive Statistics of Fruit Cost at Commercial Grocery Stores and Farmers' Markets	83

Table 5.2: Descriptive Statistics of Vegetable Cost at Commercial Grocery Stores and Farmers' Markets	84
Table 5.3: Post Hoc Power Analysis of Comparison of Vegetables Sold at Farmers' Markets and Grocery Stores.....	85
Table 5.4: Post Hoc Power Analysis for Comparison of Fruits Sold at Farmers' Markets and Grocery Stores.....	86
Table 5.5: Description of Social Cognitive Theory Constructs Related to Fruit and Vegetable Intake	101
Table 5.6: Percentage of WIC Participants Who Used FMNP and Interest in Future Participation	103
Table 5.7: Descriptive Statistics for Age in FM Voucher and Non-FM Voucher Groups.....	104
Table 5.8: Frequency Statistics for Demographics of FM Voucher and Non-FM Voucher Groups	105
Table 5.9: Frequency Statistics for Shopping, Cooking, and Enrollment in FM Voucher and Non-FM Voucher Groups	106
Table 5.10: Frequencies of Fruit and Vegetable Intake Items in the FM Voucher and Non-FM Voucher Groups	107
Table 5.11: Descriptive Statistics of Fruit and Vegetable Intake Items in the FM Voucher and Non-FM Voucher Groups	108
Table 5.12: Descriptive Statistics of Fruit and Vegetable Intake Items in the FM Voucher and Non-FM Voucher Groups	109

Table 5.13: Stepwise Multiple Regression Analyses of Relationship Between Fruit and Vegetable Survey Items and Intake.....	110
Table 5.14: Frequencies for Psychosocial Items Relating to Fruit and Vegetable Intake in FM Voucher and Non-FM Voucher Groups.....	111
Table 5.15: Frequencies of Stages of Change Items Relating to Fruit Intake in FM Voucher and Non-FM Voucher Groups	113
Table 5.16: Frequencies of Stages of Change Items Relating to Vegetable Intake in FM Voucher and Non-FM Voucher Groups	114
Table 5.17: Frequencies of Environmental Variables Related to Farmers Market Usage Fruit and Vegetable Intake for FM Voucher Group	115
Table 5.18: Descriptive Statistics of Voucher Use in the FM Voucher Group	117
Table 5.19: Frequencies of Farmers' Market Voucher Use in FM Voucher Group	118
Table 5.20: Frequencies of Farmers' Market Attended by FM Voucher Group	119
Table 5.21: Percentage of WIC Participants Meeting National Recommendation for Fruit and Vegetable Intake.....	120

LIST OF FIGURES

Figure 4.1: Theory of Planned Behavior Constructs as Used in this Study.....	67
Figure 4.2: Correlations Between Theory of Planned Behavior Constructs and Intake of Soy Milk at Site 1	68
Figure 4.3: Correlations Between Theory of Planned Behavior Constructs and Intake of Soy Milk at Site 2	69
Figure 5.1: Social Cognitive Theory Constructs Related to Fruit and Vegetable Intake and Factors Influencing Fruit and Vegetable Intake.....	121
Figure 5.2: Percentage of WIC Participants Identified in Stages of Change Continuum for Fruit Intake	122
Figure 5.3: Percentage of WIC Participants Identified in Stages of Change Continuum for Vegetable Intake.....	123

Chapter 1: Introduction

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) has provided supplemental foods, nutrition education, and health referrals to low-income mothers and children under age 5 since its inception in the 1970s [1]. The program is similar to the Food Stamp Program (now Supplemental Nutrition Assistance Program [SNAP]) in that both are food assistance programs [2]. However, WIC is unique because it only allocates vouchers for supplemental foods that meet “WIC guidelines” regarding their nutritional value. Whereas SNAP, the largest program in the domestic hunger safety net, offers offer nutrition assistance to a broader population of low income Americans that is not limited to mothers, infants and children. Benefits provided by SNAP are to be used for the purchase of household food items and seeds and plants which produce food for the household to eat. However, foods purchased using SNAP benefits do not need to meet any specific nutritional guidelines. Foods with little nutritional value such as soft drinks, cookies, and candy are eligible to purchase using SNAP benefits as are “luxury food items,” including steak and seafood [3]. Although the Food and Nutrition Service (FNS) works with state agencies, nutrition educators, and neighborhood and faith-based organizations to ensure that those eligible for SNAP can make informed decisions about the foods they choose to purchase using program funds, there is no required nutrition education component as there is for WIC participants. The provision of nutrition education and health referrals make WIC a unique federal program that not only helps to alleviate hunger and promote better health outcomes, but it also educates the population on how to make healthy food choices after they no longer meet the eligibility criteria.

During the inception of the WIC program, its intent was to identify services and create guidelines and eligibility criteria that would help achieve the mission of improving health outcomes related to nutrition and access to health services in low-income mothers and children. In 1992, the WIC Farmers Market Nutrition Program (FMNP) was implemented to provide fresh, unprepared, locally grown fruits and vegetables to WIC participants and to expand awareness, usage, and sales at farmers' markets. At the time of the program's inception, the provision of fruits and vegetables was limited to canned carrots. Fruits and vegetables purchased with FMNP vouchers were the only fresh fruits and vegetables that were covered by program benefits [1].

In 2007, following heightened awareness of the obesity epidemic in the United States, the Institute of Medicine (IOM) published a report titled "WIC Food Package: Time for a Change" [4]. The IOM made recommendations that brought the guidelines for WIC-approved foods in line with the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA) Dietary Guidelines for Americans [5]. Included in the report was the recommendation for more fruits, vegetables, whole grains, and the inclusion of soy foods in the WIC package. Initiatives such as the promotion of breastfeeding and the FMNP were also outlined. In 2009, these changes were implemented federally among WIC agencies.

The objectives of this research are to examine intake of and behaviors related to soy milk and fruits and vegetables, items that were added to the WIC food package as a result of the implementation of new guidelines for WIC-approved foods in 2009. A "WIC food package" refers to the approved food items that a participant may buy with using his or her WIC vouchers. Additionally, this research will investigate usage of the FMNP, identify potential barriers to participation in the program, and evaluate if participation in the FMNP impacts fruit

and vegetable intake. Intake of soy milk, fruits, and vegetables is significant, because these foods contain nutrients vital for the health and nutrition of mothers and children, a primary goal of the WIC program since its inception [1]. Finally, this research will examine cost as a barrier to shopping at farmers' markets.

Research has shown that only a small percentage of low-income populations consume soy foods [6]. Several studies have shown a positive correlation between Theory of Planned Behavior (TPB) variables and intention to perform a behavior [7-10]. The first hypothesis to be tested is that the percentage of Champaign County WIC participants who drink soy milk is low, but there is a there is a positive correlation between Theory of Planned Behavior variables and intention to consume soy milk. The null hypothesis is that there is no correlation between TPB variables and intention to consume soy milk.

Some Champaign County residents believe that the cost of fruits and vegetables sold at farmers' markets is higher than those sold at commercial grocery stores; however, no research to date has examined this cost difference in Champaign County. The second hypothesis to be tested is that the financial cost of fruits and vegetables sold at farmers markets is greater than fruits and vegetables sold at commercial grocery stores. The null hypothesis is that there is no difference in the cost of fruits and vegetables sold at farmers' markets and those sold commercial grocery stores or that the cost of fruits and vegetables is higher at commercial grocery stores than at farmers' markets.

It has also been shown that women, infants, and children do not meet the national recommendation for fruit and vegetable intake [11-14]. Research has shown that there is a positive association between Social Cognitive Theory (SCT) constructs and diet-related behavior [45, 46]. The third hypothesis that will be tested is that fruit and vegetable intake of Champaign

County WIC participants will be lower than the national recommendation, but WIC participants who participated in the FMNP will have more positive psychosocial predictors of fruit and vegetable intake and a higher intake of fruits and vegetables than WIC participants not participating in the FMNP. The null hypothesis is that there is no difference in psychosocial predictors of fruit and vegetable intake between FMNP participants and non-FMNP participants, and that the fruit and vegetable intake of FMNP participants is less than or equal to non-FMNP participants.

Regulations developed to improve nutritional status of those participating in federal programs such as WIC and SNAP have been proven to be effective in many studies. Additionally, studies have shown that nutrition promotion efforts with foundations in behavior theories have also been effective in increasing nutritional status. Theory of Planned Behavior (TPB), states that attitudes, subjective norms surrounding the performance of the behavior, and perceived behavioral control predict the intention of an individual to perform a behavior. This theory was chosen as a foundation for the soy milk questionnaire as it is appropriate for the analysis of discrete behaviors such as the intake of a specific food. The Social Cognitive Theory (SCT) [15] was chosen to explore the intake fruits and vegetables and utilization of the FMNP. The SCT posits that human behavior is rooted in the interplay between personal, environmental, and behavioral influences. It was chosen for this aspect of the research project as access to fruits and vegetables, and especially access to farmers markets, is inherently linked to an individuals' environment, a cornerstone of the theory.

Chapter 2: Review of Literature

History of (WIC)

The WIC program was established in 1975 as a federal program following concerns sparked in the 1960s that many low-income Americans were suffering from malnutrition [1]. During the 1960s, several studies, public demonstrations, and documentaries such as CBS's "Hunger in America" brought the topic of hunger and poverty to the national conversation [16]. In 1969, the White House Conference on Food, Nutrition, and Health met to address the problem of malnutrition and hunger due to poverty. The conference report recommended that special attention be given to the nutritional needs of low-income pregnant women and preschool children [17].

The USDA established the Commodity Supplemental Food Program (originally named the Supplemental Food Program) in 1969 [18]. The program was modeled after a voucher program created by Dr. David Paige of Johns Hopkins University, Baltimore, MD. The WIC program, as we know it today, originated as a 2-year USDA pilot program. (In 1994, P.L. 103-448 changed WIC's name to the Special Supplemental Nutrition Program for Women, Infants, and Children.) The program was designed to provide supplemental foods to participants; however, there was no inclusion of nutrition education or health care referrals at its commencement. The program provided commodities to feed low-income pregnant women, infants, and children up to age 6 [1]. Eligibility criteria included that participants must have demonstrated that they were at nutritional risk. Nutritional risk related to eligibility was determined by healthcare professionals and created an important association between provision of supplemental food and health care services [19].

After minimal action was taken by the USDA to implement the WIC program, a task force was created in 1973 to create operational guidelines and regulations. The first WIC site was opened in Pineville, KY, in January of 1974. Additional sites were in operation in 45 states by the end of that year, leading to the 1975 establishment of WIC as a permanent federal program [1]. The legislation stated, “Congress finds that substantial numbers of pregnant women, infants and young children are at special risk in respect to their physical and mental health by reason of poor or inadequate nutrition or health care, or both. It is, therefore, the purpose of the program authorized by this section to provide supplemental nutritious food as an adjunct to good health during such critical times of growth and development in order to prevent the occurrence of health problems.” Eligibility was extended to non-breastfeeding women (up to 6 months postpartum) and restricted to children up to 5 rather than 6 years of age. It was suggested that 5 years old was an appropriate age criteria because at the age of 5 children would be eligible to participate in food assistance programs that are provided through public schools such as the free and reduced price school meals [20]. Eligibility was limited to persons at nutritional risk (per the assessment of a healthcare professional) and with inadequate income although there no definition of inadequate income was provided. Supplemental foods were defined as foods containing nutrients known to be lacking in the diets of populations at nutritional risk, in particular foods containing high quality protein, iron, calcium, vitamin A, and vitamin C. The WIC program was intended to supplement the Food Stamp Program. Nutrition education costs were covered through administrative expenses [1].

In 1978, a definition of nutritional risk and income eligibility standards was included in the legislation. These requirements were linked to the income standards prescribed for free and reduced price school meals. The legislation also dictated that no less than one-sixth of

administrative funds be allocated towards the provision of nutrition education to all program participants. This act also redefined supplemental foods as foods containing nutrients determined by nutrition research to be lacking in the diets of the target population, as prescribed by the Secretary of Agriculture. The Secretary of Agriculture was also to assure that the fat, sugar, and salt content of the foods prescribed by WIC were appropriate. The act established the link between WIC and the third component of its benefit package- referrals to health and other services. These services included coordination with state agencies that provide special counseling services such family planning, immunization, child abuse counseling, and alcohol and drug abuse prevention counseling. Although many other legislative acts have affected the WIC program over time, it was the 1978 legislation that created the structure of the program as we know it today, providing vouchers for supplemental food, nutrition education, and referrals to health care services [1].

WIC Today

The WIC program is the third-largest food assistance program administered by the U.S. Department of Agriculture [1]. The program served approximately 9.3 million participants per month during the fiscal year (FY) in 2010. The target population of WIC is low-income individuals who are at nutritional risk [21]. Children have always been the largest category of WIC participants. Of the 9.17 million people who received WIC benefits each month in FY 2010, approximately 4.86 million were children, 2.17 million were infants, and 2.14 million were women.

The WIC program is not an entitlement program as congress does not set aside funds to allow every eligible individual to participate in the program. The WIC program is a federal grant

program for which congress authorizes a specific amount of funds each year for the program [22]. For the FY 2010, Congress appropriated \$7.252 billion to cover the program costs. Congress also appropriated \$15 million for research related to the program for FY 2010, which ended a long period in which there was very little funding for WIC research [23]. In 2012, the House Ag Committee and Senate passed acts that would reduce SNAP funding over the next ten years by \$16 billion and \$4.49 billion, respectively [24]. However, the despite this era of uncertainty regarding funding for supplemental nutrition programs, the Senate Appropriations Committee approved to fund WIC at \$7.041 billion, the level of the President’s Budget Request, in FY 2013. This level of funding should allow the WIC program to meet the FY 2013 caseload needs [25].

The WIC program is available in all 50 states and the District of Columbia, 34 Indian Tribal Organizations, Guam, American Samoa, the Commonwealth Islands of the Northern Marianas, Puerto Rico, and the Virgin Islands. Ninety state agencies administer the program through approximately 2,200 local agencies and 9,000 clinic sites [1]. Examples of where WIC services are provided include county health departments, hospitals, mobile clinics (vans), community centers, schools, public housing sites, migrant health centers and camps, Indian Health Service facilities [22].

Through federal grants to states, participants receive supplemental “food packages” tailored to specific age groups for infants and children and to physiological status for women. Additionally, participants receive nutrition education and referrals to health services and social services. In October 2009, the USDA issued regulations that substantially revised the WIC food “package.” A package does not represent actual food, but foods included on a WIC-approved list. These revisions are the first major change in the food package since the program’s inception

in 1972 [1]. The report *WIC Food Packages: Time for a Change* issued by the Institute of Medicine [4] largely influenced the changes to WIC-approved foods by bringing the packages into alignment with the recommendations from the Dietary Guidelines for Americans [5]. These revised packages include more fruits, vegetables, whole grains, placed priority on breastfeeding, and include soy foods [23, 26, 27] and other initiatives like additional promotion of breastfeeding and farmers' markets.

Current eligibility guidelines include pregnant women (through pregnancy and up to 6 weeks after birth or after pregnancy ends), breastfeeding women (up to infant's 1st birthday), non-breastfeeding postpartum women (up to 6 months after the birth of an infant or after pregnancy ends), infants (up to 1st birthday), and children up to their 5th birthday [21]. Participants must meet income guidelines, a state residency requirement, and be individually determined to be at "nutritional risk" by a health professional. Two major types of nutritional risk are recognized for WIC eligibility. The first type of nutritional risk is medically-based risks. Medically based risks are designated as "high priority" and include anemia, underweight, maternal age, history of pregnancy complications, and poor pregnancy outcomes. The second type of nutritional risk is related to diet such as inadequate dietary pattern. Nutritional risk is determined by a health professional such as a physician, nutritionist, or nurse, and is based on federal guidelines. This health screening is free to program applicants. Beginning April 1, 1999, state agencies use WIC nutritional risk criteria from a list established for use in the WIC program. WIC nutritional risk criteria were developed by FNS in conjunction with state and local WIC agency experts. However, state agencies are not required to use all of the nutritional risk criteria on the new list. As new scientific evidence emerges, FNS will collaborate with health and nutrition experts to update the list of criteria as necessary. The current income guideline for

WIC eligibility is household income at or below 185 percent of the U.S. Poverty Income Guidelines [22].

Characteristics of WIC Participants

In 2009, FNS conducted a series of surveys to explore the characteristics and experiences of WIC participants. Forty sample clusters were selected from the 48 contiguous states and the District of Columbia. The clusters were identified in 23 separate states, with 7 states selected multiple times. The survey consisted of one telephone interview (n=2,538) and one interview conducted in person with respondents who had participated in the phone interview (n=1,210).

The WIC population consisted of 52% children 24% infants. Total women—pregnant, breastfeeding, and postpartum women combined—made up 23.9% of the WIC population. Of those sampled, 12.5% were 25 years and older, 9.6% were between 18-24 year old, and a small number were younger than 18 years old. The majority of participants, 42.3%, identified themselves as white. About one-third (33.4%) identified themselves as multiracial or “other” race, and 19.5% identified themselves as African American. With respect to education, 66.8% had a high school education or less, and 33.2% had more than a high school diploma. The number of WIC participants who have more than a high school diploma is much lower than the general US population in which 59.3% of the 18–29 age group have received more than a high school education.

The primary language of 63.9% of WIC households was English, and 30.9% reported Spanish as a first language. One in 20 WIC households (5.1%) reported speaking a different language than English or Spanish. The most prevalent were Vietnamese (0.6%), Arabic (0.6%),

and Cantonese/Mandarin (0.4%). Breastfeeding mothers were significantly more likely to speak Spanish than participants speaking English or another language.

Two thirds (67%) of participants reported receiving other food assistance, and 53.1% of respondents reported also receiving SNAP benefits. When asked about food security, 81.9% of respondents reported high food security, 1.1% marginal food security, 9% low food security, and 8% very low food security. When asked about breastfeeding, 67% of postpartum respondents reported currently breastfeeding and 70% of expecting participants reported intentions to breastfeed [28].

Behavior Theory in Nutrition Research

Eating patterns are complex behaviors that involve many factors. Dietary choice is a product of biological, environmental, and personal factors [29]. It is therefore appropriate to develop nutrition research with the use of behavior theory to account for the multitude of variables that impact an individual's diet.

In the position paper “Total Diet Approach to Healthy Eating,” the Academy of Nutrition and Dietetics promotes adapting behavior-oriented theories in developing nutrition education messages. It is the position of the AND that total diet or overall pattern of food eaten is the most important focus of healthy eating. This includes developing nutrition messages that emphasize balancing food and beverages with energy needs, rather than focusing one meal or type of food. To communicate this message, AND includes Knowledge-Attitude-Beliefs, Health Belief Model, the Transtheoretical Model, Social Marketing, Social Cognitive Theory, and the Socio-Ecological design as appropriate models to outline dietary messages and interventions [30].

In a systematic review of literature, the AND evaluated 87 articles utilizing Cognitive Behavioral Theory (CBT), Transtheoretical Model (TTM), and Social Cognitive Theory (SCT) between July 2007 and March 2008 to assess how these behavior theories and models could guide nutrition counseling and the nutrition care process [31]. Cognitive Behavioral Theory, developed by Albert Skinner, Aaron Beck, and Albert Ellis, uses directive approach that prompts and individual to explore, identify, and analyze dysfunctional patterns of action and thought. Cognitive Behavioral Theory posits that behavioral, cognitive, and emotional factors influence one another [32-35]. In the application of CBT, cognitive and behavior change strategies are used to effect dietary change. In the AND review of literature, 41 studies were reviewed that used CBT. Strong evidence existed to support the use of CBT to facilitate modification of targeted dietary habits, weight, and cardiovascular and diabetes risk factors.

The Transtheoretical Model, often referred to as the Stages of Change, was developed by James O. Prochaska. This theory describes a sequence of attitudes, intentions, and behavioral steps. These stages include precontemplation, contemplation, preparation, action, and maintenance [36,37]. The model offers specific strategies found effective at various points in the change process and suggests outcome measures including decision balance and self-efficacy. In the AND review of literature only one intervention that provided limited/weak evidence strongly supported application of the Transtheoretical model in improving health and food behavior. It was determined that additional research is needed to support the effective application of the Transtheoretical model in nutrition counseling [31].

Social Cognitive Theory, developed by Albert Bandura, posits the interaction or “reciprocal determinism” between personal determinants, environmental factors, and behavior [15]. In the AND review of literature, only two small randomly controlled trials documented use

of the SCT as the theoretical framework for nutrition intervention [31]. These studies failed to show clear effect. Additional research is needed to explore the application of SCT in nutrition counseling.

Although there was a lack of compelling evidence regarding the application of TNT and SCT, the AND still encourages professionals in dietetics to use behavior change theories and strategies to plan effective nutrition counseling interventions. Additionally, the AND promotes routine use and documentation of evidence-based interventions to garner better understanding the factors that influence nutrition-related behavior change [31]. The research presented in this thesis will add to the body of evidence evaluating the use of behavior theory in nutrition research.

Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is a behavior theory which posits that subjective norms, attitudes towards the behavior, and perceived behavioral control affect intention to perform the behavior. Subjective norms are those in an individual's life that influence the decisions the individual makes. Additionally, subjective norms are weighted by the individual's motivation to comply with those people. Attitudes are determined by the outcomes an individual associates with a behavior as well as the importance of those outcomes. Behavioral control is a product of control beliefs, both internal and external, that facilitate or inhibit a behavior. Skills and abilities to perform a behavior are internal control beliefs while opportunities and barriers are external control beliefs. Both behavioral control and intention have a direct correlation with the performance of a behavior [6, 7].

In a review of the application of 56 studies published between 1985 and 1996 that employed TPB in health-related research, Godin and Kok found that TPB variables were a good predictor of behavior [22]. On average, 41% of the variance in intention ($R^2 = 0.41$) was explained by attitudes and perceived behavioral control. Additionally, an average of 34% of the variance in behavior ($R^2 = 0.34$) was explained by TPB variables. Intention was the most important predictor of behavior, but perceived behavioral control significantly added to the prediction in half of the studies reviewed.

In a study of 162 older adults, Kim et al. found that 42% of the variance of intention to consume dairy was explained by TPB variables ($F = 40.5$, $p < 0.0001$). This study was not included in the review of TPB application conducted by Godin and Kok as it was published in 2003, after the review had been conducted. In this study, attitudes toward performing a behavior and behavioral control were related to intention whereas subjective norms were not [38].

Lien et al. demonstrated similar results in a study of fruit and vegetable intake in adolescents. Regression analysis revealed that attitudes and behavioral control had a more significant relationship with intention than did subjective norms. There was no effect of attitudes or subjective norms on behavior directly. In this study, 31% of the variance in intention to consume fruits and vegetables was explained by TPB variables [39].

In a study of soy intake in adults participating in a diabetes education program, Li et al. demonstrated that behavioral control was a significant predictor of intention to consume soy products. From a total of 233 participants, 187 participants completed both the pre and post survey. Researchers administered a 43-item questionnaire modeled in the TPB to the program participants. The questionnaire was administered at the commencement of the program during

which the participants had three sessions that included the taste-testing of soy foods. Taste and texture of soy products did not have an impact on intention to consume soy foods. Having soy recipes was the most important barrier to soy intake, followed by adequate soy health benefit knowledge, and availability and price of soy products. Health care providers and health experts were identified as important subjective norm to the participants in terms of advice about soy [40].

Social Cognitive Theory

Social Cognitive Theory (SCT) is a theoretical framework for understanding, predicting, and changing behavior [15, 41]. The SCT is built on previous research and theorization by Mill and Dollard [42] and Rotter [43] and was first known as Social Learning Theory (SLT). The SCT is based on the principles of learning within human social context [44]. It posits that human behavior is rooted in the interplay between personal, environmental, and behavioral influences. This interaction is known as reciprocal determinism. While recognizing that environmental influences shape behavior, SCT also emphasizes people's potential abilities to alter and construct environments to suit purposes they devise for themselves.

Individual-level or personal-level determinants of behavior are identified in SCT. One main personal-level determinant is outcome expectancies. Outcome expectancies are defined as "beliefs about the likelihood of various outcomes that might result from the behaviors that a person might choose to perform, and the perceived value of those outcomes." Outcome expectancies are highly subjective and deeply rooted in an individual's own perceptions of what is desirable and undesirable. Self-efficacy [44] is another personal-level determinant of

behavior. Self-efficacy is a person's beliefs about his or her capacity to influence the quality of function and events that affect his or her life.

Environmental influences on human behavior also complement personal-level determinants. An observer's environment must be conducive to support change to a new behavior [44]. One form of environmental change to modify behavior is incentive motivation. Incentive motivation is the provision of rewards or punishments for desirable or undesirable behaviors. In addition to incentive motivation, an individual's environment may be influenced by facilitation. Facilitation is the provision of new structures or resources that enable behaviors or make them easier to perform. The SCT recognizes the importance of barriers on influencing an individual's decision to perform a behavior. Environmental influences such as incentive motivation and facilitation can promote behavioral change by decreasing barriers to change. Public health campaigns may use incentive motivation and facilitators to encourage positive behavioral change. In the case of the WIC Farmers' Market Nutrition Program, the farmers' market voucher would be viewed as a facilitator to behavior change. Additionally, promotions such as doubling the worth of vouchers during certain months would be considered an incentive motivation to shop at farmers' markets to purchase fruits and vegetables. The perceived barrier of financial cost is reduced by the environmental influence of incentive motivation and facilitation.

Cahill et al. demonstrated that positive changes in SCT constructs were associated with weight loss in a sample of 58 low-income early postpartum women. Participants were recruited at WIC clinics, doctors' offices, and neighborhood centers to participate in an 8-week weight-loss intervention. Heights and weights were measured at week one and week ten of the ten week study. A pretest and post-test was administered that contained information about demographics,

the Eating Stimulus Index, a nutrition knowledge test, a food-frequency questionnaire, and a household environment survey. Linear regression analyses revealed that increases in dietary restraint, weight-management skills, and weight-loss self-efficacy and decreases in discretionary energy intake significantly predicted weight loss. Dietary restraint explained 20% of the variance in weight loss ($R^2 = 0.199$), weight management skills explained 17% of the variance in weight loss ($R^2 = 0.174$), weight loss self-efficacy explained 16% of the variance in weight loss, ($R^2 = 0.161$), and decreases in discretionary energy explained 15% of the variance in weight loss ($R^2 = 0.153$). Per hierarchical regression analysis, improvement in dietary restraint was the most significant determinant, followed by decreases in total energy intake [45].

Poddar et al. demonstrated that online interventions using SCT improved dairy intake in a sample of 211 college students. Participants were split into two groups with approximately half of the participants receiving an eight week dairy intake intervention and the other half, the comparison group, receiving an eight week stress management intervention. Baseline and follow-up data collection included dairy intake from seven day food records and SCT variables using questionnaires administered during January 2008 and April 2008. Data were analyzed using multivariate analysis of covariance, with age and sex as covariates ($P < 0.05$). Total dairy intake increased significantly in the intervention group ($P = 0.012$). Students receiving the dairy intake intervention demonstrated an increase of 0.17 servings per day and those in the comparison group reported a decrease in dairy intake of 0.13 servings per day. Students who received the dairy intake intervention also reported improved use of self-regulation strategies for consuming three servings per day of total dairy ($P = 0.000$) and low-fat dairy foods ($P = 0.002$) following the intervention [46].

Soy Nutrition

Soy foods, such as fortified soy milk and calcium-set tofu, are excellent sources of calcium and high quality protein and are free of saturated fat and cholesterol. Calcium carbonate-fortified soy milk has the same calcium bioavailability as cow's milk, although availability from tricalcium-phosphate-fortified soy milk is somewhat lower [29]. However, consumption of soy milk has a similar positive effect on lowering osteoporosis risk as does cow's milk [30]. Additionally, in 1999 [8], and later modified [9], the U.S. Food and Drug Administration (FDA) approved the health claim that consuming 25 grams of soy protein per day may reduce the risk of coronary heart disease when consumed with a diet low in saturated fat and cholesterol.

Soy Intake in Low Income Populations

In a review of literature published in the last ten years, only one study was found that examined soy consumption in low-income populations specifically. Wenrich et al. found that in a sample of 353 individuals participating in either EFNEP or FSNEP, only 13% (n=44) participants reported currently consuming soy foods in their diets. Over two-fifths had never tried soy foods (42%) and almost half of participants had tried soy foods but did not continue to consume them (46%). In this study, soy milk was the second most commonly consumed soy product (n=20) after sauces made with soy (n=43). Other commonly consumed soy products included soy cheese (n=18), nutrition drinks (n = 17), roasted soy nuts (n=15), and cooked soybeans (n=13). Participants were asked about health statements related to soy. Responses were measured on a 5-point Likert-type scale. These statements included reduction in risk for CVD, osteoporosis, and breast cancer; relief of menopausal symptoms; and capacity as an alternative to hormone replacement therapy. The average score for these five items was 3.60

(SD 0.57) indicating that the average response for these questions ranged from “don’t know” to “agree.” Most participants (75%) disagreed with the statement “I am not interested in trying soy or soy-based products”, indicating a desire to sample soy products. The main barrier to consuming soy was lack of knowledge related to how to use soy (86%). Over half of respondents indicated that soy products are too expensive (55%) [6].

Fruit and Vegetable Intake in WIC Participants

A review of literature published from 2004 to present day reveals that despite a large body of evidence linking the consumption of fruits and vegetables with positive health, the intake of these foods is low in most US diets [7, 51, 52]. Only an estimated 33% of adults in the US consume the recommended servings of fruit and 26% consume the suggested amount of vegetables [53]. Many food intake studies of the US population indicate that women, infants, and children do not consume adequate amounts of fruits and vegetables [11-14].

Three studies investigated intake of fruits and vegetables in WIC participants specifically. Ettienne-Gittens et al. examined differences in food intake between urban and rural WIC participants. Results indicated that intake of fruits and vegetables were lower than recommended. In this study, fruit intake exceeded vegetable intake with 35.8% of urban and 42.3% of rural adult women consumed fruits 2 or more times per day. Children’s rates of consuming fruits 2 or more times per day were slightly higher than adults’ rates for both urban (42.3%) and rural (42.9%) children. Child fruit intake was most commonly indicated as 2 times per day for both urban (23.5%) and rural (23.4%). Urban and rural adults in the study reported eating “vegetables not including potatoes, French fries, or potato chips” at least 3 times per day at similar rates of 15.1% and 17.0, respectively. With respect to vegetable intake, 14.6% of

urban children and 9.3% of rural children reported consuming vegetables 3 times or more per day [54].

Kong et al. demonstrated that prior to the revision of the WIC food package, diets of African Americans and Hispanic mothers and children were generally low in fruit and vegetable intake . However, Hispanic participants had a higher intake of fruit than African American participants. The national fruit recommendation was met by 40% of Hispanic respondents while only 23.6% of African Americans met this recommendation. Regarding vegetables, both groups reported lower intakes: 22.4% for Hispanics and 13.7% for African Americans [55].

Whaley et al. found that there was a small but significant increase in fruit and vegetable consumption after the 2009 implementation of the revised WIC package [43]. A collection of 3,000 English and Spanish surveys determined that mean fruit intake rose from 1.26 ± 1.52 to 1.38 ± 1.82 ($P < 0.006$) servings per day after the implementation of the new package, and mean vegetable intake rose from 1.19 ± 1.38 to 1.25 ± 1.65 ($P < 0.12$) servings per day [56].

Differences in Fruit and Vegetable Intake Between Genders

Three studies dating back to 1999 were found that examined the impact of sex on fruit and vegetable intake. These studies were conducted in adults, adolescents, and college age students. Schafer et al. found that in a sample of 155 married couples, it was demonstrated that women consumed significantly more servings of fruits per week as well as had a greater variety in both fruit and vegetable choices. It was also found that women had higher energy-adjusted nutrient intakes than did their husbands. Women met the national recommendations (Food Guide Pyramid) for fruit intake and approached the recommendation for vegetable servings. However, men did not meet national recommendations for both fruit and vegetables [57].

Granner et al. found no statistically significant difference in mean servings of fruit or vegetables between adolescent male and females. However, males reported greater peer normative beliefs and importance of social influences regarding dietary choice. Females reported a higher level of importance for avoiding weight gain. There was no difference for other variables related to fruit and vegetable intake between the two sexes: self-efficacy, health or social outcome expectations, permissive eating, food preparation, family normative beliefs, parental or peer modeling, fruit and vegetable availability, appeal and access, or snack choice [58].

When examining fruit and vegetable intake in collegiate men and women, Chung et al. revealed that women tended to meet the minimum recommended servings of fruit more frequently than men. Women were also more likely to have past successful attempts to increase intakes of both fruits and of vegetables; however, no significant difference in either of these variables was found. Men showed a higher total intake of vegetables including fried potatoes. Nearly 60% of men met the recommended serving of three vegetables per day, and 0.70 of that intake was fried potatoes. When intake was adjusted for fried potatoes, men averaged 3.2 ± 2.6 servings per day and women 2.5 ± 1.5 , indicating a significantly higher vegetable intake for men [59].

WIC Farmers' Market Nutrition Program

Several studies have used the Farmers' Market Nutrition Program (FMNP) as an intervention intended to increase the intake of fruits and vegetables [60,61]. Two studies, one by Herman et al. published in 2008 and one by Kropf et al. published in 2007, were examined. Herman et al. found that FMNP participants showed an increase of 1.4 servings per 1000kcal

from baseline to the end of intervention compared with controls, and supermarket participants showed an increase of 0.8 servings per 1000kcal [60]. A limitation of making inferences to the WIC population nationwide is that this study was conducted in California where there is a longer growing season for agriculture. Although the results showed a significant increase in intake of fruits and vegetables in FMNP participants, it is unlikely that participants nationwide would experience these positive results to the same extent due to a generally shorter growing season in regions of the United States that are more affected by inclement weather.

Kropf et al. examined food security status and produce intake in the WIC population using a mail-based questionnaire to determine the differences between fruit and vegetable consumption in FMNP participants and non-participants. There was a significantly higher increase in daily vegetable intake in the FMNP group with no difference in daily fruit intake, but no other variations in behaviors related to fruit and vegetable intake (fruit and vegetable variety, eating two or more servings of vegetables at a main meal, and eating fruits and vegetables as snacks) were significantly different. With respect to psychosocial variables, women in the FMNP group had higher scores for perceived benefit, perceived diet quality, and Stages of Change continuums for both fruit and vegetable intake [61].

Summary

The WIC program serves a diverse population of low-income women and children. The one study to date that examined soy consumption in low-income participants demonstrated that only a small percentage of the sample consumed soy foods and almost half had never tried soy products. Soy foods, such as fortified soy milk and calcium-set tofu, are excellent sources of calcium and high quality protein and are free of saturated fat and cholesterol. Calcium and

protein are key nutrients in the growth and development of infants and children, a group that represents 76% of the WIC population nationally. Soy milk has a similar positive effect on lowering osteoporosis risk as does cow's milk. Women are at an increased risk for osteoporosis. Participants of the WIC program could benefit from the effects of drinking soy milk on reducing the risk for osteoporosis.

Many studies have shown that women, infants, and children do not consume adequate amounts of fruits and vegetables. Three studies investigating WIC participants specifically demonstrated that the majority of participants did not meet national recommendations for fruit and vegetable intake. There is a large body of evidence that links fruit and vegetable consumption to good health. One study showed that participation in the Farmers' Market Nutrition program was associated with an increase in intake of both fruits and vegetables and another study linked participation in the FMNP with an increased intake of vegetables.

Behavior theories offer systematic explanations for nutrition-related behaviors. The AND promotes the use of behavior theory in the development of nutrition messages and dietary interventions. The TPB has been shown as an effective model for predicting intention to consume dairy, fruits and vegetables, soy products, and health-related behaviors. The SCT constructs have been shown to predict weight loss in postpartum women and interventions based in SCT have effectively increased dairy intake in college students.

Additional research is needed to examine the application of behavior theory in understanding the intricacies of nutrition-related behavior. The TPB and SCT were employed in this research to assess the variety of factors that impact the intake of soy milk and fruits and vegetables in Champaign County WIC participants.

The research presented in this thesis will add to the body of evidence evaluating the use of behavior theory in nutrition research.

References

1. Oliveira V, Frazão E. The WIC Program Background, Trends, and Economic Issues, 2009 Edition. Washington D.C.:United States Department of Agriculture and Economic Research Service, ERR-73;2009.
2. A Short History of the Supplemental Nutrition Assistance Program. United States Department of Agriculture Food and Nutrition Service. Last modified 01/08/2013.
<http://www.fns.usda.gov/snap/rules/Legislation/about.htm>
3. Supplemental Nutrition Assistance Program Eligible Food Items. United States Department of Agriculture Food and Nutrition Service. Last modified 02/14/2013.
<http://www.fns.usda.gov/snap/retailers/eligible.htm>
4. Food and Nutrition Board, Institute of Medicine. WIC Food Packages: Time for a Change; Washington, D.C.: The National Academy Press; 2006.
5. U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2005. 6th Edition, Washington, D.C.: U.S. Government Printing Office; January 2005.
6. Wenrich TR, Cason KL. Consumption and perceptions of soy among low-income adults J Nutr Educ Behav 2004; 36 (3): 140-5.
7. Ajzen I. Attitudes, Personality and Behavior. Chicago, IL: Dorsey Press; 1988.
8. Ajzen I. The Theory of Planned Behavior. Organ Behav Hum Decision Processes. 1991;50:179-211.
9. Godin G, Kok G. The theory of planned behavior: a review of its applications to health-related behaviors. Am J Health Promot 1996; 11(2): 87-98.
10. Kim K, Reicks M, Sjoberg S. Applying the theory of planned behavior to predict dairy product consumption by older adults. J Nutr Educ Behav 2003;35(6): 294-301.

11. Faith MS, Dennison BA, Edmunds LS, Stratton HH. Fruit juice intake predicts increased adiposity gain in children from low-income families: Weight status-by-environment interaction. *Pediatrics*, 2006; 118: 2066–75.
12. Briefel RR, Reidy K, Karwe V, Devaney B. Feeding infants and toddlers study: Improvements needed in meeting infant feeding recommendations. *J Am Diet Assoc* 2004; 104(1): S31–7.
13. Fox MK, Pac S, Devaney B, Jankowski L. Feeding infants and toddlers study: What foods are infants and toddlers eating? *J Am Diet Assoc* 2004; 104(1): S22-30.
14. Papas MA, Hurley KM, Quigg AM, Oberlander SE, Black MM. Low-income African American adolescent mothers and their toddlers exhibit similar dietary consumption patterns. *J Nutr Educ Behav* 2009; 41(2): 87-94.
15. Bandura A. *Social Foundations of Thought and Action*. Newark, NJ: Prentice Hall; 1986.
16. USDA, Food and Nutrition Service. *History of WIC, 1974-1999, 25th Anniversary: Activities Which Led to WIC's Establishment*, 1999.
17. White House Conference on Food, Nutrition and Health. *Final Report, 1970*. Summary and full report are available at www.nns.nih.gov/1969/conference.htm.
18. Institute of Medicine. *WIC Nutritional Risk Criteria: A Scientific Assessment*, Washington, DC: National Academy Press, 1996.
19. U.S. General Accounting Office. *The Special Supplemental Food Program for Women, Infants, and Children (WIC)—How Can It Work Better?* report by the Comptroller General, CED-79-55, February 1979.

20. U.S. General Accounting Office. Need to Foster Optimal Use of Resources in the Special Supplemental Food Program for Women, Infants, and Children (WIC), GAO/RCED-85-105, September 1985.
21. Frequently Asked Questions about WIC. United States Department of Agriculture Food and Nutrition Service. Last modified 11/20/12. http://www.fns.usda.gov/wic/faqs/faq.htm#3_
22. WIC at a Glance. United States Department of Agriculture Food and Nutrition Service. Last modified 11/20/2012. http://www.fns.usda.gov/wic/faqs/faq.htm#3_
23. IOM (Institute of Medicine). 2011. Planning a WIC Research Agenda: Workshop Summary. Washington, DC: The National Academies Press.
24. Food Research and Action Center. Farm Bill 2013. [Internet] [Cited March 28, 2013]. Available from: <http://frac.org/leg-act-center/farm-bill-2012/#house>
25. National WIC Association. Senate Appropriations Committee approves agriculture appropriations bill that fully funds WIC! [Internet] [Cited March 28, 2013]. <http://www.nwica.org/?q=advocacy/d14/d51>
26. Zenk SN, Odoms-Young A, Powell LM, Campbell RT, Block D, Chavez N. Fruit and vegetable availability and selection: federal food package revisions, 2009. *Am J Prev Med.* 2012 Oct;43(4):423-8.
27. Havens EK, Martin, KS, Yan J, Dauser-Forrest D, Ferris AM. Federal nutrition program changes and healthy food availability. *Am J Prev Med.* 2012 Oct: 43(4): 419-22.
28. U.S. Department of Agriculture, Food and Nutrition Service, Office of Research and Analysis, national survey of WIC participants II: participant characteristics report, by Daniel M. Geller, Ph.D., et al. Project Officers: Sheku G. Kamara, Karen Castellanos-Brown, Alexandria, VA: 2012.

29. Contento IR. Nutrition education: linking research, theory, and practice. *Asia Pac J Clin Nutr* 2008;17(1): 176-9.
30. Freeland-Graves JH, Nitzke S. Position of the academy of nutrition and dietetics: total approach to healthy eating. *J. Acad. Nutr. Diet* 2013; 113(2): 307-16.
31. Spahn JM, Reeves RS, Keim KS, Laquatra I, Kellogg M, Jortberg B, Clark NA. State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change, *J Am Diet Assoc* 2010; 110(6): 879-91.
32. Skinner BF. *The Behavior of Organisms*. New York, NY: Appleton-Century-Crofts; 1938.
33. Skinner BF. *Contingencies of Reinforcement: A Theoretical Analysis*. New York, NY: Appleton-Century-Crofts; 1969.
34. Beck A. *Cognitive Therapy and the Emotional Disorders*. New York, NY: Penguin; 1993.
35. Ellis A. *Overcoming Destructive Beliefs, Feelings, and Behaviors: New Directions for Rational Emotive Behavior Therapy*. Amherst, NY: Prometheus Books; 2001.
36. Greene GW, Rossi SR, Rossi JS, Velicer WF, Fava JL, Prochaska JO. Dietary applications of the stages of change model. *J Am Diet Assoc* 1999; 99: 673-8.
37. Kristal AR, Glanz K, Curry S, Patterson RE. How can stage of change be best used in dietary interventions? *J Am Diet Assoc* 1999; 99: 679–84.
38. Kim K, Reicks M, Sjoberg S. Applying the theory of planned behavior to predict dairy product consumption by older adults. *J Nutr Educ Behav* 2003;35(6): 294-301.
39. Lien N, Lytle LA, Komro KA. Applying theory of planned behavior to fruit and vegetable consumption of young adolescents. *Am J Health Promot* 2002; 16(4):189-97.

40. Li S, Camp S, Finck J, Winter M, Chapman-Novakofski KM. Behavioral control is an important predictor of soy intake in adults in the USA concerned about diabetes. *Asia Pac J Clin Nutr* 2010;19 (3):358-364.
41. Glanz K, Rimer B, Viswanath K. *Health Behavior and Health Education, Theory Research and Practice*, 4th edition:. San Francisco, CA.: Jossey-Bass, 2008.
42. Miller NE, Dollard J. *Social Learning and Imitation*. New Haven, Conn.: Yale University Press, 1941.
43. Rotter JB. *Social Learning and Clinical Psychology*. Englewood Cliffs, NJ.: Prentice Hall, 1954.
44. Bandura A. *Social Learning Theory*. Englewood Cliffs, N.J.: Prentice Hall. 1977.
45. Cahill JM, Freeland-Graves JH, Shah BS, Lu H, Reese Pepper M. Determinants of weight loss after an intervention in low-income women in early postpartum . *J Am Coll Nutr* 2012; 31(2): 133-43.
46. Poddar KH, Hosig KW, Anderson-Bill ES, Nickols-Richardson SM, Duncan SE. Dairy intake and related self-regulation improved in college students using online nutrition education. *J Acad Nutr Diet*. 2012;112:1976-86.
47. Zhao Y, Martin BR, Weaver CM. Calcium bioavailability of calcium carbonate fortified soymilk is equivalent to cow's milk in young women. *J Nutr* 2005;135:2379-82.
48. Matthews VL, Knutsen SF, Beeson WL, Fraser GE. Soy milk and dairy consumption is independently associated with ultrasound attenuation of the heel bone among postmenopausal women: the Adventist Health Study-2. *Nutr Res* 2011 Oct;31:766-75.
49. U.S. Food and Drug Administration. Federal Register. Food labeling: Health claims; soy protein and coronary heart disease, final rule. [Internet] October 26, 1999. [Cited February 21,

2012]. Available from:

<http://www.fda.gov/food/labelingnutrition/labelclaims/healthclaimsmeetingsignificantscientificagreements/ucm074740.htm>.

50. U.S. Food and Drug Administration. Code of Federal Regulations Title 21, volume 2.

[Internet] revised April 2011. [Cited February 21, 2012]. Available from:

<http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=101.82> . Accessed February 21, 2012.

51. Casagrande SS, Wang Y, Anderson C, Gary TL. Have Americans increased their fruit and vegetable intake? The trends between 1988 and 2002. *Am J Prev Med*. 2007;32(4):257-263.

52. Arimond M, Ruel MT. Dietary diversity is associated with child nutritional status: Evidence from 11 demographic and health surveys. *J Nutr*, 2004; 134: 2579–85.

53. Grimm K, Blanck H, Scanlon K, Moore L, Grunner-Strawn L, Foltz J. State-specific trends in fruit and vegetable consumption among adults—United States, 2000-2009. *Morb Mortal Wkly Rep* 2010; 59: 1125–30.

54. Ettienne-Gittens R, Mckyer E, Lisako J, Odum M, Diep CS, Li Y, Girimaji A, Murano PS. Rural versus Urban Texas WIC Participants' Fruit and Vegetable Consumption. *Am J Health Behav* 2013; 37(1): 130-41.

55. Kong A, Odoms-Young AM, Schiffer LA, Berbaum ML, Porter SJ, Blumstein L, Fitzgibbon ML. Racial/ethnic differences in dietary intake among WIC families prior to food package revisions. *J Nutr Educ Behav* 2013; 45(1): 39.

56. Whaley SE, Ritchie LD, Spector P, Gomez J. Revised WIC food package improves diets of WIC families. *J Nutr Educ Behav* 2012; 44(3): 204.

57. Schafer E, Schafer RB, Keith PM, Böse J. Self-esteem and fruit and vegetable intake in women and men J Nutr Educ Behav 1999; 31(3): 153-160.
58. Granner ML, Sargent RG, Calderon KS, Hussey JR, Evans AE, Watkins KW. Factors of fruit and vegetable intake by race, gender, and age among young adolescents. J Nutr Educ Behav 2004;36:173-180.
59. Chung SJ, Hoerr SL. Predictors of fruit and vegetable intakes in young adults by gender. Nutr Res 2005; 25: 453-63.
60. Herman DR, Harrison GG, Afifi AA, Jenks E. Effect of a targeted subsidy on intake of fruits and vegetables among low-income women in the Special Supplemental Nutrition Program for Women, Infants, and Children. Am J Public Health 2008; 98(1): 98-105.
61. Kropf M, Holben D, Holcomb J, Anderson H. Food security status and produce intake and behaviors of Special Supplemental Nutrition Program for Women, Infants, and Children and Farmers' Market Nutrition Program participants. J Am Diet Assoc 2007; 107(11): 1903-08.

Chapter 3: Hypotheses

Women Infant and Children Program Participants' Beliefs and Consumption of Soy Milk: Application of the Theory of Planned Behavior

Wenrich et al. found that in a sample of 353 individuals participating in either EFNEP or FSNEP, only 13% (n=44) participants reported currently consuming soy foods in their diets. Over two-fifths had never tried soy foods (42%) and almost half of participants had tried soy foods but did not continue to consume them (46%) [1]. Several studies have shown a positive correlation between Theory of Planned Behavior variables and intention to perform a behavior [2-6].

- It is hypothesized that the percentage of Champaign County WIC participants who drink soy milk is low, but there is a positive correlation between Theory of Planned Behavior variables and intention to consume soy milk.
- The null hypothesis is that there is no correlation between TPB variables and intention to consume soy milk.

Woman Infant and Children Program Participants Usage of and Attitudes Towards The WIC Farmers' Market Nutrition Program: Application of the Social Cognitive Theory

Part I: Cost of Fruits and Vegetables Found at Farmers' Markets versus Commercial Grocery Stores

Some Champaign County residents believe that the cost of fruits and vegetables sold at farmers' markets is higher than those sold at commercial grocery stores; however, no research to date has examined this cost difference in Champaign County.

- It is hypothesized that the financial cost of fruits and vegetables sold at farmers markets is greater than fruits and vegetables sold at commercial grocery stores.
- The null hypothesis is that there is no difference in cost of fruits and vegetables sold at farmers' markets and those sold commercial grocery stores or that the cost of fruits and vegetables is higher at commercial grocery stores than at farmers' markets.

Part II: Intake of Fruits and Vegetables and Social Cognitive Theory Constructs Associated with Intake of Fruits and Vegetables in WIC Participants

It has been demonstrated that women, infants, and children do not meet the national recommendation for fruit and vegetable intake [7-10]. Research has indicated that there is a positive association between Social Cognitive Theory (SCT) constructs and diet-related behavior [11, 12].

- It is hypothesized that fruit and vegetable intake of Champaign County WIC participants is lower than the national recommendation, but WIC participants who participated in the FMNP will have more positive psychosocial predictors of fruit and vegetable intake and a higher intake of fruits and vegetables than WIC participants not participating in the FMNP.
- The null hypothesis is that there is no difference in psychosocial predictors of fruit and vegetable intake between FMNP participants and non-FMNP participants, and that the fruit and vegetable intake of FMNP participants is less than or equal to non-FMNP participants.

The following chapters describe the methodology used to explore these hypotheses, the results that emerged, and a discussion of relevant literature.

References

1. Wenrich TR, Cason KL. Consumption and perceptions of soy among low-income adults
J Nutr Educ Behav 2004; 36 (3): 140-5.
2. Ajzen I. Attitudes, Personality and Behavior. Chicago, IL: Dorsey Press; 1988.
3. Ajzen I. The Theory of Planned Behavior. Organ Behav Hum Decision Processes.
1991;50:179-211.
4. Godin G, Kok G. The theory of planned behavior: a review of its applications to health-
related behaviors. Am J Health Promot 1996; 11(2): 87-98.
5. Kim K, Reicks M, Sjoberg S. Applying the theory of planned behavior to predict dairy
product consumption by older adults. J Nutr Educ Behav 2003;35(6): 294-301.
6. Li S, Camp S, Finck J, Winter M, Chapman-Novakofski KM. Behavioral control is an
important predictor of soy intake in adults in the USA concerned about diabetes. Asia Pac
J Clin Nutr 2010;19 (3):358-364.
7. Faith MS, Dennison BA, Edmunds LS, Stratton HH. Fruit juice intake predicts increased
adiposity gain in children from low-income families: Weight status-by-environment
interaction. Pediatrics, 2006; 118: 2066–75.
8. Briefel RR, Reidy K, Karwe V, Devaney B. Feeding infants and toddlers study:
Improvements needed in meeting infant feeding recommendations. J Am Diet Assoc
2004; 104(1): S31–7.
9. Fox MK, Pac S, Devaney B, Jankowski L. Feeding infants and toddlers study: What
foods are infants and toddlers eating? J Am Diet Assoc 2004; 104(1): S22-30.

10. Papas MA, Hurley KM, Quigg AM, Oberlander SE, Black MM. Low-income African American adolescent mothers and their toddlers exhibit similar dietary consumption patterns. *J Nutr Educ Behav* 2009; 41(2): 87-94.
11. Cahill JM, Freeland-Graves JH, Shah BS, Lu H, Reese Pepper M. Determinants of weight loss after an intervention in low-income women in early postpartum. *J Am Coll Nutr* 2012; 31(2): 133-43.
12. Poddar KH, Hosig KW, Anderson-Bill ES, Nickols-Richardson SM, Duncan SE. Dairy intake and related self-regulation improved in college students using online nutrition education. *J Acad Nutr Diet*. 2012;112:1976-86.

Chapter 4: Women Infant and Children Program Participants' Beliefs and Consumption of Soy Milk: Application of the Theory of Planned Behavior

Introduction

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is the third largest food assistance program administered by the United States Department of Agriculture (USDA)[1]. The program served approximately 9.3 million low-income women, infants, and children younger than 5 years who were at nutritional risk during the final quarter of fiscal year 2009. Women and children participating in the WIC program receive vouchers from local clinics for supplemental food as well as nutrition and breastfeeding education and referrals to health and social services.

For the fiscal year 2010, Congress appropriated \$7.3 billion to cover WIC programs in all 50 states and the District of Columbia, as well as in tribal organizations and select American commonwealths. Ninety state agencies administer the program through approximately 2,200 local agencies and 9,000 clinic sites. Congress also appropriated \$15 million for research related to the program for fiscal year 2010, which ended a long period in which there was very little funding for WIC research [3].

In October 2009, the USDA issued regulations that substantially revised the WIC food “package.” A package does not represent actual food, but foods included on a WIC-approved list. These revisions were the first major change in the food package since the program’s inception in 1972 [1]. The report *WIC Food Packages: Time for a Change* issued by the Institute of Medicine [4] largely influenced the changes to WIC-approved foods by bringing the packages into alignment with the recommendations from the 2005 Dietary Guidelines for Americans [5].

These revised packages include more fruits, vegetables, whole grains, placed priority on breastfeeding, and include soy foods [3].

Soy foods, such as fortified soy milk and calcium-set tofu, are excellent sources of calcium and high quality protein and are free of saturated fat and cholesterol. Calcium carbonate-fortified soy milk has the same calcium bioavailability as cow's milk, although availability from tricalcium-phosphate-fortified soy milk is somewhat lower [6]. Consumption of soy milk has a similar positive effect on lowering osteoporosis risk as does cow's milk [7]. Additionally, in 1999 [8], and later modified [9], the U.S. Food and Drug Administration (FDA) approved the health claim that consuming 25 grams of soy protein per day may reduce the risk of coronary heart disease, when consumed as part of a diet low in saturated fat and cholesterol. The addition of soy foods to WIC packages is important because it expands options for milk for women and children, allows for cultural food preferences, and provides more choices for vegetarians/vegans and lactose intolerant individuals [10]. By including these alternative sources of calcium in the WIC food packages, the USDA has created a more flexible program that better serves the diverse WIC population. Before the 2009 revision of the WIC food packages, soy beverages were limited to infant formula and required a physician's documentation that the patient should not consume cow's milk [11].

Twenty-six states and the District of Columbia have approved soy foods for their state WIC food packages. However, soy milk often requires a physician's authorization stating that there is a medical need before it can be an approved food for children. An additional 22 states have approved soy foods with certain restrictions. Soy beverages that are approved by WIC must be fortified to meet the many nutrient levels, including 276 mg calcium per cup and 100 IU vitamin D per cup (**Table 4.1**).

Deciding to choose particular foods is a result of many psychosocial variables. To explain food-related behavior, numerous theories have been employed. One such theory, the Theory of Planned Behavior (TPB), states that attitudes, subjective norms surrounding the performance of the behavior, and perceived behavioral control predict the intention of an individual to perform a behavior (**Figure 4.1**). This theory was chosen as a foundation for the soy milk questionnaire as it is appropriate for the analysis of discrete behaviors such as the intake of a specific food. Attitudes towards performing a behavior are based on behavioral beliefs. Subjective norm is the group of people an individual perceives as important when deciding whether to perform a behavior. Subjective norms are weighted by the normative beliefs- the motivation of an individual to conform to that group. Perceived behavior control is a measurement of how difficult the individual perceives it to be to perform the behavior and can include several perspectives on why or to what extent the behavior is difficult to [12,13]. The TPB has been used to identify mediators of intake of several foods and supplements, including novel foods enriched with omega-3 fatty acids [14], sustainably-produced foods [15], multivitamin use [16], fish consumption [17], family meal frequency [18], as well as soy foods [19,20].

Knowledge of the consumption patterns of WIC participants concerning soy milk and soy foods could impact the development of guidance relative to the inclusion of soy products in WIC supplemental packages and educational programs about soy foods. In addition, increased intake of soy milk could improve the nutritional status for those whose dairy or calcium-rich food intake is low.

Objective

The objectives of this study were to investigate adult, female WIC participants intake and intention to consume soy milk using the TPB and to identify key TPB variables that could be used to strengthen nutrition education efforts.

Hypothesis

The percentage of Champaign County WIC participants who drink soy milk is low, but there is a there is a positive correlation between TPB variables and intention to consume soy milk. The null hypothesis is that there is no correlation between TPB variables and intention to consume soy milk.

Methods

A 2004 soy intake survey using the TPB [19] that was developed for use with Central Illinois women who had a wide range of socioeconomic levels was modified to reflect the WIC population. Questions related to WIC enrollment and demographics were added and the language was changed to focus on soy milk rather than all soy foods. Five questions addressed the intake of soy foods (soy milk, veggie burgers and hotdogs, soy baked products, tofu, and edamame), and the remaining questions were related to soy milk specifically. There were 29 questions in addition to demographic items (**Table 4.2**). Cronbach alpha for constructs of the TPB (**Table 4.3**) were strong with one exception . Internal reliability for perceived behavioral control was not strong when the four items were grouped (0.57 and 0.59, for sites 1 and 2, respectively), but rose to a stronger level when split into two groups to reflect two concepts: outcomes expectancies (perceived knowledge of soy milk use and benefits) and perceived

environment (availability and expense). Outcome expectancies and perceived environment were multiplied by control beliefs to create two new variables: environmental beliefs and outcome expectancy beliefs. Normative beliefs, or the motivation to comply with others' desires, was multiplied by subjective norm to create the variable subjective norm beliefs [12]. All survey items were measured on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree", "extremely unlikely" to "extremely likely" and "extremely unpleasant" to "extremely pleasant." Where Cronbach alpha was ≥ 0.70 for multiple items within one behavioral construct, a composite value was derived and used in analyses [21].

Subjects and Recruitment

The study was approved by the University Institutional Review Board who deemed it exempt from requiring informed consent of participants. A sheet providing information pertaining to the purpose of the study was provided to participants at the time of the survey. Two WIC Directors were invited to participate in the study, chosen because they had worked with the investigators previously on other projects, agreed to participate, and would have a fairly large client pool to recruit from, (active rosters of 4,400 participants enrolled at site 1 and 1,370 participants enrolled at site 2). At site 1, an investigator was present in the waiting area several times per week to recruit participants for the self-administered survey. At site 2, WIC staff offered surveys to clients at the time of their appointment. Recruitment and data collection did not exceed 3 months to prevent duplication in surveys. The 3-month period reflects the approximate time between routine clinic visits. After completing the surveys, participants could choose to be entered into a drawing by providing their contact information.

Data Analysis

Data collected were entered into SPSS (version 18, Chicago, IL, 2009) and Microsoft Excel (Redmond, WA, 2010) for analysis. Distributions for demographics were not normally distributed as tested by kurtosis and skewness. Gender and age were normally distributed between the two sites. Data were significantly different ($P < 0.05$, Mann-Whitney U Test) for the two sites based on race/ethnicity and education. Therefore, separate analyses were conducted for the two clinics. The effects of age, education, and ethnicity on TPB variables were examined using Kruskal-Wallis independent analyses. Wilcoxon tests were used to determine significant differences between those responding in the affirmative versus negative for whether they thought soy milk was an approved WIC food. Age categories were based on quartile distribution: Age category one (15-21 years), category 2 (22-25), category 3 (26-32), and category 4 (>33). As responses were measured on 7-point Likert scale with neutral responses represented as 4, neutral responses were omitted from the calculation of composites in order to obtain an accurate representation of participants' beliefs. Composites were therefore measured on the modified 6-point scale that ranged from extremely negative to extremely positive. To help clearly explain the study results, Likert responses were combined into affirmative and negative groups and not reported in the detail of the original scale; however, responses for items can be found in the original 7-point scale in **Tables 4.7-4.11**. When calculating composites, scales were reversed for one item pertaining to attitudes (soy milk may cause upset stomach) and the two items comprising the perceived environment construct. that did not originally utilize a negative to positive spectrum. Bivariate correlations determined associations between TPB constructs and behavioral intention. Stepwise regression analyses were used to determine if the variance in intention could be explained by other TPB variables.

Results

Most of the respondents in both counties were less than 34 years old (median for each county = 26 years). Participants were primarily non-Hispanic white at site 2 (80%); however, site 1 participants were more diverse, with 42% non-Hispanic white and 35% African American (**Table 4.4**). Most at both sites did their own shopping and cooking. Few were vegetarian, had allergies to soy, or had children with allergies to soy. Approximately 40% of respondents at each site did not think soy was a WIC-approved food.

The survey used a 7-point Likert scale with 4 representing a neutral response. To accurately analyze constructs in composite, neutral responses were omitted from analysis. For ease of reporting results, responses were combined into negative and affirmative groups. Frequencies for questions in their original scale can be found in **Tables 4.7-11**.

Intake of soy products was low. Most (64% site 1; 80% site 2) reported to rarely or never consume soy products. Similarly, 78% and 92% at sites 1 and 2, respectively, claimed to rarely or never drink soy milk in particular (**Tables 4.5, 4.6**). There were 112 participants at site 1 (n=315) and 13 at site 2 (n=65) who reported consuming soy products.

Attitudes relating to soy milk were positive with a composite median of 5.0 on a scale of 1-6 at both sites 1 and 2 (**Table 4.5**). Roughly half of participants at site 1 and site indicated that the flavor of soy milk is pleasant, 49.3% and 50.1% respectively (**Table 4.10**). With respect to the texture, 45.2% of participants at site 1 and 46.4% at site 2 responded that the texture of soy milk is pleasant (**Table 4.11**).

The composite for subjective norm beliefs was measured on a scale of 1-6. The median response was 3.0 at site 1 and 2.0 at site 2, indicating that participants did not believe that healthcare professionals or their families thought they should consume soy milk (**Table 4.5**).

However, most participants wanted to comply with what their own particular health care providers instructed them to do (1 of 3 items in normative beliefs), and most felt that they wanted to comply with what health care providers in general wanted them to do. About half to two-thirds (depending on site) reported not knowing what their health care provider thought about soy milk. Forty percent of participants at site 1 agreed health care experts would think people should drink soy milk whereas 50% of participants at site 2 thought that health care experts neither agreed nor disagreed that they should consume soy milk. The other two items measuring normative beliefs related to health experts and family/friends were primarily neutral.

Medians measuring perceived behavioral control to consume soy milk, specifically regarding environmental beliefs and outcome expectancy beliefs, were also low (**Table 4.5**). At site 1, 42% of participants said that the price of soy milk would make it for them to purchase it. However, at site 2, 44% indicated that price did not affect their decision. When asked about the availability of soy milk, 35% of site 1 participants and 43% of site 2 participants stated that the availability of soy milk did not make it more likely or less likely for them to consume it. Most in each county felt they did not know about the health benefits of soy milk (64%; 74%) and did not know how to cook with it (69%; 74%).

Intentions were significantly correlated with intakes for both sites (**Table 4.12, Figures 4.2, 4.3**). At site 1, the strongest correlations with intention were with environmental beliefs, expectancy beliefs, attitudes, and subjective norm beliefs perceived environment, and control beliefs ($p < 0.01$). At site 2, correlations existed between intention and intake, environmental beliefs, and expectancy beliefs ($p < 0.01$).

Upon examining the participant's education level and intention (Kruskal-Wallis), there was a significant difference in site 1 data ($p = 0.007$) in intention to consume soy milk between

those with less than high school, high school, college, or higher than college levels of education. Differences among education levels at site 2 were not significant, perhaps because the majority were at the high school education level ($p=0.352$).

Statistically significant equations were found using stepwise regression to predict the variance in intention for both counties. At site 1, 30% of the variance in intention to consume soy milk was explained by expectancy beliefs ($B= 0.422$) and subjective norm beliefs ($B= 0.255$) ($p<0.0001$). At site 2, 40% of the variance in intention was explained by expectancy beliefs ($B= 0.638$) ($p<0.0001$) (**Table 4.13**). Analysis by Kruskal-Wallis test for non-parametric data showed that the distribution of intake of soy products was significantly different between the 2 sites ($p=0.028$), with site 2 soy consumers eating soy more frequently. However, no significant differences existed between sites for intention, attitudes, environmental beliefs, and expectancy beliefs related to soy intake. Distributions of intake, intention, and subjective norm beliefs were statistically different among ethnicities at site 1; however, data for attitudes, environmental beliefs, and expectancy beliefs were not different between the ethnicities. Tests to determine significant difference were not conducted at site 2 due to the high rate of white participants (80%).

Discussion

As reported in other U.S. studies, intake of soy, in this case soy milk, was infrequent. A survey of Expanded Food and Nutrition Education Program (EFNEP) participants in Pennsylvania found only 13% of participants consuming soy [22]. Intention to consume soymilk was generally negative, similar to a survey of attitudes towards changes in the WIC food basket in Maryland, where few consumed soy (13%) and most were not interested in trying those foods

in the future [23]. Most of those respondents consumed whole milk (56%) and were not interested in low-fat milk. However, intention to consume soy has been shown to improve after tasting and education about the products [20]. Thus, education about the availability of new food products in the WIC food basket may help increase awareness and acceptability. Nutrition education has been shown to move women through the stages of change toward more healthful diets [24].

Regarding participants' beliefs and subjective norms, the current study had similar findings to a study of North Carolina WIC participants who strongly agreed with the statement "I would eat nuts on most days of a week if my doctor recommended me to do so" [26]. Participants in this study, much like participants in the current study examining WIC participants and soy milk, had a low intake (7%) of the food of interest- nuts. This indicates that education about the benefits of soy delivered by medical professionals and WIC nutritionists could increase the percentage of Champaign County WIC participants who consume soy milk.

According to the correlation analysis, soy consumption behavior was positively associated with intention. Thus, women with stronger intentions were more likely to consume more soy milk. This has been shown previously with a convenience sample of African American and non-Hispanic white women. Rah et al [19] reported that intake, intention, beliefs about taste and health benefits, and control beliefs were not statistically different between African American and non-Hispanic white participants who were surveyed concerning their soy food intake. However, in the current sample of WIC participants, data for intake, intention, subjective norm beliefs, flavor and texture, and control beliefs were statistically different between ethnicities, whereas data for health beliefs (outcome expectancies and attitudes) were similar to those of Rah et al.

This was a cross-sectional survey to gauge intake and variables that may impact intake of soy milk in WIC participants in Illinois. Previous work in Central Illinois women of a wide range of socioeconomic levels found that attitudes towards taste played a significant role in predicting intention to consume soy milk. If these results could be expanded to low-income women in Central Illinois, changing the taste-related attitude may be important in planning programs to increase acceptance of soy in WIC participants [19]. Although taste testing is sometimes used to introduce new or novel foods, taste testing does not always change behavior. In this study, over 90% of participants at each site indicated that the taste of soy milk is pleasant. Indeed, a study providing yogurt as part of the WIC allowance with an educational component compared to a control group found no significant difference in yogurt intake ($p=0.09$). In another study, participants attending a diabetes education class were given a variety of soy products to taste. Although participants most tasted the samples, flavor and textures attitudes had no impact on intention to consume soy foods [20]. In that study, subjective norm and behavioral control were most important determinants in intention to consume soy. In the present study, subjective norm beliefs were important determinants of intention to consume soy milk. Perceived environment, as part of behavioral control, also was a significant factor for both sites, as a whole or when evaluated based on ethnicity. However, attitudes and control beliefs have been shown to be more easily influenced through education than normative beliefs in regards to dairy or calcium-rich foods intake [27,28]. Many, but not all, of the current participants felt that soy milk was a healthy food. Other studies have found that perceived food healthiness can affect intake of that food [29].

Schyver and Smith revealed that barriers to soy consumption in soy consumers and non-consumers are its unfamiliarity, negative image, and lack of preparation skills, which is similar

to the present study. However, that those who did not consume soy expressed interest in learning how to prepare soy foods so they would taste good [25], whereas the current study participants did not explore interests in this area. These barriers can be addressed through WIC education that emphasizes how to incorporate soy foods into recipes and the diet.

There are several limitations to consider in this study, including the smaller sample size in site 2 due to a shorter period of data collection. The discrepancy between data collection periods at the two sites is attributed to a misunderstanding between the researchers and the director of the site 2 WIC clinic. The survey was a convenience sample that consisted of mostly African American and non-Hispanic white participants and cannot be generalized to WIC populations with greater racial diversity. Although the survey had been previously used in a Central Illinois population, this population included woman of various socioeconomic backgrounds. The survey had not been pilot-tested for health literacy for use in a low-income population specifically. The soy consumption data was based on self-reported frequency of intake with the assumption that participants were using standard serving sizes and may not represent actual quantities of soy products consumed. In addition, cow's milk intake was not evaluated, so potential improvement in calcium intake with soy milk consumption cannot be estimated.

There was a high rate of neutral responses and participants indicating that they “did not know” about items pertaining to soy milk. This indicates a need to conduct focus groups to garner information regarding WIC participants' knowledge of soy milk, what they want in food packages, and what they would like to know about soy milk. At the time of this study, there were two substantial barriers to the procurement of soy milk using WIC vouchers in Illinois. Only one brand of soy milk, 8th Continent Original, was WIC-approved [30]. This creates an

environmental barrier for participants who have access to smaller grocers who sell do not carry a variety of soy milk brands. In addition to the restrictive nature of the soy milk voucher itself, a physician's authorization was required to purchase soy milk rather than cow's milk in the state. Criteria to for physician's approval included vegan diet or religious observance, milk protein allergy, or severe lactose maldigestion in which participants cannot tolerate lactose free milk [31]. Physician authorization and specific inclusion criteria create additional barriers for a WIC participant who wishes to use soy milk but has limited access to healthcare or does not meet inclusion criteria.

Positive correlations between TPB variables and intake indicate that WIC participants should be educated on the availability of soy in WIC packages and WIC nutritionists should emphasize its health benefits and information on how to use soy in recipes. In addition, more research is needed on soy intake among WIC participants, its impact on calcium intake, and the role soy milk may play in addressing lactose intolerance, vegetarian diets, and taste preferences.

Tables

Table 4.1 Required Nutrient Composition of Soy Milk Compared to Cow's Milk*

	Calcium	Protein	Vitamin A	Vitamin D	Magnesium	Phosphorus	Potassium	Riboflavin	B₁₂
Soy Milk	276 mg	8 g	500 IU	100 IU	24 mg	222 mg	349 mg	.44 mg	1.1 mcg
Cow's Milk (skim)	306 mg	8 g	500 IU	100 IU	27 mg	247 mg	382 mg	.44 mg	1.29 mcg

*after fortification of soy milk and cow's milk

Table 4.2 Theory of Planned Behavior Constructs Related to Soy Milk Intake

Construct	Items
Intake	I eat tofu. I drink soy milk. I eat soy veggie burgers or soy hot dogs. I eat soy baked products (such as soy muffins or soy cookies). I eat edamame.
Attitudes	The taste of soy milk is. The feel of soy milk. Soy milk may cause stomach upsets (such as diarrhea or bloating). Soy milk is a healthy food. In choosing foods, the healthfulness of food is important. In choosing foods, the price of food is important.
Intention	During the next month, I will (or ask the food shopper in my home to) buy soy milk. During the next month, I intend to consume soy milk more often than now. During the next month, I intend to buy soy milk more often than now. During the next month, I intend to use soy milk in recipes more often than now.
Subjective Norm	Most health experts (doctor, pharmacist, or nutritionist) think I should consume more soy milk. In particular, my health care providers (doctor, pharmacist, or nutritionist) think I should consume more soy milk. My family or the people in my household think I should consume more soy milk.
Normative Beliefs	Generally speaking, I want to do what most health professionals think I should do concerning foods. Generally speaking, I want to do what my health care provider in particular thinks I should do concerning my diet and the food I eat. Generally speaking, I want to do what my family or people in my household think I should do concerning my diet and the food I eat.

- Subjective Norm x Normative Beliefs = Subjective Norm Beliefs
- Control Beliefs x Perceived Environment = Environmental Beliefs
- Control Beliefs x Outcome Expectancies = Expectancy Beliefs

Table 4.2 Theory of Planned Behavior Constructs Related to Soy Milk Intake (Continued)

Construct	Items
Behavioral Control	<i>Perceived Environment</i> Generally, the price of soy milk would make it ____ for me to purchase more soy milk. The availability of soy milk would make it ____ for me to consume more soy products. <i>Outcome Expectancies</i> I often feel that I do not know much about the health benefits of soy milk in particular. I often feel I do not know enough about cooking with soy milk.
Control Beliefs	In general, I believe that soy milk is more expensive than other foods. I often feel that there is not enough soy milk available on the market. What I know about the benefits of soy would make it ____ for me to consume more soy milk. Having soy recipes would make it ____ for me to consume more soy milk.

- Subjective Norm x Normative Beliefs = Subjective Norm Beliefs
- Control Beliefs x Perceived Environment = Environmental Beliefs
- Control Beliefs x Outcome Expectancies = Expectancy Beliefs

Table 4.3 Cronbach alpha for Theory of Planned Behavior Constructs

	Number of Items	Cronbach alpha Site 1	Cronbach alpha Site 2
Behavior: Intake	5	0.80	0.75
Intention	4	0.96	0.95
Attitudes	6	0.77	0.79
Subjective Norm	3	0.83	0.87
Normative Beliefs	3	0.78	0.70
Perceived Behavioral Control¹	4	0.57	0.59
Outcome Expectancies	2	0.80	0.93
Perceived Environment	2	0.84	0.77
Control Beliefs	4	0.67	0.50

¹Perceived behavioral control divided into outcomes expectancies and perceived environment

Table 4.4 Description of WIC Participants' Demographics

Site	African American		White		Latino Hispanic		Asian		Unknown		Total	
	1	2	1	2	1	2	1	2	1	2	1	2
Age Category												
<21	25	2	37	10	2	1	1	0	5	1	72	14
22-25	29	0	34	10	5	1	4	0	1	0	75	12
26-32	23	1	30	18	3	0	9	0	7	0	73	19
>33	32	3	32	14	11	1	13	0	6	0	95	20
Gender												
Female	99	6	118	49	20	3	20	0	11	1	273	62
Male	7	0	15	3	0	0	7	0	4	0	34	3

Values in columns may not reflect total number of respondents due to unknown and incorrect responses. Native Americans were excluded from the table due to low number of participants, 26 total.

Table 4.4 Description of WIC Participants' Demographics (Continued)

Site	African American		White		Latino Hispanic		Asian		Unknown		Total	
	1	2	1	2	1	2	1	2	1	2	1	2
Education												
Less than high school	2	0	5	3	2	0	0	0	0	0	10	4
High school	52	4	65	25	10	3	1	0	6	1	136	35
Currently in college	28	1	36	13	3	0	3	0	4	0	75	14
More than college	16	0	22	7	2	0	22	0	4	0	68	7
Unknown	11	1	5	4	4	0	1	0	5	0	26	5

Values in columns may not reflect total number of respondents due to unknown and incorrect responses. Native Americans were excluded from the table due to low number of participants, 26 total.

Table 4.5 Descriptive Statistics for Theory of Planned Behavior Variables Related to Soymilk in WIC Participants

	n		Mean		Standard Deviation		Median		25, 75 Percentiles	
Site	1	2	1	2	1	2	1	2	1	2
Intake	112	13	2.36	2.71	1.21	1.43	2.25	2.00	1.00, 3.31	1.33, 4.00
Attitudes	303	65	4.80	4.87	0.94	0.93	5.00	5.00	4.33, 5.50	4.50, 5.56
Intention	284	57	2.86	2.74	1.48	1.57	2.67	2.00	1.50, 4.00	1.25, 4.00
Subjective Norm	171	36	3.02	2.45	1.46	1.38	3.00	2.00	2.00, 4.00	1.50, 3.38
Normative Beliefs	278	60	4.46	4.44	1.05	0.973	4.67	4.67	4.00, 5.00	3.67, 5.00
Subjective Norm Beliefs	160	34	13.62	10.28	7.99	7.30	12.00	6.83	7.51, 20.00	5.25, 14.59
Control Beliefs	283	55	3.57	3.69	1.31	1.45	4.00	4.00	2.75, 4.50	2.50, 5.00

Table 4.5 Descriptive Statistics for Theory of Planned Behavior Variables Related to Soymilk in WIC Participants (Continued)

	n		Mean		Standard Deviation		Median		25, 75 Percentiles	
	1	2	1	2	1	2	1	2	1	2
Site Outcome Expectancies	247	46	4.23	4.47	1.39	1.29	4.50	4.50	3.50, 5.00	4.00, 5.50
Expectancy Beliefs	232	41	15.97	17.29	7.65	8.30	17.16	16.00	10.00, 21.65	11.63, 22.50
Perceived Environment	227	42	3.92	3.67	1.44	1.55	4.00	3.50	3.00, 5.00	3.00, 5.00
Environmental Beliefs	220	39	12.58	12.94	4.86	5.76	12.00	12.75	9.35, 15.16	9.00, 16.00

- Intake is measured on a scale of 1-5. Intake composite does not reflect participants who rarely or never drank soy milk.
- Subjective Norm, Normative Beliefs, Control Beliefs, Outcome Expectancies, Perceived Environment are measured on a scale of 1-6.
- Subjective Norm Beliefs, Environmental Beliefs, and Expectancy Beliefs are measured on a scale of 1-36.
- Subjective Norm x Normative Beliefs = Subjective Norm Beliefs
- Control Beliefs x Perceived Environment = Environmental Beliefs
- Control Beliefs x Outcome Expectancies = Expectancy Beliefs

Table 4.6 Percentage of WIC Participants Consuming Soy Products

	N		Rarely or never		Several times a year		Once a month		2-3 times a month		About once a week		Most days	
Site	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Tofu	289	58	83.0	96.6	2.8	0.0	3.5	0.0	4.2	3.4	4.2	0.0	2.4	0.0
Soy milk	305	65	81.0	92.3	5.6	0.0	2.0	3.1	3.6	3.1	3.9	0.0	3.9	1.5
Veggie burgers or soy hot dogs	305	65	83.9	86.2	7.9	3.1	2.3	3.1	2.6	1.5	2.3	3.1	1.0	3.1
Soy baked products	304	64	86.8	90.6	4.9	1.6	1.3	1.6	3.0	0.0	2.0	6.3	2.0	0.0
Edamame	280	57	81.4	93.0	7.9	3.5	2.5	0.0	4.6	1.8	2.1	1.8	1.4	0.0

Table 4.7 Percentage of WIC Participants Responding to Subjective Norm and Normative Beliefs Items

	n		Strongly Disagree		Disagree		Slightly Disagree		Neither		Slightly Agree		Agree		Strongly Agree	
Site	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
In particular, my health care providers think I should consume more soy milk.	218	51	9.6	3.9	15.1	19.6	3.7	0.0	48.2	64.7	10.1	5.9	10.6	3.9	2.8	2.0
Most health experts think I should consume more soy milk.	152	28	7.8	10.7	12.5	17.9	3.9	3.6	35.5	50.0	13.2	3.6	21.7	7.1	5.3	7.1
My family or the people in my household think I should consume more soy milk.	216	47	15.7	23.4	24.1	27.7	1.9	8.5	39.4	36.2	9.7	2.1	7.4	2.1	1.9	0.0
Generally speaking, I want to do what most health professionals think I should do concerning foods.	278	62	2.9	3.2	4.7	1.6	4.0	6.5	11.2	14.5	19.4	24.2	41.0	38.7	16.9	11.3

Table 4.7 Percentage of WIC Participants Responding to Subjective Norm and Normative Beliefs Items (Continued)

	n		Strongly Disagree		Disagree		Slightly Disagree		Neither		Slightly Agree		Agree		Strongly Agree	
Site	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Generally speaking, I want to do what my health care provider in particular thinks I should do concerning my diet and the food I eat.	280	62	2.9	0.0	2.9	3.2	2.1	4.8	9.6	8.1	18.9	21.0	44.6	41.9	18.9	21.0
Generally speaking, I want to do what my family or people in my household think I should do concerning my diet and the food I eat.	281	62	4.3	4.8	10.0	11.3	6.8	9.7	17.8	19.4	23.1	14.5	28.5	27.4	9.6	12.9

Table 4.8 Percentage of WIC Participants Responding to Behavioral Control (Perceived Environment and Outcome Expectancies)
Items

Site	n		Extremely Unlikely		Quite Unlikely		Slightly Unlikely		Neither		Slightly Likely		Quite Likely		Extremely Likely	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Generally, the price of soy milk would make it ___ for me to purchase more soy milk.	298	63	15.8	11.1	10.4	11.1	15.8	7.9	34.9	44.4	12.8	14.3	8.7	4.8	1.7	6.3
The availability of soy milk would make it ___ for me to consume more soy products.	301	63	15.3	7.9	9.3	11.1	8.0	6.3	34.6	42.9	18.3	15.9	11.0	7.9	3.7	7.9

Table 4.8 Percentage of WIC Participants Responding to Behavioral Control (Perceived Environment and Outcome Expectancies)
Items (Continued)

	n		Strongly Disagree		Disagree		Slightly Disagree		Neither		Slightly Agree		Agree		Strongly Agree	
Site	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
I often feel that I do not know much about the health benefits of soy milk in particular.	249	47	7.6	2.1	8.4	6.4	6.8	4.3	13.3	12.8	18.9	31.9	28.9	19.1	16.1	23.4
I often feel I do not know enough about cooking with soy milk.	256	46	5.9	8.7	7.4	0.0	6.3	6.5	11.7	10.9	18.0	21.7	31.6	21.7	19.1	30.4

Table 4.9 Percentage of WIC Participants Responding to Intention Items

	n		Extremely Unlikely		Quite Unlikely		Slightly Unlikely		Neither		Slightly Likely		Quite Likely		Extremely Likely	
Site	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
During the next month, I will (or ask the food shopper in my home to) buy soy milk.	310	65	22.9	21.5	16.8	20.0	9.4	7.7	16.1	16.9	17.1	21.5	13.2	1.5	4.5	10.8
During the next month, I intend to consume soy milk more often than now.	309	65	23.3	30.8	18.4	15.4	10.0	6.2	17.8	23.1	16.5	16.9	11.0	6.2	2.9	1.5
During the next month, I intend to buy soy milk more often than now.	245	55	24.5	29.1	16.7	12.7	9.8	9.1	16.7	16.4	21.2	25.5	7.3	1.8	3.7	5.5
During the next month, I intend to use soy milk in recipes more often than now.	241	55	25.7	30.9	16.2	18.2	9.1	7.3	21.2	20.0	18.3	12.7	7.1	5.5	2.5	5.5

Table 4.10 Percentage of WIC Participants Responding to Items Describing Flavor and Texture of Soy Milk (Attitudes)

Site	n		Extremely Unpleasant		Very Unpleasant		Slightly Unpleasant		Neither		Slightly Pleasant		Very Pleasant		Extremely Pleasant	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
The taste of soy milk is.	195	32	10.8	9.4	11.3	6.3	13.3	18.8	15.4	15.6	22.6	21.9	20.5	21.9	6.2	6.3
The feel of soy milk.	188	28	11.7	10.7	11.2	7.1	10.6	21.4	21.3	14.3	19.7	28.6	20.2	10.7	5.3	7.1

Table 4.11 Percentage of WIC Participants Responding to Items Describing Attitudes Towards Soy Milk

Site	n		Strongly Disagree		Disagree		Slightly Disagree		Neither		Slightly Agree		Agree		Strongly Agree	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Soy milk may cause stomach upsets (such as diarrhea or bloating).	149	18	24.2	11.1	27.5	16.7	8.7	16.7	8.1	5.6	6.7	16.7	0.7	0.0	24.2	33.3
Soy milk is a healthy food.	215	42	2.3	0.0	0.0	0.0	0.90	2.4	5.6	7.1	10.2	14.3	43.3	59.5	37.7	16.7
In choosing foods, the healthfulness of food is important.	297	62	1.3	3.2	0.30	0.0	0.0	3.2	1.7	0.0	7.1	0.0	33.7	32.3	55.9	61.3
In choosing foods, the price of food is important.	297	65	1.7	1.5	3.7	1.5	2.4	4.6	4.7	3.1	13.8	10.8	35.4	35.4	38.4	43.1

Table 4.12 Bivariate Correlations of Theory of Planned Behavior Constructs in WIC Participants

	Site	Intake	Attitudes	Intention	Subjective Norm Beliefs	Environmental Beliefs	Expectancy Beliefs
Intake	Site 1		0.141*	0.507**	0.253**	0.165**	0.310**
	Site 2		0.117	0.308*	0.133	0.234	0.267*
Attitudes	Site 1	0.141*		0.147**	0.059	0.054	0.209**
	Site 2	0.117		.044	-0.084	0.106	0.048
Intention	Site 1	0.507**	0.147**		0.280**	0.282**	0.490**
	Site 2	0.308*	0.044		0.110	0.410**	0.636**
Subjective Norm Beliefs	Site 1	0.253**	0.059	0.280**		0.099	0.236**
	Site 2	0.133	-0.084	0.110		0.182	0.209
Environmental Beliefs	Site 1	0.165**	0.054	0.282**	0.099		0.383**
	Site 2	0.234	0.106	0.410**	0.182		0.505**
Expectancy Beliefs	Site 1	0.310**	0.209**	0.490**	0.236**	0.383**	
	Site 2	0.267*	0.048	0.636**	0.209	0.505**	

Bivariate correlations of the theory constructs were analyzed using Spearman's method.

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 4.13 Stepwise Multiple Regression Analyses of Relationship Between Theory of Planned Behavior Composites and Intention to Consume Soy Milk

	Variable	Equation	R2	F	p-value
Site 1	Intention	0.422 Expectancy Beliefs 0.255 Subjective Norm Beliefs	0.303	69.17	<0.0001
Site 2	Intention	0.638 Expectancy Beliefs	0.398	43.34	<0.0001

Figures

Figure 4.1 Theory of Planned Behavior Constructs as Used in this Study

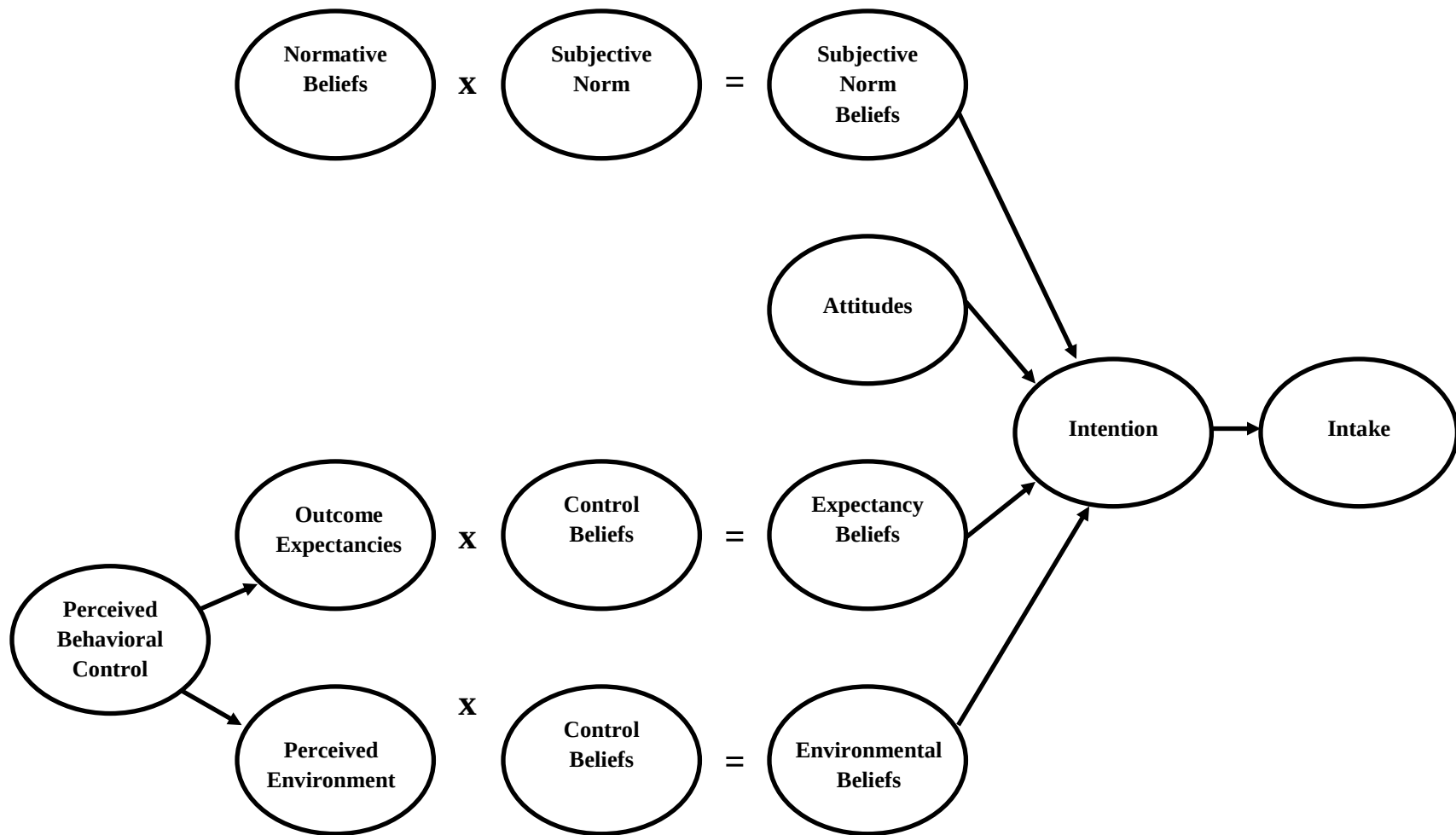
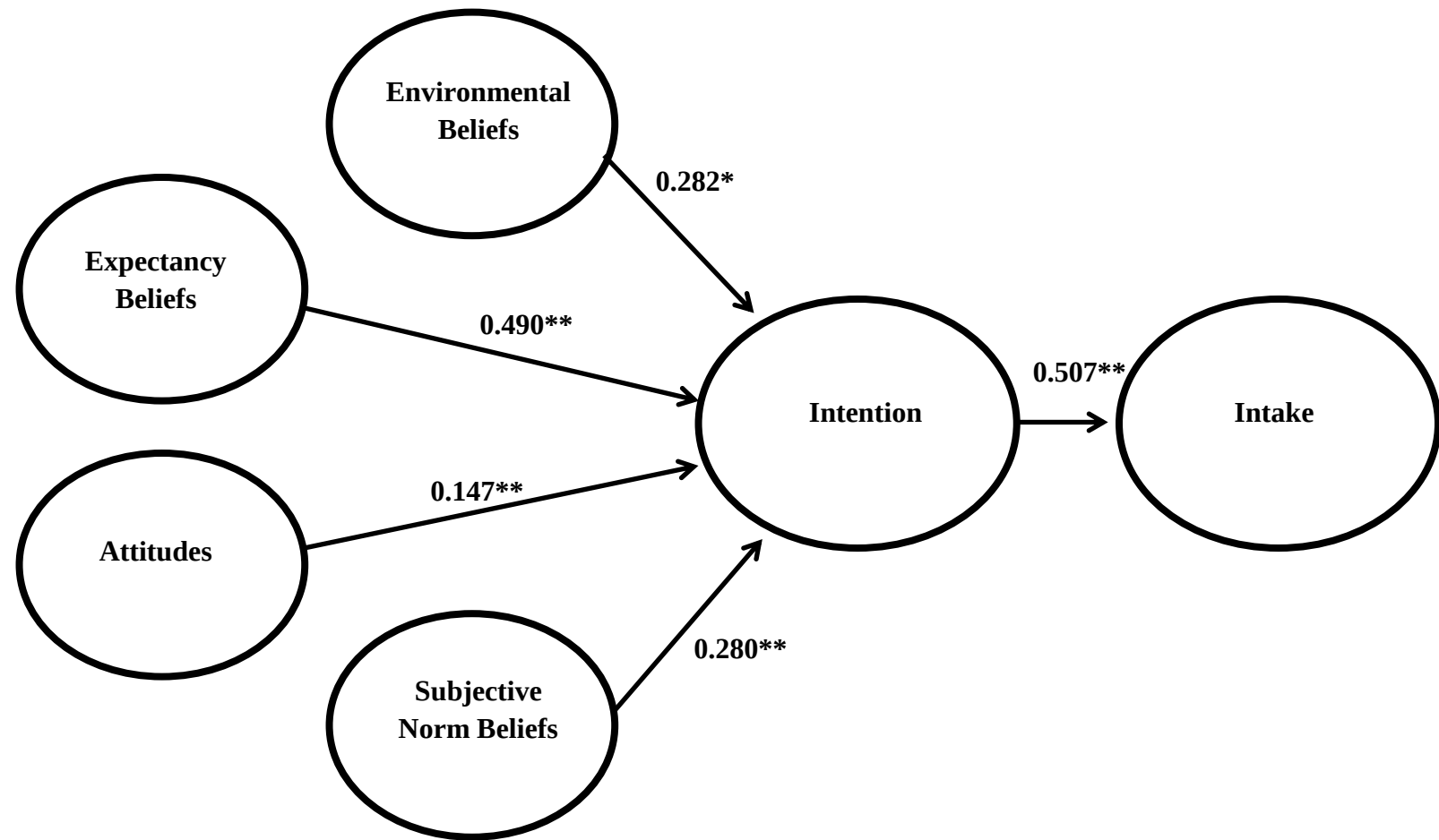


Figure 4.2 Correlations Between Theory of Planned Behavior Constructs and Intake of Soy Milk at Site 1

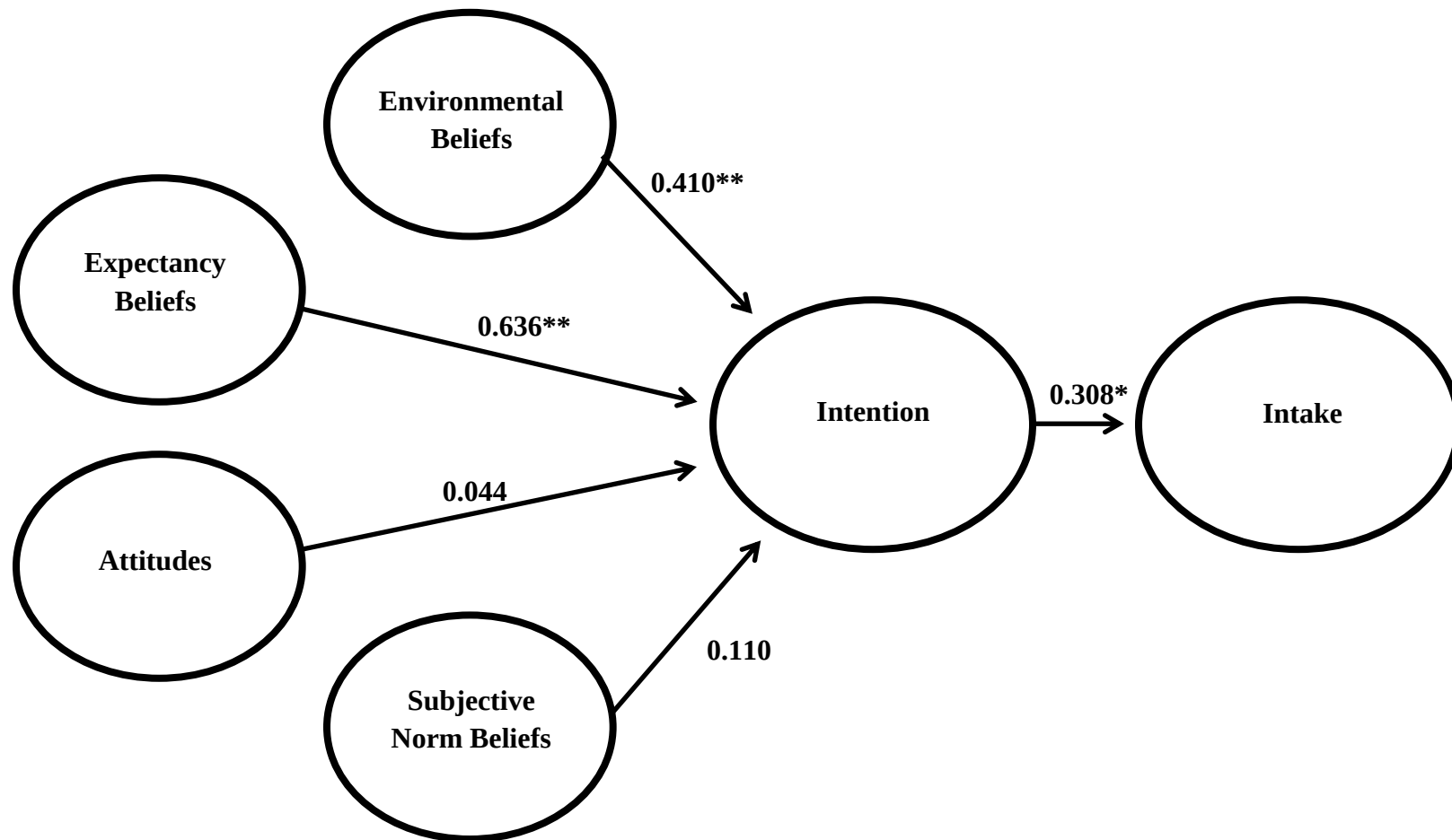


Spearman's rho correlation

**Significant at the 0.01 level (2 –tailed)

*Significant at the 0.05 level (2-tailed)

Figure 4.3 Correlations Between Theory of Planned Behavior Constructs and Intake of Soy Milk at Site 2



Spearman's rho correlation

**Significant at the 0.01 level (2-tailed)

*Significant at the 0.05 level (2-tailed)

References

1. Oliveira V, Frazão E. The WIC Program Background, Trends, and Economic Issues, 2009 Edition. Washington D.C.:United States Department of Agriculture and Economic Research Service, ERR-73;2009.
2. Kim CI, Lee Y, Kim BH, Lee HS, Jang YA. Development of supplemental nutrition care program for women, infants and children in Korea: NutriPlus. *Nutr Res Pract* 2009;3:171-9.
3. Food and Nutrition Board, Institute of Medicine. Planning a WIC Research Agenda: Workshop Summary. Washington, D.C.: The National Academy Press; 2011.
4. Food and Nutrition Board, Institute of Medicine. WIC Food Packages: Time for a Change; Washington, D.C.: The National Academy Press; 2006.
5. U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2005. 6th Edition, Washington, D.C.: U.S. Government Printing Office; January 2005.
6. Zhao Y, Martin BR, Weaver CM. Calcium bioavailability of calcium carbonate fortified soymilk is equivalent to cow's milk in young women. *J Nutr* 2005;135:2379-82.
7. Matthews VL, Knutsen SF, Beeson WL, Fraser GE. Soy milk and dairy consumption is independently associated with ultrasound attenuation of the heel bone among postmenopausal women: the Adventist Health Study-2. *Nutr Res* 2011 Oct;31:766-75.
8. U.S. Food and Drug Administration. Federal Register. Food labeling: Health claims; soy protein and coronary heart disease, final rule. [Internet] October 26, 1999. [Cited February 21, 2012]. Available from:
<http://www.fda.gov/food/labelingnutrition/labelclaims/healthclaimsmeetingsignificantscientificagreements/ucm074740.htm>.

9. U.S. Food and Drug Administration. Code of Federal Regulations Title 21, volume 2. [Internet] revised April 2011. [Cited February 21, 2012]. Available from: <http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=101.82> . Accessed February 21, 2012.
10. Food Research and Action Center. New WIC Food Packages Proposed. [Internet] [Cited February 21, 2012]. Available from: <http://frac.org/new-wic-food-packages-proposed/>
11. Special Supplemental Nutrition Program for Women, Infants and Children (WIC): Revisions in the WIC Food Packages; Interim Rule. Washington, D.C.:Food and Nutrition Service, USDA; 2007. Vol. 72, No. 234.
12. Ajzen I. Attitudes, Personality and Behavior. Chicago, IL: Dorsey Press; 1988.
13. Ajzen I. The Theory of Planned Behavior. Organ Behav Hum Decision Processes. 1991;50:179-211.
14. Patch CS, Tapsell LC, Williams PG. Overweight consumers' salient beliefs on omega-3-enriched functional foods in Australia's Illawarra region. J Nutr Educ Behav 2005; 37: 83–9.
15. Robinson R, Smith C. Integrating issues of sustainably produced foods into nutrition practice: A survey of Minnesota Dietetic Association members. J Am Diet Assoc 2003; 103: 608-11.
16. Pawlak R, Connell C, Brown D, Meyer MK, Yadrack K. Predictors of multivitamin supplement use among African-American female students: A prospective study utilizing the Theory of Planned Behavior. Ethn Dis 2005; 15: 540-47.
17. Verbeke, W, Vackier, I. Individual determinants of fish consumption: application of the Theory Of Planned Behaviour. Appetite 2005; 44: 67-82.

18. Eto K, Koch P, Contento IR, Adachi M. Variables of the Theory of Planned Behavior are associated with family meal frequency among adolescents. *J Nutr Educ Behav* 2011;43:525-30.
19. Rah JR, Hasler CM, Painter JE, Chapman-Novakofski KM. Applying the Theory of Planned Behavior to women's behavioral attitudes on and consumption of soy products. *J Nutr Educ Behav* 2004; 36: 238-44.
20. Li S, Camp C, Finck J, Winter M, Chapman-Novakofski K. Using the Theory of Planned Behavior to evaluate soy intake. *Asia Pac Clin Nutr* 19: 358-64, 2010
21. Nunnally JC. Psychometric theory, 2nd ed. New York: McGraw-Hill; 1978.
22. Wenrich TR, Cason KL. Consumption and perceptions of soy among low-income adults. *J Nutr Educ Behav* 2004; 36:140-5.
23. Black MM, Hurley KM, Oberlander SE, Hager ER, McGill AE, White NT, Quigg AM. Participants' comments on changes in the revised special supplemental nutrition program for women, infants, and children food packages: the Maryland food preference study. *J Am Diet Assoc* 2009;109:116-23.
24. Ritchie LD, Whaley SE, Spector P, Gomez J, Crawford PB. Favorable impact of nutrition education on California WIC families. *J Nutr Educ Behav* 2010;42:S2-10.
25. Schyver T, Smith C. Reported attitudes and beliefs toward soy food consumption of soy consumers versus nonconsumers in natural foods or mainstream grocery stores. *J Nutr Educ Behav* 2005;37: 292-9.
26. Pawlak R, Colby S, Herring J. Beliefs, benefits, barriers, attitude, intake and knowledge about peanuts and tree nuts among WIC participants in eastern North Carolina. *Nutr Res Pract* 2009;3:220-5.

27. Nolan-Clark DJ, Neale EP, Probst YC, Charlton KE, Tapsell LC. Consumers' salient beliefs regarding dairy products in the functional food era: a qualitative study using concepts from the theory of planned behaviour. *BMC Public Health* 2011;11:843.
28. Lv N, Brown JL Impact of a nutrition education program to increase intake of calcium-rich foods by Chinese-American women. *J Am Diet Assoc* 2011;111:143-9.
29. Provencher V, Polivy J, Herman CP. Perceived healthiness of food. If it's healthy, you can eat more! *Appetite* 2009; 52:340-4.
30. WIC program Illinois authorized WIC food list. State of Illinois Department of Human Services. Accessed on April 20, 2013. Available at <http://www.peoriacounty.org/download?path=/pcchd/IllinoisWICFoodList.pdf>
31. WIC formula and medical nutritional prescriptions. Illinois Department of Human Services. Accessed on April 20, 2013. Available at <http://www.dhs.state.il.us/page.aspx?item=45972>

Chapter 5: Women Infant and Children Program Participants Usage of and Attitudes Towards The WIC Farmers' Market Nutrition Program: Application of the Social Cognitive Theory

Introduction

Despite a large body of evidence linking the consumption of fruits and vegetables with positive health, the intake of these foods is low in most U.S. diets [1-3]. Only an estimated 33% of adults in the U.S. consume the recommended servings of fruit and 26% consume the suggested amount of vegetables [4]. In addition, many studies indicate that woman, infants, and children do not consume adequate amounts of fruits and vegetables [3-7].

Several studies have used the Farmers' Market Nutrition Program (FMNP) as an intervention aimed at increasing the intake of fruits and vegetables [8, 9]. Herman et al. found that FMNP participants showed an increase of 1.4 servings per 1000kcal from baseline to the end of intervention compared with controls, and supermarket participants showed an increase of 0.8 servings per 1000kcal [8]. A limitation of making inferences to the WIC population nationwide is that this study was conducted in California where there is a longer growing season for agriculture. Although the results showed a significant increase in intake of fruits and vegetables in FMNP participants, it is unlikely that participants nationwide would experience these positive results to the same extent due to a generally shorter growing season in regions of the United States that are more affected by inclement weather.

Kropf et al. examined food security status and produce intake in the WIC population using a mail-based questionnaire to determine the differences between fruit and vegetable consumption in FMNP participants and non-participants [9]. There was a significantly higher

increase in daily vegetable intake in the FMNP group with no difference in daily fruit intake. No other variations in behaviors related to fruit and vegetable intake were significantly different: fruit and vegetable variety, eating two or more servings of vegetables at a main meal, and eating fruits and vegetables as snacks. With respect to psychosocial variables, women in the FMNP group had higher scores for perceived benefit, perceived diet quality, and Stages of Change [10, 11] continuums for both fruit and vegetable intake.

Social Cognitive Theory

The Social Cognitive Theory (SCT) is a theoretical framework for understanding, predicting, and changing behavior [12]. It posits that human behavior is rooted in the interplay between personal, environmental, and behavioral influences. This interaction is known as reciprocal determinism. While recognizing that environmental influences shape behavior, SCT also emphasizes people's potential abilities to alter and construct environments to suit purposes they devise for themselves.

The SCT was chosen to explore the intake fruits and vegetables and utilization of the FMNP because access to fruits and vegetables, and especially access to farmers markets, is inherently linked to an individuals' environment, a cornerstone of the theory (**Figure 5.1**).

There were two phases of this study. The first phase examined the barrier of cost of fruits and vegetables. Cost data was collected from Champaign County grocery stores and farmers' markets to determine if significant differences existed for fruits and vegetables sold. Some Champaign County residents believe that the cost of fruits and vegetables sold at farmers' markets is higher than those sold at commercial grocery stores; however, no research to date has examined this cost difference in Champaign County. The hypothesis tested was that fruits and

vegetables sold at farmers' markets would have a higher financial cost than fruits and vegetables sold at grocery stores. The second phase of this study examined intake of fruits and vegetables in WIC participants, psychosocial variables affecting fruit and vegetable intake, and attitudes about usage of the FMNP. The hypothesis tested was that WIC participants who used the FMNP would have a higher intake of fruits and vegetables as well as stronger psychosocial predictors of fruit and vegetable intake.

Part I: Cost of Fruits and Vegetables Found at Farmers' Markets versus Commercial Grocery Stores

Introduction

Bandura's Social Cognitive Theory (SCT) [13] posits that an individual's environment affects his or her behavior. In the case of WIC participants' consumption of fruits and vegetables, it is conceivable that one context of this environmental impact would be related to the cost of fruits and vegetables available at commercial grocery stores versus those sold at farmers' markets. While the cash vouchers used to purchase farmers' market fruits and vegetables and those used at grocery stores are each unique and cannot be used interchangeably, the quantities of a particular food a WIC client can purchase at a given vendor could be impacted by this price difference. Farmers' market vouchers are distributed in three dollar increments. To help determine whether cost is a barrier to fruit and vegetable purchase at farmers markets, prices were tracked at three farmers markets and compared to those at five grocery stores within close proximity to the WIC clinic.

Hypothesis

The financial cost of fruits and vegetables sold at farmers markets is greater than fruits and vegetables sold at commercial grocery stores. The null hypothesis is that there is no difference in cost of fruits and vegetables sold at farmers' markets and those sold commercial grocery stores or that the cost of fruits and vegetables is higher at commercial grocery stores than at farmers' markets.

Methods

Farmers' markets and grocery stores in the Champaign-Urbana city limits were used to choose the sample. Eleven farmers' markets vendors were chosen from two farmers markets in Champaign, IL, and one in Urbana, IL. These markets included the WIC farmers' market located in the Champaign County Department of Public Health (CUPHD) parking lot, the Historic 1st Street Farmers' Market, and the Lincoln Square Farmers' Market. These three markets were promoted in the WIC "Farm to Table" promotion, and fliers with locations and bus routes to the markets were distributed with the FMNP vouchers. Grocery stores were located in Champaign, IL, and included Schnucks, County Market, Wal-Mart, Meijer, and Aldi. Each grocery store was within 3.5 miles of the WIC clinic and accessible by bus. Commonly consumed fruits and vegetables [14] as well as those popular to Central Illinois farmers' markets were selected for analysis. Prices were collected biweekly from each grocery store or farmers' market vendor (**Tables 5.1, 4.2**). Data was collected from mid-May to mid-August of 2011 during which there was an approximate 2 month period including June and July when the value of FM vouchers was doubled. When collecting data, the lowest unit price was recorded. When possible, single unit prices were recorded; however, when the only available product was sold in

a unit other than price per pound, prices were recorded and then later converted to price per pound. In the case of items sold per piece rather than by weight, weight of the individual times were averaged and converted in to price per pound. When fruit or vegetable items could not be compared between farmers' markets and grocery stores for reasons related to unit pricing or physical differences between the food items to be compared, price data for that particular item was excluded from analysis.

To determine if there was a significant difference between fruits and vegetables sold at farmers' markets and those sold in grocery stores, mean values for each item were calculated from the sample costs recorded; then mean values for the item within the category of grocery store or farmers' market were derived (**Tables 5.1, 5.2**). These data were analyzed to determine distribution, which was found to be not normally distributed, so Wilcoxon Signed Rank tests were used to determine if there were significant differences. To determine if sufficient samples were taken to detect a significant difference if there was one, a post-hoc power analysis was run (Sample Power 2.0). A standard medium effect of 0.40 was used with $\alpha=0.05$ and 80% power (**Tables 5.3, 5.4**).

Results

Carrots, rhubarb, sugarsnap peas, blueberries, cantaloupe, nectarines, plums, and watermelon were omitted from analysis as not enough samples were collected to achieve 80% power for an effect size of 0.40. Significant differences for costs between farmers' markets and grocery stores were found for asparagus, broccoli, cucumbers, green beans, tomatoes, red/white/Vidalia onions, peaches, and raspberries, with lower costs found at the grocery stores

(Tables 5.1, 5.2). There was no significant difference in cost of fruits or vegetables between the three farmers' markets (Kruskal-Wallace).

Discussion

The financial cost difference between farmers' markets and grocery stores has been a growing topic with the emergence of the local food movement [15,16]. In contrast to the results of this study, one Seattle study found that farmers' markets were slightly less expensive, pound for pound, on average, for fifteen food items [15]. In a North Carolina cost comparison between produce found at farmers' markets in 12 counties and 12 conventional markets, there was an average savings of 17.9% at farmers' markets among all produce items (n=230). In most counties examined, there was a price savings to consumers at farmers' markets compared to supermarkets; However, there was a significant difference in produce price savings by county ($p=0.0477$). While Jones et al. and McGuirt et al. did find that the prices of fruits and vegetables sold at farmers' markets were less than those found at grocery stores, McGuirt et al. also indicated that the county of the farmers' market location did have an impact in the cost difference even for counties that were in the same region of the state or geographical region. The current study only surveyed the Champaign-Urbana area whose university population may make it different than other communities with WIC clinic. Nevertheless, the current findings are similar to a study by Flaccavento analyzing the cost of foods sold at 24 farmers market in 19 communities in 6 states: Virginia, Tennessee, West Virginia, Kentucky, North Carolina, and South Carolina. In this broad survey, farmers' markets were more expensive than grocery stores 52% of the time when comparing the least expensive item for each product [17].

One important factor when evaluating the cost difference between foods found at farmers' markets and those found at commercial grocery stores is the method in which the food was produced. For example, informal interviews during data collection revealed that many Central Illinois farmers' market vendors avoid using conventional pesticides and fertilizers. If this were true for the majority, their production costs could be higher. However, no data were collected specifically concerning these types of production in the present study. In the Flaccavento study, when comparing the cost of similar items, such as "organically grown apples to organically grown apples," farmers' markets were *less* expensive than grocery stores in 74% of the cases. In this study, only the lowest price available for each fruit or vegetable was recorded. It could be assumed that the cost difference would be less significant if organic and pesticide-free foods had been categorized during collection and analysis.

The Illinois Department of Human Services took a key initiative to mediate the cost of fruits and vegetables sold at WIC-approved farmers' market vendors by increasing the worth of the vouchers during a period of the market season. During this promotion, the State of Illinois subsidized doubled the value of the WIC farmers' market vouchers. At the time of this survey, vouchers were doubled in value for approximately two months that included June and July. By increasing the value of the voucher, it is more likely that the FMNP will provide sufficient fruits and vegetables for a household to eat. Provision of adequate amounts of fruits and vegetables to feed a household gives added value to the FMNP which is largely viewed as an educational intervention to introduce WIC participants to farmers' markets and fresh produce.

Limitations

There were three major limitations to the cost analysis between fruits and vegetables found at farmers' markets and those found at commercial grocery stores. The first limitation was that there was no primary data collection to find out where Champaign County WIC participants shopped for fruits and vegetables. Although data collection was done within a close proximity to WIC and farmers' markets marketed by WIC were chosen for analysis, there was no inclusion of independent grocery stores, convenience stores, farmers' markets not marketed by WIC, or other vendors selling fruits and vegetables. For a more accurate assessment of fruit and vegetable, it would be necessary to do preliminary focus groups, interviews, or surveys to reveal where WIC participants shop for fruits and vegetables.

The second limitation is related to the units in which the foods are sold. Items sold in grocery stores were almost always sold at cost per pound or cost for an individual piece of fruit or vegetable. However, in the less formal farmers' market environment, fruits and vegetables were often distributed in bags or bundles that did not easily transcend into a price per pound. Carrots, radishes, and beets were often eyed and sold in arbitrary bunches according to the farmer's discretion. Greens were often divided into bags of various weights and sold at a cost per bag.

The third limitation was physical differences between fruits and vegetables grown in Central Illinois during the spring and summer growing season and commercially grown produce available at larger commercial grocery stores. Items sold at a cost per piece did not resemble their grocery store counterparts sold at cost per piece. For example, pears grown in Central Illinois that were of various sizes and sold at \$0.50 per piece were not comparable to large, commercially-grown Bartlett pears found at major grocery stores that were sold at \$2.99 per

pound. Additionally, qualitative interviews with farmers at farmers' markets revealed that many WIC FMNP program participants did not perceive these items to be similar. One grower remarked, "The moms, they don't what to do with these hard peaches. They are so used to soft peaches like they find at Wal-Mart that have been sitting there for ages." Ed Harper, the primary vendor for the farmers' market located in the WIC parking lot stated, "I like to grow weird vegetables," as he showed off his ugly tomatoes and cheddar cauliflower. The types of fruits and vegetables sold at the farmers' market were not easily comparable to those sold at grocery stores because of the variation in price per unit and the differences in varieties available compared to the standard, recognizable commercially-grown varieties commonly available at commercial grocery retailers.

Conclusion

While the cost of fruits and vegetables at farmers' markets were significantly higher than those at commercial grocery stores, the provision of the farmers' market and cash conventional vouchers might mediate this cost difference. Initiatives such as the Illinois Department of Human Services promotion of "double voucher" periods of the market season would provide additional financial incentive for WIC participants to use farmers' market vouchers to procure fresh fruits and vegetables for their family. Additionally, some research has shown that the integration of farmers' markets into neighborhoods where fresh food is scarce has decreased the cost of fruits and vegetables in surrounding conventional grocery stores in the long term [18].

Tables

Table 5.1 Descriptive Statistics of Fruit Cost at Commercial Grocery Stores and Farmers' Markets

Fruit	n		Minimum, Maximum (\$)		Mean (\$)		Standard Deviation		p
	GS	FM	GS	FM	GS	FM	GS	FM	
Apples	5	4	1.07, 1.92	1.00, 2.75	1.55	2.06	0.315	0.775	0.116
Blueberries	5	2	1.62, 2.95	4.50, 5.00	2.24	4.75	0.624	0.354	0.053
Cantaloupe	5	2	.99, 2.75	2.25, 3.00	1.92	2.62	0.626	0.530	0.118
Nectarines	5	2	.99, 1.95	2.67, 2.75	1.45	2.71	0.381	0.057	0.053
Peaches	5	6	.99, 1.95	2.00, 3.00	1.41	2.70	0.465	0.392	0.006
Plums	5	1	.98, 2.62	3.00, 3.00	1.75	3.00	0.633	0.000	0.143
Raspberries	4	3	2.03, 3.00	4.83, 6.00	2.50	5.44	0.468	0.587	0.043
Strawberries	5	3	1.32, 2.87	2.00, 5.00	2.12	3.50	0.712	1.50	0.101
Watermelon	5	2	4.91, 5.99	5.00, 5.00	5.17	5.00	0.457	0.0	0.223

Wilcoxon Signed Rank

All cost is reported in dollars/pound

GS= commercial grocery store

FM= farmers' market

Table 5.2 Descriptive Statistics of Vegetable Cost at Commercial Grocery Stores and Farmers' Markets

Vegetable	n		Minimum, Maximum (\$)		Mean		Standard Deviation		p
	GS	FM	GS	FM	GS	FM	GS	FM	
Asparagus	4	4	2.42, 3.42	4.00, 6.00	2.83	4.50	.434	1.00	0.018
Broccoli	5	7	1.42, 1.99	1.50, 3.50	1.65	2.51	.242	.667	0.019
Carrots	5	2	0.65, 0.98	2.50, 2.50	.83	2.50	.122	.000	0.051
Corn	5	8	0.26, 0.41	0.25, 0.50	.32	0.44	.067	.0956	0.071
Cucumber	5	10	0.42, 0.74	0.50, 1.00	.58	0.84	.135	.186	0.012
Green Beans	4	10	1.22, 2.65	2.00, 3.00	1.86	2.64	.645	.404	0.043
Green Bell Pepper	5	7	0.66, 0.82	0.50, 1.50	0.71	0.78	.064	.344	0.935
Red, Yellow, and Orange Bell Peppers	5	10	1.25, 2.09	2.00, 3.00	1.54	2.64	.322	.404	0.142
Iceberg Lettuce	5	2	0.95, 1.44	0.50, 2.00	1.12	1.25	.228	1.06	1.000
Potatoes	5	9	0.56, 1.27	1.00, 3.00	.94	1.96	.257	.686	0.009
Rhubarb	2	5	2.99, 2.99	3.00, 4.00	2.99	3.20	.000	.447	0.031
Spinach	3	6	1.29, 1.99	3.00, 7.00	1.52	5.08	.404	1.50	0.019
Squash	5	14	1.08, 1.71	1.00, 2.00	1.41	1.76	.306	.311	0.086
Tomatoes	4	12	1.49, 1.74	2.00, 3.15	1.62	2.64	.138	.375	0.003
Red Onions	5	5	0.75, 1.37	1.00, 2.00	1.00	1.40	.232	.391	0.047
White Onions	5	5	0.75, 1.62	1.00, 2.00	1.02	1.46	.349	.434	0.047
Vidalia Onions	5	8	0.68, 1.12	1.00, 2.00	.90	1.24	.166	.354	0.017

Wilcoxon Signed Rank

All cost is reported in dollars/pound

GS= commercial grocery store

FM= farmers' market

Table 5.3 Post Hoc Power Analysis of Comparison of Vegetables Sold at Farmers' Markets and Grocery Stores

Vegetable	Population Mean (\$)	SD of Difference	n Pairs	Power (%)
Asparagus	3.66	1.070	4	99.0
Broccoli	2.20	0.850	5	99.0
Corn	0.40	0.106	5	100.0
Cucumber	0.75	0.137	5	100.0
Green Beans	2.42	0.642	4	100.0
Green Bell Pepper	0.75	0.336	5	97.0
Red, Yellow, and Orange Bell Peppers	1.36	0.485	5	100.0
Iceberg Lettuce	1.15	1.288	5	36.0
Potatoes	1.60	0.994	5	77.0
Spinach	3.90	1.256	3	77.0
Squash	1.67	0.302	5	100.0
Tomatoes	2.39	0.252	5	100.0
Red Onions	1.20	0.537	5	95.0
White Onions	1.24	0.673	5	84.0
Vidalia Onions	1.11	0.358	5	100.0

All cost is reported in dollars/pound.

Effect = 0.40

$\alpha=0.05$

Table 5.4 Post Hoc Power Analysis for Comparison of Fruits Sold at Farmers' Markets and Grocery Stores

Fruit	Population Mean	SD of Difference	n Pairs	Power (%)
Apples	1.78	0.833	4	81.0
Peaches	2.12	0.433	5	100.0
Raspberries	3.76	0.686	3	99.0
Strawberries	2.64	1.784	3	30.0

All cost is reported in dollars/pound

Effect = 0.40

$\alpha=0.05$

Part II: Intake of Fruits and Vegetables and Social Cognitive Theory Constructs Associated with Intake of Fruits and Vegetables in WIC Participants

Introduction

As mentioned previously, despite a large body of evidence linking the consumption of fruits and vegetables with positive health, the intake of these foods is low in the diets of most people living in the U.S. [1-3]. Only an estimated 33% of adults in the U.S. consume the recommended servings of fruit and 26% consume the suggested amount of vegetables [4] and many studies indicate that women, infants, and children do not consume adequate amounts of fruits and vegetables [3-7]. Research evaluating intake patterns of WIC participants after the 2009 provision of cash value vouchers and promotion of the FMNP show that consumption of fruits and vegetables is still lower than the national recommendation [8, 9, 19-21].

There were three main objectives of this study. The first objective was to gather baseline data regarding intake of fruits and vegetables in adult WIC participants. The second objective of this study was to examine psychosocial variables that affect the intake of fruits and vegetables in this population. The final objective of this study was explore the usage of the Farmers Market Nutrition Program (FMNP) and determine if receiving farmers' market coupons in addition to conventional WIC fruit and vegetable vouchers has an impact on fruit and vegetable intake.

Hypothesis

Fruit and vegetable intake of Champaign County WIC participants will be lower than the national recommendation, but WIC participants who participated in the FMNP will have more positive psychosocial predictors of fruit and vegetable intake and a higher intake of fruits and

vegetables than WIC participants not participating in the FMNP. The null hypothesis is that there is no difference in psychosocial predictors of fruit and vegetable intake between FMNP participants and non-FMNP participants, and that the fruit and vegetable intake of FMNP participants is less than or equal to non-FMNP participants.

Methods

Recruitment

The study was approved by the University Institutional Review Board who decided the study did not need to include signed consent of participants. A sheet providing information pertaining to the purpose of the study was provided to participants at the time of the survey. Inclusion criteria was enrollment in WIC or child enrollment in WIC, ability to read in the English language, and age of 18 years or older. An investigator was present in the waiting area several times per week to recruit participants for the self-administered survey. Participants included those enrolled in WIC as well as parents who had children participating in WIC. Participants were recruited verbally and the investigator was present to clarify any questions regarding the survey if necessary. The time period for recruitment and data collection was three months, the average timespan between routine WIC appointments. This three month period was intended to allow for the recruitment of as many WIC participants as possible while preventing duplication in surveys. At the time of the study, the WIC clinic had an active roster of approximately 4,400 participants. After completing the surveys, participants could choose to be entered into a drawing for \$50 compensation by providing their contact information.

Survey Development

The Social Cognitive Theory [13] provided foundation for the survey used in this research. Social Cognitive Theory was chosen as it explores the relationship between environmental factors, personal determinants, and behavior.. The theory's incorporation of the impact of environmental factors on personal behavior makes it an ideal for assessing attitudes towards the FMNP and the intake of fruits and vegetables. In addition to demographics, items relating to SCT constructs (personal, behavioral, and environmental factors) were included in the survey (**Table 5.5**).

Questions from previously validated surveys were used [22- 26] and additional questions were developed by the investigators to identify participants who had received farmers' market vouchers and assess at which farmers' markets that participant used their vouchers. The survey was initially tested for content validity by Food Science and Human Nutrition faculty and staff for breadth and depth. The survey was then reviewed by WIC nutrition professionals and staff members again for breadth and depth and also to determine if the survey was appropriate for the WIC clientele. Finally, the survey was pilot tested with 20 WIC participants for face validity and reliability. The participants were asked to take the survey in the waiting room of the clinic and circle any difficult or unclear wording. They were then asked to return in two weeks and take the survey again. Survey questions were deemed appropriate by the reviewers at the University and WIC clinics. No suggestions were made beyond those related to the survey format. Reliability of WIC participants' responses was high during the test-retest (Wilcoxon Signed Rank, $p < 0.05$) and no questions were excluded from the survey. However, the original survey had questions pertaining to demographics located on this last page. A WIC participant completing the face validity test remarked that these questions may not be seen by those taking

the survey that had not participated in the FMNP and therefore did not have to complete the sections about voucher use. The demographic questions were therefore moved to the second page of the survey so they would be apparent to all participants. Identification information for the face validity and reliability was kept in a locked cabinet and then shredded to maintain confidentiality.

One survey question was added to the previously validated items [22, 23] evaluating self-efficacy to account for vegetable intake. The two items measuring perceived control were not used verbatim and were captured in the demographics section of the survey at the recommendation of the expert content reviewers. All items measuring psychosocial variables related to fruit and vegetable intake (outcome expectancies, self-efficacy, perceived control, Stages of Change, perceived diet quality) were computed into a single composite measuring the sum of psychosocial variables with a scale of 0 to 26 [22, 23].

Analysis

Baseline data descriptive analysis included means, SD, median, and interquartile ranges. Distributions for age, race/ethnicity, and education were not normally distributed as tested by kurtosis and skewness. The relationship between SCT variables and fruit and vegetable intake was evaluated by Spearman's rho correlation since data were not normally distributed. This analysis was completed for all participants, as well as FM and non-FM participants separately. Because there was a difference in FM and non-FM participants' gender, an analysis was completed to determine if SCT variables or fruit and vegetable intake differed by gender. To determine if fruit and vegetable intake differed between FM and non-FM participants, Mann-Whitney U statistics were used. Stepwise regression analyses were used to determine if the variance in

intake in the FM voucher and non-FM voucher groups could be explained by other SCT variables. Gender was accounted for in the regression model, and male and female participants were analyzed in the same model for the FM voucher and non-FM voucher groups. Data collected were entered into SPSS (version 18, Chicago, IL, 2009) for analysis.

Results

There were 398 participants in this study. The minimum age was 18 years old and the maximum was 56. Of those participants, 51.5% (n= 194) received farmers market vouchers (**Table 5.6**). The median age for those in the groups who received and did not receive vouchers was also 26 years old (**Table 5.7**). Of the combined FM voucher groups and non-FM voucher groups, 95.4% were women. As determined by the Mann-Whitney U test, gender was significantly different between the FM voucher group and non-FM voucher groups ($P=0.038$). Males represented 7.1% of the non-FM voucher group and only 2.6% of the FM voucher group. About half of the FM voucher group and non-FM voucher group had completed college or were currently in college. Fifty percent of the FM voucher group and 36.9% of the non-FM market group was Caucasian/White. African American/Black participants represented 36.6% of the FM voucher group and 44.9% of the non-voucher group. Frequencies for Hispanics/Latino, Asian, and Native American participants were low in this study (**Table 5.8**). Most participants did the grocery shopping and cooking for themselves and/or their households (**Table 5.9**).

The first objective of this study was to gather baseline information about the intake of fruits and vegetables in adult Champaign County WIC participants. Similarly, the majority of those who received farmers' market vouchers (FM voucher group) and those who did not receive farmers market vouchers (non-FM voucher group) reported sometimes eating more than one kind

of fruit a day, 53.6% and 51.1% respectively. However, the FM voucher group had a higher percentage of respondents who always ate more than one kind of fruit a day than in the non-FM voucher group, 37.1% and 30.8% respectively. Responses for “do you eat more than one kind of vegetable per day” were statistically different between the two groups ($p=0.014$). Forty-four percent of FM voucher group reported always eating more than only kind of vegetable daily while only 32.0% of the non-FM voucher group always ate more than one kind of vegetable daily. In total, 68.3% of WIC participants met the national recommendation for vegetable intake and 74.9% met the national recommendation for fruit intake (**Table 5.21**). Roughly half of respondents in each group reported sometimes eating two or more servings of vegetables at their main meal. In the FM voucher group, 31.4% always ate two or more servings of vegetables at their main meal. In the non-FM voucher group, 26.1% always ate two or more servings of vegetables at their main meal (**Tables 5.10, 5.11**). The median intake of fruit servings in both the FM voucher group and the non-FM voucher group was 2 servings per day with a 25th, 75th percentile of 2, 3 and 1, 3, respectively. The median intake of vegetable servings in the FM group and non-FM group was 2 servings per day with a 25th, 75th percentile of 1.5, 3 and 1.5, 3 servings, respectively (**Table 5.12**). There was no statistical significance between the FM voucher group and the non-FM voucher group for the average number of fruit or vegetable servings consumed per day.

The second objective of this research was to explore psychosocial variables that affect the intake of fruits and vegetables in Champaign County WIC participants. Statistically significant equations were found using stepwise regression to predict the variance in servings of fruits and vegetables in the FM voucher group and non-FM voucher group. Fifty-five percent of the variance in vegetable intake in the FM voucher group was explained by servings of fruit eaten

daily ($B = 0.609$), Stages of Change for vegetables ($B = 0.345$), and more than one kind of fruit eaten daily ($B = 0.119$) ($P < 0.0001$). Fifty-three percent of the variance in fruit intake of the FM voucher group was explained by servings of vegetables eaten per day ($B = 0.664$), more than one kind of fruit eaten daily ($B = 0.332$), perceived quality of diet ($B = 0.208$) ($P < 0.0001$). Eating more than one kind of vegetable eaten daily had a negative impact on fruit intake ($B = -0.168$) indicating that eating more than one kind of vegetable per day may displace fruit intake.

The regression models did not explain variance in fruit and vegetable intake as well in the non-FM voucher group. Twenty-nine percent of the variance in vegetable intake of the non-FM voucher group was explained by eating two or more servings of vegetables at main meal ($B = 0.372$), servings of fruit eaten daily ($B = 0.362$), and the intention to use FM vouchers in 2012 ($B = 0.152$) ($P < 0.0001$). Twenty-six percent of the variance in fruit intake of the non-FM voucher group was explained by Stages of Change for fruit ($B = 0.292$), servings of vegetables eaten per day ($B = 0.252$), and perceived quality of diet ($B = 0.179$) ($P < 0.0001$). Gender had a negative impact on fruit intake in the non-FM voucher group ($B = -0.181$) (**Table 5.13**).

When analyzed in composite [22, 23], psychosocial variables pertaining to the intake of fruits and vegetables were more positive in the FM voucher group than in the non-FM voucher group ($P = 0.001$). The percentage of respondents indicating positive outcome expectations of eating fruits and vegetables was high. Most agreed that they were helping their bodies when eating fruits and vegetables, 97.4% of FM voucher group and 96.2% of the non-FM voucher group. When asked if they might develop health problems if they do not eat fruits and vegetables, 75.9% of the FM voucher group agreed while 68.1% of the non-FM group agreed. Fourteen percent of the FM voucher group and 15.9% of the non-FM voucher group did not have

an opinion about effect of fruit and vegetable consumption and developing health problems (Table 5.14).

Self-efficacy was positive in the FM voucher group and non-FM voucher group. There was a significant difference between the FM voucher and non-FM voucher group with respect to eating fruits and vegetables as snacks ($p=0.041$). Ninety-seven percent of the FM voucher group and 93.4% of the non-FM voucher group felt they could eat fruit or vegetables as snacks. Eighty-seven percent of the FM voucher group and 84.0% of the non-FM voucher group believed they could buy more vegetables the next time that they shopped. There was a significant difference between the two groups for the self-efficacy items “I feel that I can plan meals or snacks with more vegetables” ($p=0.034$) and “I feel that I can plan meals or snacks with more fruits ($p=0.026$).” Of the FM voucher group, 92.2% felt that they could plan meals or snacks with more vegetables during the next week and 93.3% felt that they could plan meals or snacks with more fruit in the next week. The non-FM voucher group responded that they could plan meals or snacks with more vegetables and fruits, 85.2% and 86.2% respectively. There was a statistical difference between the FM voucher group and the non-FM voucher group for the item “I can eat 2 or more servings of vegetables at dinner” ($p=0.040$). Ninety-two percent of the FM voucher group and 85.2% of the non-FM voucher group indicated that they could eat two or more servings of vegetables at dinner. When asked if they felt they could plan meals with more vegetables in the next week, 91.7% of the FM group and 90.2% of the non-FM group responded in the affirmative. Ninety-one and a half percent of the FM voucher group and 88.0% of the non-FM voucher group felt that they could add extra vegetables to casseroles and stews (Table 5.14).

The FM voucher group and the non-FM voucher group had significantly different responses for the Stages of Change item related to vegetable intake ($p=0.008$); However, there was no statistically significant difference for the Stages of Change item that addressed fruit intake. With regard to Stages of Change, the majority of the FM voucher group indicated that they were trying to eat more vegetables and fruit at the time, 54.3% and 47.5% respectively. Twenty-five point five percent of the FM voucher group indicated that they were already eating three or more servings of vegetables per day, and 28.7% indicated that they were already eating three or more servings per fruit day. Only 1.6% of the FM voucher group indicated that they were not currently thinking about eating more vegetables, and 2.2% indicated that they were not thinking about eating more fruit. Half of the non-FM voucher group indicated that they were currently trying to eat more fruit, and 45.3% indicated that they were currently trying to eat more vegetables. Twenty-five percent of the non-FM group indicated that they were already eating three or more servings of fruit per day, and 20.6 indicated that they were already eating three or more servings of vegetables per day. Six percent of the non-FM voucher group indicated that they were not currently thinking about eating more vegetables, and 1.2% indicated that they were not currently thinking about eating more fruit (**Tables 5.15, 5.16; Figures 5.2, 5.3**).

The final objective of this study was explore the usage of the FMNP and determine if receiving farmers market coupons in addition to conventional WIC fruit and vegetable vouchers had an impact on fruit and vegetable intake. There were a higher percentage of FM voucher group respondents who reported eating more than one kind of vegetable daily than there were in the non-FM voucher group. No other statistically significant differences existed between the FM voucher group and non-FM voucher group for questions addressing intake.

Of those surveyed, 93.5% said they would use farmers' market vouchers if available to them in 2012. Of those participating in the FMNP in 2011, 96.4% said they would use farmer's market vouchers in 2012. Of those who did not participate in 2011, 90.2% said that they would use farmers' market vouchers in 2011 (Table 3). Fifty-seven percent of participants who used the vouchers had never shopped at a farmers' market prior to participation in the FMNP.

Seventy-seven percent stated that the farmers' market coupons provided enough fresh produce for them and their families. With respect to excess food purchased at the farmers' markets, 5.3% of participants stated that they threw away excess food purchased at the farmers' markets, 3.7% stated that they sold excess food purchased at the farmers' markets, 2.6% stated that they traded excess food purchased at the farmers' markets, and 7.9% stated that they gave away excess food purchased at the farmers' markets. When asked about the effect of FM vouchers on their consumption of fruits and vegetables, participants responded largely in the affirmative that the vouchers did indeed have a positive influence on their intake. Three survey items asked about the farmers' market vouchers impact on participants' fruit and vegetable intake during their participation in the FMNP. Respondents indicated that the provision of the farmers' market vouchers had a positive impact on intake with 78.3% indicating that they ate more fruits and vegetables when they had farmers market vouchers than when they did not, 40.9% indicating that they ate the same amount of fruits and vegetables, and only 9.0% indicating that they ate less fruits and vegetables upon receiving the farmers' market vouchers (**Table 5.17**).

The median number of coupons received by the FM voucher was 2.00 with a 25th and 75th percentile of 1, 5. Of the coupons received, the median number of coupons used was 2 with a 25th and 75th percentile of 1, 6.5 (**Table 5.18**). As each farmers' market voucher has a value of

three dollars, the average value of coupons received by a WIC participant was six dollars. In the FM voucher group, 75.4% report using all of the vouchers they received, 15.6% reported not using all of the vouchers they received, 0.60 reported not using any vouchers at all, and 8.4% did not remember how many farmers' market vouchers they used (**Table 5.19**). The majority of the FM voucher group, 54.1%, used their vouchers at Lincoln Square Farmers' Market in Urbana, IL. The WIC parking lot market in Champaign, IL, was the second most frequented market with a frequency of 22.1% of participants. Only 7.7% of participants shopped at the North First Street Farmers' Market in Champaign, IL (**Table 5.20**).

Discussion

The national recommendation for fruit intake for men and women ages 19-30 years old is 2 cups per day. The recommendation for vegetables is 3 cups for men ages 19-30 and 2.5 cups for women [27, 27]. In this study of Champaign County WIC participants, 28.8% of men and 40.7% of women met the national recommendation for vegetable intake. The percentage of participants meeting the national fruit intake was higher: 72.2% of men and 75.0% of women (**Table 5.21**).

A study of WIC participants in California revealed that after the provision of CCV vouchers that came with the implementation of the 2009 revised WIC package, intake rose but remained low overall [10]. Fruit intake rose significantly from 1.26 ± 1.52 servings per day to 1.38 ± 1.82 ($P=0.006$). Although statistically significant, the pre and post-test intake was still below the recommended national average of 2-3 cups per day [27]. Intake of vegetables did not rise significantly from pre to post test, 1.19 ± 1.38 and 1.25 ± 1.65 respectively ($P=0.12$). This study only examined conventional cash vouchers (CCVs), which are valid grocery stores to buy

WIC-approved frozen, fresh, and canned FV. In this study of Champaign County WIC participants, fruit and vegetable intake met national recommendations in both the FM voucher group and non-FM voucher group.

In the Herman et al. study of California WIC participants, FM voucher recipients showed an increase of 1.4 servings per 1000 calories from baseline to the end of intervention, and CCV voucher recipients showed an increase of 0.8 servings per 1000 calories compared with controls [11]. In a study of WIC and Community Action Agency participants receiving FM vouchers for the Michigan Farmers' Market Nutrition Program, an increase in fruit and vegetable intake of about 0.2 servings per day was observed after the provision of a \$10 worth of vouchers per month for produce at farmers' markets [8].

Kropf et al. found that with respect to psychosocial variables, women in the FMNP group had higher scores for perceived benefit, perceived diet quality, and Stages of Change continuums for both fruit and vegetable intake [9]. This is similar to our study where participants who received FM vouchers had higher scores for Stages of Change related to vegetable intake; however, there were no differences between the FM voucher and non-FM voucher groups regarding scores for perceived benefit, perceived diet quality, or Stages of Change related to fruit intake. Kropf et al. also found that the FM voucher group had a significantly higher increase in daily vegetable consumption when compared to the non-FM control. This is similar to our study as the Champaign County WIC FM voucher group reported a significantly higher frequency than the non-FM voucher group for the intake item related to eating more than one kind of vegetable daily. Similar to Kropf et al.'s study, there were no statistical differences in items measuring fruit intake between the FM voucher and non-FM voucher groups.

The provision of cash value vouchers is a mediator to increased intake of fruit and vegetables. Cash value vouchers offer convenience as they can be used at the same retailer where WIC participants can buy other WIC-approved foods; however, the specific nature of the FM vouchers places an additional emphasis on the purchase of fruit and vegetables. Observational learning, an important aspect of SCT, is the act of learning a new behavior by exposure to interpersonal or medial displays of the behavior, particularly by peer modeling. Farmers' market vouchers, similar to CCVs, provide facilitation to purchase more FV than a family would otherwise be able to afford. Additionally, it could be posited that FM vouchers have a unique educational benefit of promoting FV intake because farmers' markets are an ideal place to observe and model the procurement of FV, the primary food items sold in the environment. Many studies have shown that models are imitated most frequently when observers perceive the models are similar to themselves [29]. Farmers' markets located at WIC sites such as the CUPHD provides an ideal venue for the promotional of FV procurement and intake because of the environment conducive to observational learning by modeling other WIC participants who purchase and consume fruit and vegetables.

Conclusion

The hypothesis was that WIC participants who participated in the FMNP would have a higher intake of fruits and vegetables and more positive psychosocial predictors of fruit and vegetable intake and a than WIC participants not participating in the FMNP. WIC participants who participated in the FMNP did have a higher frequency for eating more than one kind of vegetable a day than those who did not participate in the FMNP. However, medians for intake of fruit and vegetables and other items addressing frequency of consumption of fruits and

vegetables were not significantly different between FMNP participants and non-participants.

With respect to psychosocial variables, FMNP participants did have statistically significant more positive responses when analyzed in composite. When each psychosocial variable was analyzed individually, more positive responses were indicated for the item measuring Stages of Change for vegetable intake, one environmental item (willingness to use the FM voucher in the subsequent year), and four self-efficacy items (plan meals or snacks with vegetables, plan meals or snacks with more fruits, eat two or more servings of vegetables at dinner).

Table 5.5 Description of Social Cognitive Theory Constructs Related to Fruit and Vegetable Intake

Construct	Item
Behavior (Fruit and Vegetable Intake)	1. Do you eat more than one kind of fruit a day? 2. How many servings of fruit do you eat each day? 3. Do you eat fruit as snacks? 4. During the last week, did you have citrus fruit (such as orange or grapefruit) or citrus juice? 5. Do you eat more than one kind of vegetable a day? 6. Do you eat two or more servings of vegetables at your main meal? 7. How many servings of vegetables do you eat each day? 8. Do you eat vegetables as snacks?
Personal	
Perceived Control	1. Do you do the grocery shopping for yourself and/or your household? 2. Do you do most of the cooking for yourself and/or household? 3. I feel that I am helping my body when I eat fruits and vegetables. 4. I may develop health problems if I do not eat fruits and vegetables.
Outcome Expectancies	1. I feel that I am helping my body when I eat fruits and vegetables. 2. I may develop health problems if I do not eat fruits and vegetables.
Self-Efficacy	1. I feel that I can eat fruit or vegetables as snacks. 2. I feel that I can buy more vegetables the next time that I shop. 3. I feel that I can plan meals or snacks with more vegetables during the next week. 4. I feel that I can plan meals or snacks with more fruit during the next week. 5. I feel that I can eat two or more servings of vegetables at dinner. 6. I feel that I can plan meals with more vegetables during the next week. 7. I feel that I can add extra vegetables to casseroles and stews.
Environmental	
	1. Did you receive farmers' market coupons in 2011? 2. If farmers' market coupons were available in 2012 would you use them? 3. Before receiving the farmers' market coupons, had you ever shopped at a farmers' market? 4. Did the Farmers' Market Nutrition Program coupons provide enough fresh produce for you and your family?

Table 5.5 Description of Social Cognitive Theory Constructs Related to Fruit and Vegetable Intake (Continued)

Environmental	
	5. I threw away excess food from the farmers' market. 6. I sold excess food from the farmers' market. 7. I traded excess food from the farmers' market. 8. I gave away excess food from the farmers' market. 9. I ate more fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers. 10. Before receiving the farmers' market coupons, had you ever shopped at a farmers' market? 11. Did the Farmers' Market Nutrition Program coupons provide enough fresh produce for you and your family? 12. I threw away excess food from the farmers' market. 13. I sold excess food from the farmers' market. 14. I traded excess food from the farmers' market. 15. I gave away excess food from the farmers' market. 16. I ate more fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers. 17. I ate less fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers. 18. I ate the same amount of fruits and vegetable because I had farmers' market vouchers than I do when I do not have farmers' market vouchers. 19. I intend to eat more fruits and vegetables after my experience with the farmers' market. 20. I was satisfied with the foods available at the farmers' market. 21. I was satisfied with the location of the farmers' market. 22. I could often not get to the farmers' market because I did not have transportation. 23. I could not get to the farmers' market on the days and the times it was open. 24. How many coupon books did you receive? 25. How many coupon books did you turn in for food? Which farmer's market did you go to most of the time?

Table 5.6 Percentage of WIC Participants Who Used FMNP and Interest in Future Participation

Item	n	% Yes	% No
Did you receive farmers' market coupons in 2011?	377	51.5	48.5
If farmers' market coupons were available in 2012, would you use them? -FM Voucher Group	192	96.4	3.6
If farmers' market coupons were available in 2012, would you use them? -Non-FM Voucher Group	164	90.2	9.8

Table 5.7 Descriptive Statistics for Age in FM Voucher and Non-FM Voucher Groups

	n		Mean		SD		Median		25, 75%	
	FM	NFM	FM	NFM	FM	NFM	FM	NFM	FM	NFM
Age	185	180	27.67	27.42	6.5	7.51	26.0	26.0	23.0, 32.0	21.0, 31.0

FM = received farmers' market vouchers

NFM = did not receive farmers' market vouchers

Table 5.8 Frequency Statistics for Demographics of FM Voucher and Non-FM Voucher Groups

Gender	n		%	
	FM	NFM	FM	NFM
Female	189	169	97.4	92.9
Male	5	13	2.6	7.1
Education				
Less than high school	11	6	5.7	3.3
High school	65	70	33.5	38.5
College or currently in college	99	90	51.0	49.5
More than college	19	16	9.8	8.8
Ethnicity				
African American/ Black	68	79	36.6	44.9
Caucasian/ White	93	65	50.0	36.9
Hispanic/ Latino	17	11	9.1	6.3
Asian	8	19	4.3	10.8
Native American	0	2	0	1.1

FM= farmers' market voucher group

NFM= non-farmers' market voucher group

Table 5.9 Frequency Statistics for Shopping, Cooking, and Enrollment in FM Voucher and Non-FM Voucher Groups

	n		% Yes		% No		p
	FM	NFM	FM	NFM	FM	NFM	
Do you do the grocery shopping for yourself and/or household?	193	180	95.3	96.7	4.7	3.3	0.514
Do you do most of the cooking for yourself and/or household?	193	183	91.2	88.5	8.8	11.5	0.392
Do you have a child under 5 enrolled in WIC?	193	179	95.3	76.0	4.7	24.0	0.001
Are you enrolled in WIC?	190	180	67.9	76.1	32.1	23.9	0.079
Are you a prenatal client?	126	128	16.7	35.2	83.3	64.8	0.001
Are you postpartum?	137	130	65.7	62.3	34.3	37.7	0.565
Are you breastfeeding?	130	119	21.5	22.7	78.5	77.3	0.827

Independent-Samples Mann-Whitney U Test

FM= farmers' market voucher group

NFM= non-farmers' market voucher group

Table 5.10 Frequencies of Fruit and Vegetable Intake Items in the FM Voucher and Non-FM Voucher Groups

	n		Never		Sometimes		Often		Always		p
	FM	NFM	FM	NFM	FM	NFM	FM	NFM	FM	NFM	
Do you eat more than one kind of fruit a day?	194	182	2.6	3.3	53.6	51.1	6.7	14.8	37.1	30.8	0.696
Do you eat more than one kind of vegetable a day?	193	181	1.6	3.9	43.0	51.4	11.4	12.7	44.0	32.0	0.014
Do you 2 or more servings of vegetables at your main meal?	194	182	5.2	7.7	52.1	50.0	11.3	15.9	31.4	26.4	0.473

Independent-Samples Mann-Whitney U Test

FM= farmers' market voucher group

NFM= non-farmers' market voucher group

Table 5.11 Descriptive Statistics of Fruit and Vegetable Intake Items in the FM Voucher and Non-FM Voucher Groups

	n		Mean		SD		Median		25,75		p
	FM	NFM	FM	NFM	FM	NFM	FM	NFM	FM	NFM	
Do you eat more than one kind of fruit a day?	194	182	2.78	2.73	0.984	0.940	2	2	2, 4	2, 4	0.696
Do you eat more than one kind of vegetable a day?	193	181	2.97	2.73	0.968	0.960	3	2	2, 4	2, 4	0.014
Do you 2 or more servings of vegetables at your main meal?	194	182	2.69	2.61	0.975	0.961	2	2	2, 4	2, 4	0.473

Independent-Samples Mann-Whitney U Test

Table 5.12 Descriptive Statistics of Fruit and Vegetable Intake Items in the FM Voucher and Non-FM Voucher Groups

	n		Mean		SD		Median		25,75	
	FM	NFM	FM	NFM	FM	NFM	FM	NFM	FM	NFM
How many servings of fruit do you eat each day?	191	177	2.51	2.54	1.52	1.89	2	2	2, 3	1.5, 3
How many servings of vegetables do you eat each day?	190	178	2.51	2.30	1.51	1.31	2	2	1.5, 3	1.5, 3

Table 5.13 Stepwise Multiple Regression Analyses of Relationship Between Fruit and Vegetable Survey Items and Intake

	Variable	Equation	R²	F	p
FM Vouchers	Fruit Intake	0.664 How many servings of vegetables eaten per day + 0.332 More than one kind of fruit eaten per day – 0.168 More than one kind of vegetable eaten per day	0.53	71.07	<0.0001
	Vegetable Intake	0.609 Servings of fruit eaten daily + 0.345 Stages of Change for vegetables + 0.119 More than one kind of fruit eaten per day	0.55	70.97	<0.0001
Non-FM Vouchers	Fruit Intake	0.292 Stages of Change for Fruit) + 0.252 Servings of vegetables eaten per day - 0.181 Gender + 0.179 Perceived quality of diet	0.26	15.45	<0.0001
	Vegetable Intake	0.372 Eat two or more servings of vegetables at main meal + 0.362 Servings of fruit eaten daily + 0.152 Would you use FM vouchers in 2012	0.29	21.98	<0.0001

Table 5.14 Frequencies for Psychosocial Items Relating to Fruit and Vegetable Intake in FM Voucher and Non-FM Voucher Groups

	n		% Agree		% Disagree		% No Opinion		p
	FM	NFM	FM	NFM	FM	NFM	FM	NFM	
I feel that I am helping my body when I eat fruits and vegetables.	193	183	97.4	96.2	0.0	0.0	2.6	3.8	0.497
I may develop health problems if I do not eat fruits and vegetables.	191	182	75.9	68.1	9.9	15.9	14.1	15.9	0.131
I feel that I can eat fruit or vegetables as snacks.	193	183	96.9	93.4	1.0	3.8	2.1	2.7	0.124
I feel that I can buy more vegetables the next time that I shop.	193	181	87.0	84.0	4.7	7.7	8.3	8.3	0.441
I feel that I can plan meals or snacks with more vegetables during the next week.	193	183	92.2	85.2	2.1	4.9	5.7	9.8	0.034
I feel that I can plan meals or snacks with more fruit during the next week.	193	183	93.3	86.3	2.6	4.9	4.1	8.7	0.026
I feel that I can eat two or more servings of vegetables at dinner.	192	183	92.2	85.2	2.6	7.7	5.2	7.1	0.040

Independent-Samples Mann-Whitney U Test

FM= farmers' market voucher group; NFM= non-farmers' market voucher group

Table 5.14 Frequencies for Psychosocial Items Relating to Fruit and Vegetable Intake in FM Voucher and Non-FM Voucher Groups Continued

	n		% Agree		% Disagree		% No Opinion		p
	FM	NFM	FM	NFM	FM	NFM	FM	NFM	
I feel that I can plan meals with more vegetables during the next week.	193	183	91.7	90.2	2.1	4.4	6.2	5.5	0.640
I feel that I can add extra vegetables to casseroles and stews.	188	183	91.5	88.0	3.2	4.3	5.3	7.7	0.264

Independent-Samples Mann-Whitney U Test

FM= farmers' market voucher group; NFM= non-farmers' market voucher group

Table 5.15 Frequencies of Stages of Change Items Relating to Fruit Intake in FM Voucher and Non-FM Voucher Groups

Stage of Change	n		Percentage	
	FM	NFM	FM	NFM
I am not thinking about eating more fruit.	4	2	2.2	1.2
I am thinking about eating more fruit... planning to start in the next 6 months.	16	21	8.8	12.7
I am definitely planning to eat more fruit in the next month.	23	19	12.7	11.5
I am trying to eat more fruit now.	86	82	47.5	49.7
I am already eating 3 or more servings of fruit a day.	52	41	28.7	24.8
Total	181	165	100	100

FM= farmers' market voucher group

NFM= non-farmers' market voucher group

No difference was detected for Stages of Change between the FM and NFM groups as determined by Independent-Samples Mann-Whitney U Test ($p=0.437$).

Table 5.16 Frequencies of Stages of Change Items Relating to Vegetable Intake in FM Voucher and Non-FM Voucher Groups

Stage of Change	n		Percentage	
	FM	NFM	FM	NFM
I am not thinking about eating more vegetables.	3	10	1.6	5.9
I am thinking about eating more vegetables... planning to start in the next 6 months.	12	18	6.5	10.6
I am definitely planning to eat more vegetables in the next month.	22	30	12.0	17.6
I am trying to eat vegetables fruit now.	100	77	54.3	45.3
I am already eating 3 or more servings of vegetables a day.	47	35	25.5	20.6
Total	184	170	100	100

FM= farmers' market voucher group

NFM= non-farmers' market voucher group

A significant difference was detected for Stages of Change between the FM and NFM groups as determined by Independent-Samples Mann-Whitney U Test ($p=0.008$).

Table 5.17 Frequencies of Environmental Variables Related to Farmers Market Usage Fruit and Vegetable Intake for FM Voucher Group

Item	n	% Yes	% No
Did you receive farmers' market coupons in 2011?	377	51.5	48.5
If farmers' market coupons were available in 2012 would you use them?	360	93.6	6.4
Before receiving the farmers' market coupons, had you ever shopped at a farmers' market?	192	43.2	56.8
Did the Farmers' Market Nutrition Program coupons provide enough fresh produce for you and your family?	188	77.1	22.9
I threw away excess food from the farmers' market.	188	5.3	94.7
I sold excess food from the farmers' market.	190	3.7	96.5
I traded excess food from the farmers' market.	189	2.6	97.4
I gave away excess food from the farmers' market.	190	7.9	92.1
I ate more fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers.	189	78.3	21.7
I ate less fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers.	189	9.0	91.0
I ate the same amount of fruits and vegetable because I had farmers' market vouchers than I do when I do not have farmers' market vouchers.	186	40.9	59.1

Table 5.17 Frequencies of Environmental Variables Related to Farmers Market Usage Fruit and Vegetable Intake for FM Voucher Group (Continued)

Item	n	% Yes	% No
I intend to eat more fruits and vegetables after my experience with the farmers' market.	186	88.7	10.8
I was satisfied with the foods available at the farmers' market.	190	90.5	9.5
I was satisfied with the location of the farmers' market.	190	91.6	8.4
I could often not get to the farmers' market because I did not have transportation.	184	90.2	9.8
I could not get to the farmers' market on the days and the times it was open.	183	18.0	82.0

Table 5.18 Descriptive Statistics of Voucher Use in the FM Voucher Group

	n	Mean	SD	Median	25,75
How many coupon books did you receive?	172	3.98	4.12	2	1, 5
How many coupon books did you turn in for food?	168	4.35	4.64	2	1, 6.5

Table 5.19 Frequencies of Farmers' Market Voucher Use in FM Voucher Group

Response	n	% Frequency
Used all FM vouchers	126	75.4
Did not use all FM vouchers	26	15.6
Didn't use any FM vouchers	1	0.6
Can't remember	14	8.4
Total	167	100.0

Table 5.20 Frequencies of Farmers' Market Attended by FM Voucher Group

Market	n	% Frequency
North First Street, Champaign	14	7.7
WIC Parking Lot, Champaign	40	22.1
Lincoln Square, Urbana	98	54.1
North First Street WIC Parking Lot	3	1.7
North First Street Lincoln Square	2	1.1
WIC Lincoln Square	6	3.3
WIC and Other Market	3	1.7
Other	12	6.7
None	3	1.7
Total	181	100.0

Table 5.21 Percentage of WIC Participants Meeting National Recommendation for Fruit and Vegetable Intake*

	Percent Meeting Vegetable Recommendation	n	Percent Meeting Fruit Recommendation	n
Men	27.8	18	72.2	18
Women	40.7	366	75.0	368

Men: 3 cups vegetables; 2 cups fruit

Women: 2.5 cups vegetables; 2 cups fruit

Recommendations according to USDA MyPlate

Figures

Figure 5.1. Social Cognitive Theory Constructs Related to Fruit and Vegetable Intake and Factors Influencing Fruit and Vegetable Intake

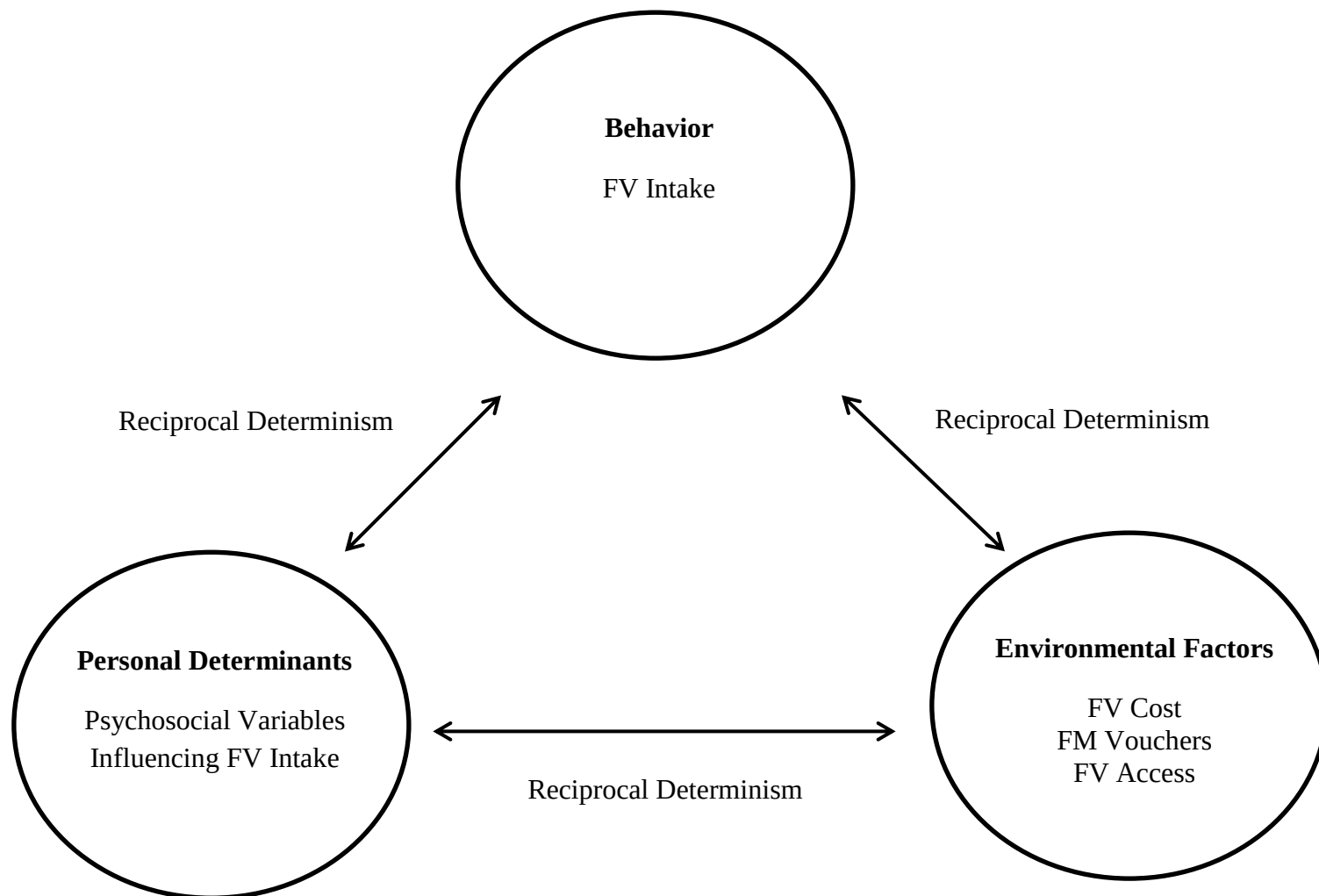


Figure 5.2. Percentage of WIC Participants Identified in Stages of Change Continuum for Fruit Intake

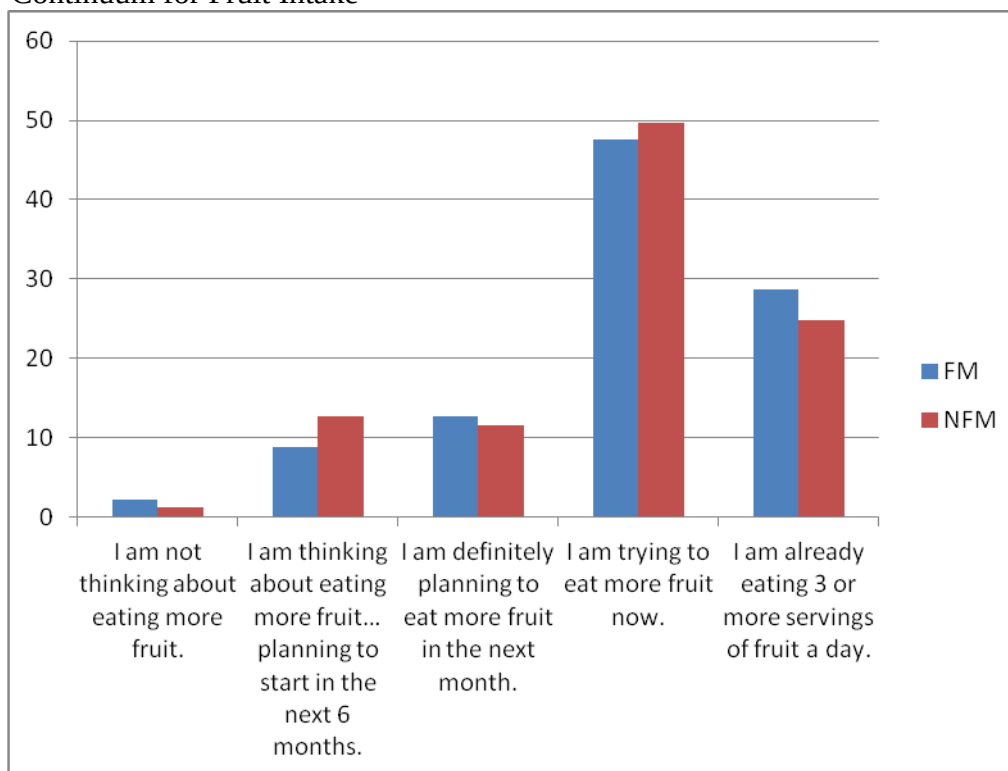
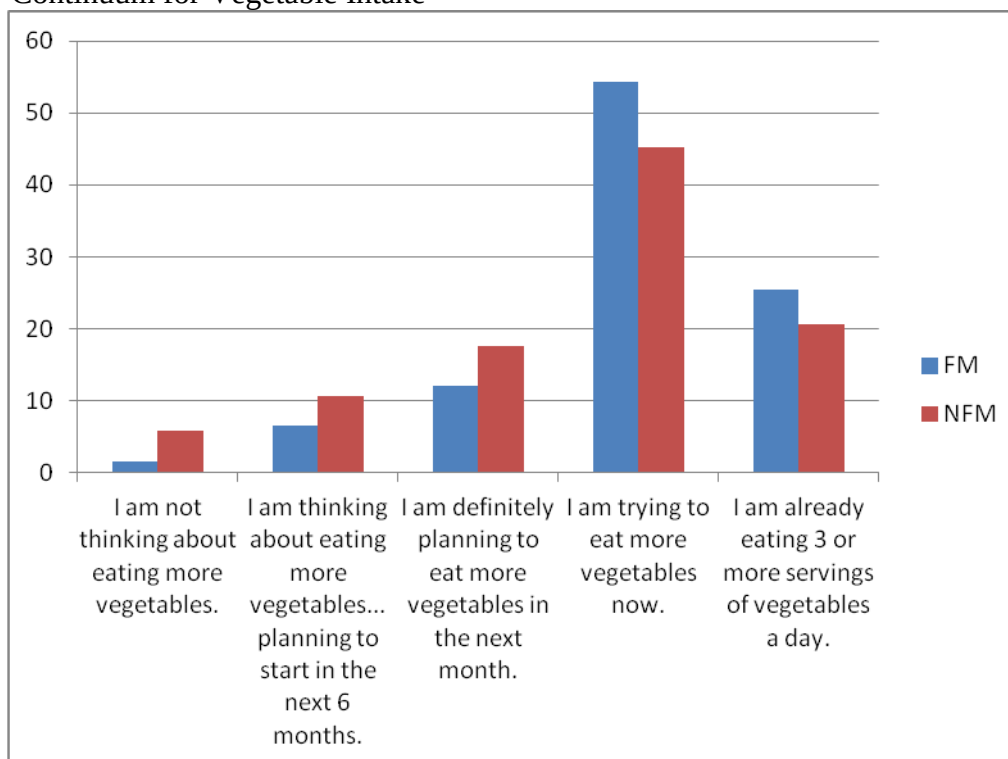


Figure 5.3. Percentage of WIC Participants Identified in Stages of Change Continuum for Vegetable Intake



References

1. Casagrande SS, Wang Y, Anderson C, Gary TL. Have Americans increased their fruit and vegetable intake? The trends between 1988 and 2002. *Am J Prev Med*. 2007;32(4):257-263.
2. Arimond M, Ruel MT. Dietary diversity is associated with child nutritional status: Evidence from 11 demographic and health surveys. *J Nutr*, 2004; 134: 2579–85.
3. Faith MS, Dennison BA, Edmunds LS, Stratton HH. Fruit juice intake predicts increased adiposity gain in children from low-income families: Weight status-by-environment interaction. *Pediatrics*, 2006; 118: 2066–75.
4. Grimm K, Blanck H, Scanlon K, Moore L, Grunner-Strawn L, Foltz J. State-specific trends in fruit and vegetable consumption among adults—United States, 2000-2009. *Morb Mortal Wkly Rep* 2010; 59: 1125–30.
5. Briefel RR, Reidy K, Karwe V, Devaney B. Feeding infants and toddlers study: Improvements needed in meeting infant feeding recommendations. *J Am Diet Assoc* 2004; 104(1): S31–7.
6. Fox MK, Pac S, Devaney B, Jankowski L. Feeding infants and toddlers study: What foods are infants and toddlers eating? *J Am Diet Assoc* 2004; 104(1): S22-30.
7. Papas MA, Hurley KM, Quigg AM, Oberlander SE, Black MM. Low-income African American adolescent mothers and their toddlers exhibit similar dietary consumption patterns. *J Nutr Educ Behav* 2009; 41(2): 87-94.
8. Herman DR, Harrison GG, Afifi AA, Jenks E. Effect of a targeted subsidy on intake of fruits and vegetables among low-income women in the Special Supplemental Nutrition Program for Women, Infants, and Children. *Am J Public Health* 2008; 98(1): 98-105.
9. Kropf M, Holben D, Holcomb J, Anderson H. Food security status and produce intake and behaviors of Special Supplemental Nutrition Program for Women, Infants, and Children and Farmers' Market Nutrition Program participants. *J Am Diet Assoc* 2007; 107(11): 1903-08.

10. Greene GW, Rossi SR, Rossi JS, Velicer WF, Fava JL, Prochaska JO. Dietary applications of the stages of change model. *J Am Diet Assoc* 1999; 99: 673-8.
11. Kristal AR, Glanz K, Curry S, Patterson RE. How can stage of change be best used in dietary interventions? *J Am Diet Assoc* 1999; 99: 679–84.
12. Glanz K, Rimer B, Viswanath K. *Health Behavior and Health Education, Theory Research and Practice*, 4th edition:. San Francisco, CA.: Jossey-Bass, 2008.
13. Bandura A. *Social Learning Theory*. Englewood Cliffs, N.J.: Prentice Hall. 1977.
14. Grigsby-Toussaint D, Zenk S, Odoms-Young A, Ruggiero L, Moise I. Availability of commonly consumed and culturally specific fruits and vegetables in African-American and Latino neighborhoods. *J Am Diet Assoc* 2010; 110(5): 746-52.
15. Jones S. Gaudette, K. Farmers-market food costs less, class finds. *The Seattle Times* 2007; http://seattletimes.com/html/localnews/2003733548_farmers04.html
16. McGuirt JT, Jilcott SB, Liu H, Ammerman AS. Produce Price Savings for Consumers at Farmers' Markets Compared to Supermarkets in North Carolina. *J Hunger Environ Nutr* 2011; 6(1): 86-98.
17. Anthony Flaccavento, SCALE, Inc. Is Local Food Affordable for Ordinary Folks? A Comparison of Farmers' Markets and Supermarkets in Nineteen Communities in the Southeast. Online source. 2001; <http://www.ruralscale.com/resources/downloads/farmers-market-study.pdf>
18. Larsen K, Gilliland J. A farmers' market in a food desert: Evaluating impacts on the price and availability of healthy food. *Health Place* 2009; 15: 1158-62.

19. Ettienne-Gittens R, Mckyer E, Lisako J, Odum M, Diep CS, Li Y, Girimaji A, Murano PS. Rural versus Urban Texas WIC Participants' Fruit and Vegetable Consumption. *Am J Health Behav* 2013; 37(1): 130-41.
20. Kong A, Odoms-Young AM, Schiffer LA, Berbaum ML, Porter SJ, Blumstein L, Fitzgibbon ML. Racial/ethnic differences in dietary intake among WIC families prior to food package revisions. *J Nutr Educ Behav* 2013; 45(1): 39.
21. Whaley SE, Ritchie LD, Spector P, Gomez J. Revised WIC food package improves diets of WIC families. *J Nutr Educ Behav* 2012; 44(3): 204.
22. Townsend MS, Kaiser LL. Development of a tool to assess psychosocial indicators of fruit and vegetable intake for 2 federal programs. *J Nutr Educ Behav* 2005; 37 (4): 170-84.
23. Townsend MS. Fruit and Vegetable Inventory. 2005/2007
<http://ucanr.org/sites/CEprogramevaluation/files/113712.pdf> Accessed on October 1, 2011.
24. Sylva K, Townsend MS, Marin A, Metz D. Food Stamp Program Fruit and Vegetable Checklist. 2006. http://townsendlab.ucdavis.edu/PDF_files/FV/FSP_FV_InstructGuide.pdf
Accessed on April 7, 2012.
25. Holben, D. WIC Food and Nutrition Survey 2005.
26. Rah J, et al. Women's perspectives and consumption behavior of soy products: Application of the Theory of Planned Behavior. University of Illinois at Urbana-Champaign, Department of Food Science and Human Nutrition, 2002.
27. Fruits- how much is needed daily? Choose MyPlate.gov. United States Department of Agriculture. Accessed on April 25, 2013. <http://www.choosemyplate.gov/food-groups/fruits-amount.html#>

28. Vegetables- how much is needed daily or weekly? Choose MyPlate.gov. United States Department of Agriculture. Accessed on April 25, 2013. <http://www.choosemyplate.gov/food-groups/vegetables-amount.html>
29. Schunk DH. Peer Models and Children's Behavioral Change. Rev Ed Res 1987; 57(2): 149-74.

Chapter 6: Implications and Future Directions

Intake of soy products was low with most participants at each site reporting to rarely or never consume soy products and soy milk. Approximately 40% of respondents at each site did not think soy milk was a WIC-approved food, indicating a need to promote awareness the inclusion of soy milk in WIC nutrition education. Attitudes about soy and soy milk were positive at both sites. Roughly half of the participants at both sites indicated that the flavor of soy milk is pleasant, and almost half of the participants at each site indicated that the texture of soy milk is pleasant. Most participants thought that soy milk was a healthy food. Additionally, the majority of participants at site 1 and site 2 reported that the healthfulness of a food is important when choosing foods. The majority of participants at site 1 and site 2 indicated that they want to comply with their health care providers recommendations regarding foods; however, about half of site 1 participants and two-thirds of site 2 participants reported not knowing what their health care provider thought about soy milk. This indicates that education about the benefits of soy delivered by medical professionals and WIC nutritionists could increase the percentage of Champaign County WIC participants who consume soy milk.

Although participants had positive beliefs about soy milk and its health benefits, the median for environmental beliefs was low. This indicates that although WIC participants sampled had positive views towards soy, there were factors related to their environments that limited their capacity to consume soy milk. In addition to questions addressing to environmental factors such as influencing soy milk consumption that were included in the survey used, there were two substantial environmental burdens to the procurement of soy milk using WIC vouchers in Illinois at the time of this study. Only one brand of soy milk, 8th Continent Original, was WIC-approved. This creates an environmental barrier for participants who have access to

smaller grocers who sell do not carry a variety of soy milk brands. In addition to the restrictive nature of the soy milk voucher itself, a physician's authorization was required to purchase soy milk rather than cow's milk in the state. Criteria to for physician's approval included vegan diet or religious observance, milk protein allergy, or severe lactose maldigestion in which participants cannot tolerate lactose free milk. This creates an additional barrier for a WIC participant who wishes to use soy milk but has limited access to healthcare or do not meet the specific criteria necessary to qualify for soy milk vouchers. Although Theory of Planned Behavior constructs were positively correlated with intention, these correlations are less predictive of soy milk intake when considering the barriers related to the procurement of soy milk vouchers.

In this study of WIC participants' consumption of fruits and vegetables, intake met the national recommendation in both the FM voucher and the non-FM voucher group. However, the FM voucher group did have more positive psychosocial indicators of fruit and vegetable intake. This could imply that while both groups are currently eating the same number of servings of fruit and vegetables, the FM voucher group may be getting a more varied intake of these foods. Higher variation in vegetable intake in the FM voucher group is supported by the statistically higher number of FM voucher respondents that ate more than one type of vegetable daily. Greater variation in fruits and vegetables is a recommendation per the Dietary Guidelines for Americans and increases the diversity of phytonutrients in an individual's diet. More positive psychosocial predictors of fruit and vegetable intake among participants in the FM voucher group points to a trend that the FMNP is an effective intervention to increase the variety of fruits and vegetables in WIC participants' diets. Although this study did find that the cost of fruits and vegetables sold at farmers' markets is for the most part higher than the cost at grocery stores, the provision of FM vouchers helped mediate this cost. Also, the value of the FMNP cannot be

assessed in terms of mere fruit and vegetable provision; it is to be viewed as an intervention to strengthen antecedents to positive nutritional habits.

Although soy milk intake was low and fruit and vegetable intake was adequate, both studies indicate a value in behavior theory based nutrition interventions for WIC participants. This is of exceptional importance as the program has foundations in nutrition education and referrals in addition to supplemental food. Education regarding soy milk founded in TPB constructs could improve calcium and protein intake in participants. However, barriers related to voucher procurement and brand restrictions must be addressed for WIC participants to experience these benefits. Additionally, participation in the FMNP could improve the nutrition of WIC participants by enhancing the variety of fruits and vegetables in their diets.

Additional research is needed that examines barriers to the procurement of WIC vouchers and usage of services. A better understanding of factors that prohibit participants from experiencing the full benefit of the WIC program could provide basis for education that helps mediate these barriers. Additionally, increased knowledge of variables prohibiting the use of WIC vouchers and services can guide future legislation dictating criteria for WIC vouchers and structuring programs aimed at increasing nutritional status of participants.

Appendix A

Soy Milk Informed Consent to Participate in Research

Information About WIC Mothers Consumption of Soymilk

Dr. Karen Chapman-Novakofski is doing this research. She works at the University of Illinois. She is in the Department of Food Science and Human Nutrition.

She is doing this research to see if WIC moms drink soy milk. She wants to know what they think about soy milk. She also wants to know what they think about some other soy foods. Some WIC clinics have soy milk or soy foods on their approved food lists. This research could help find out if that is something Illinois WIC moms would want or not.

You do not have to complete the survey if you do not want to. You can stop taking the survey at any time. That will not affect your WIC eligibility or benefits. The decision to participate, decline, or withdraw from participation will have no effect on any possible current or future relations with the University of Illinois.

The survey has 49 questions. It will take you about 10 to 15 minutes, maybe longer to complete. You can complete the survey at the clinic. You can also complete it at home and return it to the clinic later. The date it has to be back at the clinic is on the first page of the survey. When you turn your survey in to the clinic, they will take the last page off. This is the information to enter you in a drawing. The drawing is to offer something in return for your time and information. There will be 10 drawings in Champaign County and 5 drawings in Marion County (2 at the Salem site and 3 at the Centralia site). The winners will get \$50 by registered mail. The odds of your name being drawn depends on the number of entries within a 3 month time period. After 3 months, the study will be over.

When the last page is taken off the survey, there will be no other marks on the survey to identify you. The information from the survey may be published as group data in a nutrition journal. You could not be specifically identified in the paper.

You can only complete the survey one time. You can only be entered in the drawing one time. You have to be 18 to complete the survey or be in the drawing.

You do not have to answer all the questions if they confuse you or make you uncomfortable. If you have a question, you can call Dr. Karen Chapman-Novakofski at 217-244-2852 or email her at kmc@illinois.edu. If you have any questions about your rights as a participant in this study, please contact the University of Illinois Institutional Review Board at 217-333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

This paper is yours to keep.

Appendix B

Soy Milk Survey Used in Research

Soy Milk Use

Date to be returned by:

Please complete this survey only 1 time.

TELL ME ABOUT YOURSELF.....

How old are you?	Years	
Do you do the grocery shopping for yourself and/or household?	Yes	No
Do you do most of the cooking for yourself and/or household?	Yes	No
Are you vegetarian?	Yes	No
Are you allergic to soy foods that you know of?	Yes	No
Are any of your children allergic to soy that you know of?	Yes	No
Do you think soy milk is an approved WIC food?	Yes	No
Are your children enrolled in WIC?	Yes	No
Are you enrolled in WIC?	Yes	No
If yes, Are you a prenatal client (pregnant)? Are you postpartum (child has been born)? Are you breastfeeding?	Yes Yes Yes	No No No

TELL ME WHAT YOU EAT.....

GENERAL INSTRUCTIONS

For questions asking how often you eat or drink something, Please mark your answer with a check mark in the most appropriate space.

For example, if you always eat whole grain cereal, but only eat cereal on Sundays of summer months, you would answer:

I consume whole grain cereal

_____	Most days
_____	About once a week
_____	2-3 times a month
_____	Once a month
___√___	Several times a year
_____	Rarely
_____	Never

If you don't eat whole grain cereal unless it is on sale, you would answer:

I consume whole grain cereal

_____	Most days
_____	About once a week
_____	2-3 times a month
_____	Once a month
_____	Several times a year
___√___	Rarely
_____	Never

- This is about how often you eat soy. If you do not remember, use your "best guess".

1. I eat tofu

_____ Most days
_____ About once a week
_____ 2-3 times a month
_____ Once a month
_____ Several times a year
_____ Rarely
_____ Never
_____ I do not know what this food is

2. I drink soy milk

_____ Most days
_____ About once a week
_____ 2-3times a month
_____ Once a month
_____ Several times a year
_____ Rarely
_____ Never
_____ I do not know what this food is

3. I eat soy veggie burgers or soy hot dogs

_____ Most days
_____ About once a week
_____ 2-3times a month
_____ Once a month
_____ Several times a year
_____ Rarely
_____ Never
_____ I do not know what this food is

4. I eat soy baked products (such as soy muffins or soy cookies)

_____ Most days
_____ About once a week
_____ 2-3 times a month
_____ Once a month
_____ Several times a year
_____ Rarely
_____ Never
_____ I do not know what this food is

5. I eat edamame (green soybeans)

- _____ Most days
- _____ About once a week
- _____ 2-3 times a month
- _____ Once a month
- _____ Several times a year
- _____ Rarely
- _____ Never
- _____ I do not know what this food is

TELL ME WHAT YOU THINK ABOUT SOY.....

- The following statements are related to your opinion about the taste and texture of soy milk.

GENERAL INSTRUCTIONS

The questions in this survey have a range of seven answers. You should check above the place that best describes your answer.

For example, if you are asked to rate "The taste of whole grain", the seven possible answers are as follows:

The taste of whole grain is

_____	_____	_____	_____	_____	_____	_____
Extremely	Very	Slightly	Neither	Slightly	Very	Extremely
Bad	Bad	Bad		Good	Good	Good

If you think the taste of whole grain is extremely good, then you would mark as follows:

The taste of whole grain is

_____	_____	_____	_____	_____	_____	_____ <u>X</u> _____
Extremely	Very	Slightly	Neither	Slightly	Very	Extremely
Bad	Bad	Bad		Good	Good	Good

If you don't know and have no opinion, mark the following

I have never tried and have no opinion _____ X _____.

You may or may not have an opinion if you have never tried these foods.

1. The taste of soy milk is:

_____	_____	_____	_____	_____	_____	_____
Extremely Unpleasant	Very Unpleasant	Slightly Unpleasant	Neither	Slightly Pleasant	Very Pleasant	Extremely Pleasant

I have never tried and have no opinion _____.

2. The feel of soy milk in my mouth is

_____	_____	_____	_____	_____	_____	_____
Extremely Unpleasant	Very Unpleasant	Slightly Unpleasant	Neither	Slightly Pleasant	Very Pleasant	Extremely Pleasant

I have never tried and have no opinion _____.

-
- The following statements are related to your opinion about soy milk and health.

1. Soy milk may cause stomach upsets (such as diarrhea or bloating).

_____	_____	_____	_____	_____	_____	_____
Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree

I have no idea _____.

2. Soy milk is a healthy food.

_____	_____	_____	_____	_____	_____	_____
Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree

I have no idea _____.

3. In choosing foods, the healthfulness of food is important.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

4. In choosing foods, the price of food is important.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

-
- The following statements are related to how people around you may think about soy milk.

1. Most health experts (doctor, pharmacist, or nutritionist) think I should consume more soy milk.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

2. In particular, my health care providers (doctor, pharmacist, nutritionist) think I should consume more soy milk.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no current health care provider _____.

3. My family or the people in my household think I should consume more soy milk.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

4. Generally speaking, I want to do what most health professionals think I should do concerning foods.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

5. Generally speaking, I want to do what my health care provider in particular thinks I should do concerning my diet and the food I eat.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

6. Generally speaking, I want to do what my family or people in my household think I should do concerning my diet and the food I eat.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

The following statements are related to shopping and consumption of soy milk.

1. During the next month, I will (or will ask the food shopper in my home to) buy soy milk.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

2. During the next month, I intend to consume soy milk more often than now.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

3. In general, I believe that soy milk is more expensive than other foods.

_____	_____	_____	_____	_____	_____	_____
Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree

I have no idea _____.

4. Generally, the price of soy milk would make it _____ for me to purchase more soy milk.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

5. The availability of soy milk would make it _____ for me to consume more soy products.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

6. I often feel that there is not enough soy milk available in the market.

_____	_____	_____	_____	_____	_____	_____
Strongly Disagree	Disagree	Slightly Disagree	Neither	Slightly Agree	Agree	Strongly Agree

I have no idea _____.

7. During the next month, I intend to buy soy milk more often than now.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

I have no idea _____.

8. During the next month, I intend to use soy milk in recipes more often than now.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

I have no idea _____.

- Please indicate your opinion of the following statements.

1. What I know about the benefits of soy would make it _____ for me to consume more soy milk.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

2. Having soy recipes would make it _____ for me to consume more soy milk.

_____	_____	_____	_____	_____	_____	_____
Extremely Unlikely	Quite Unlikely	Slightly Unlikely	Neither	Slightly Likely	Quite Likely	Extremely Likely

3. I often feel that I do not know much about the health benefits of soy milk in particular.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

4. I often feel I do not know enough about cooking with soy milk.

_____		_____		_____		_____		_____		_____		_____
Strongly		Disagree		Slightly		Neither		Slightly		Agree		Strongly
Disagree				Disagree				Agree				Agree

I have no idea _____.

The following questions are about you.

In consider my ethnicity/race to be mostly (check 1)

_____ African-American
_____ Caucasian
_____ Hispanic/Latino
_____ Asian
_____ Native American

My gender is

_____Male _____Female

The last grade of school I attended is (check 1):

_____less than high school
_____high school
_____currently in college
_____more than college

Thank you for completing this questionnaire.

Place your survey in the box labeled Completed Soy Milk Survey

To be entered in the drawing, **remove this sheet from the survey.** Place your survey in the box labeled **Completed Soy Milk Survey.**

Complete the following and place this sheet in the container labeled

Soy Milk Survey Entry

Please print clearly.

Name:

Address:

Phone or email:

If you choose not to be entered in the drawing, leave blank or do not place in drawing entry container.

Only 1 entry per person.

Appendix C

Fruits and Vegetables

Expert Content Reviewer Information Sheet and Evaluation Form

Dear Expert Content Reviewer:

This project aims to determine the intake of fruits and vegetables and factors influencing that intake in an anonymous convenience sample of WIC participants in Central Illinois. The purpose of this research is to gain information about the baseline fruit and vegetable intake in Champaign County and examine the effect of the Farmers' Market Nutrition Program on fruit and vegetable consumption. The surveys will be available for 3 months and a research assistant will be present at the WIC facility during the week to recruit participants and answer questions about the survey if necessary. The 3 month collection period reflects the approximate time between client visits. This timing will allow for few repeat survey takers, and maximize the reach to all available clients. Participants who choose to enter the drawing will write their name and address on the last page of the survey, an entry page, and tear it off and submit it the raffle box. Participation in this research is voluntary. Participants may discontinue filling out the survey at any time. This study is confidential. No identifying information will be associated with the survey and data collection will be classified by numerical code.

The survey questions were developed from a review of the literature in this area, and questions reflect previous research. Specifically, questions 1 through 8 were taken from the Food Stamp Program Fruit and Vegetable Checklist (Sylva et al, 2006); 9 through 20 from the Fruit and Vegetable Inventory (Townsend et al, 2005/2007). Questions 21, 23-28, 33-38 were taken from the Food Stamp Program Fruit and Vegetable Checklist (Holben, 2005) and questions 22, 29-32, and 39 were newly developed to specifically look at voucher use.

Do the questions provide for enough information without participant burden, concerning their fruit and vegetable intake?

Should any questions be changed or deleted?

Should any questions be added?

Do the questions provide for enough information, without participant burden, concerning their personal, behavioral and environmental aspects of their fruit and vegetable intake?

Should any questions be changed or deleted?

Should any questions be added?

Do the questions provide for enough information, without participant burden, concerning their Farmer's Market activity concerning fruit and vegetables?

Should any questions be changed or deleted?

Should any questions be added?

Additional comments:

Appendix D

Fruits and Vegetables Survey with Social Cognitive Theory Constructs Defined

Fruit and Vegetables

Please complete this survey only 1 time.

TELL ME ABOUT YOURSELF...

How old are you?	Years	
Do you do the grocery shopping for yourself and/or household?	Yes	No
Do you do most of the cooking for yourself and/or household?	Yes	No
Are your children enrolled in WIC?	Yes	No
Are you enrolled in WIC?	Yes	No
If yes, Are you a prenatal client (pregnant)? Are you postpartum (child has been born)? Are you breastfeeding?	Yes Yes Yes	No No No

DQ-SM

Please circle the answer to these questions about the fresh, frozen, and canned fruits and vegetables you eat.

1. Do you eat more than one kind of fruit a day? (Circle only one)
Never Sometimes Always Often
BR-FVCL
2. How many servings of fruits do you eat each day? Number _____
BR-FVCL
3. Do you eat fruit as snacks? Yes No
BV-FVCL
4. During the last week, did you have citrus fruit (such as orange or grapefruit) or citrus juice? Yes No
BR-FVCL
5. Do you eat more than one kind of vegetable a day? (Circle only one)
Never Sometimes Always Often
BR-FVCL
6. Do you eat 2 or more servings of vegetables at your main meal? (Circle only one.)
Never Sometimes Always Often
BR-FVCL
7. How many servings of vegetables do you eat each day? Number _____
BR-FVCL
8. Do you eat vegetables as snacks? Yes No
BR-FVCL

Please indicate your opinions of the following statements.

9. I feel that I am helping my body when I eat fruits and vegetables.
Agree Disagree No Opinion
PS-FVI
10. I may develop health problems if I do not eat fruits and vegetables.
Agree Disagree No Opinion
PS-FVI

11. I feel that I can eat fruit or vegetables as snacks.
 Agree Disagree No Opinion
 PS-FVI
12. I feel that I can buy more vegetables the next time that I shop.
 Agree Disagree No Opinion
 PS-FVI
13. I feel that I can plan meals or snacks with more vegetables during the next week.
 Agree Disagree No Opinion
 PS-FVI
14. I feel that I can plan meals or snacks with more fruit during the next week.
 Agree Disagree No Opinion
 PS-FVI
15. I feel that I can eat two or more servings of vegetables at dinner.
 Agree Disagree No Opinion
 PS-FVI
16. I feel that I can plan meals with more vegetables during the next week.
 Agree Disagree No Opinion
 PS-FVI
17. I feel that I can add extra vegetables to casseroles and stews.
 Agree Disagree No Opinion
 PS-FVI
18. How would you describe your diet?
 Excellent Very Good Good Fair Poor
 PS-FVI
19. Mark one...
 _____ I am not thinking about eating more fruit.
 _____ I am thinking about eating more fruit... planning to start in the next 6 months.
 _____ I am definitely planning to eat more fruit in the next month.
 _____ I am trying to eat more fruit now.
 _____ I am already eating 3 or more servings of fruit a day.
 PS-FVI

20. Mark one...
- _____ I am not thinking about eating more vegetables.
- _____ I am thinking about eating more vegetables... planning to start in the next 6 months.
- _____ I am definitely planning to eat more vegetables in the next month.
- _____ I am trying to eat more vegetables now.
- _____ I am already eating 3 or more servings of vegetables a day.
- PS-FVI

The next questions are about the WIC Farmers' Market Nutrition Program. If you received farmers' market coupons this year, please answer the following questions about your participation the program.

21. Did you receive farmers' market coupons in 2011? Yes No
- EV-FM

22. If farmers' market coupons were available in 2012, Yes No
would you use them?
- EV-NV

If yes, please answer the following questions about your experience with the coupons. If you did not receive the farmers' market coupons in 2011, you are finished with this survey.

23. Before receiving the farmers' market coupons, had Yes No
you ever shopped at a farmers' market?
- EV-FM
24. Did the Farmers' Market Nutrition Program coupons Yes No
provide enough fresh produce for you and your family?
- EV-FM
25. "I threw away excess food from the farmers' market." Yes No
- EV-FM
26. "I sold excess food from the farmers' market." Yes No
- EV-FM
27. "I traded excess food from the farmers' market." Yes No
- EV-FM
28. "I gave away excess food from the farmers' market." Yes No
- EV-FM
29. "I ate more fruits and vegetables because I had Yes No
farmers' market vouchers than I do when I do not have
farmers' market vouchers.
- EV-NV

- | | | | |
|-----|--|--------------|----|
| 30. | I ate less fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers." | Yes | No |
| | EV-NV | | |
| 31. | I ate the same amount of fruits and vegetable because I had farmers' market vouchers than I do when I do not have farmers' market vouchers." | Yes | No |
| | EV-NV | | |
| 32. | I intend to eat more fruits and vegetables after my experience with the farmers' market. | Yes | No |
| | EV-NV | | |
| 33. | "I was satisfied with the foods available at the farmer's market." | Yes | No |
| | EV-FM | | |
| 34. | "I was satisfied with the location of the farmers' market." | Yes | No |
| | EV-FM | | |
| 35. | "I could often not get to the farmers' market because I did not have transportation." | Yes | No |
| | EV-FM | | |
| 36. | "I could not get to the farmers' market on the days and the times that it was open." | Yes | No |
| | EV-FM | | |
| 37. | How many coupon books did your receive? | Number _____ | |
| | EV-FM | | |
| 38. | How many coupon books did you turn in for food? | Number _____ | |
| | EV-FM | | |
| 39. | Which farmers' market did you go to most of the time? | | |

North First Street, Champaign WIC Parking Lot Lincoln Square, Urbana

EV-NV

The following questions are about you.

40. In consider my ethnicity/race to be mostly (check 1)

☐ African-American

☐ Caucasian

☐ Hispanic/Latino

☐ Asian

☐ Native American

DQ-SM

41. My gender is

☐ Male ☐ Female

DQ-SM

42. The last grade of school I attended is (check 1):

☐ less than high school

☐ high school

☐ currently in college

☐ more than college

DQ-SM

Thank you for completing this questionnaire.

Key:

Construct

DQ: Demographics Questionnaire

PS: Personal

BR: Behavior

EV: Environmental

Original Surveys

SM: Soy Milk

FVI: Fruit and Vegetable Inventory

FVCL: Fruit and Vegetable Checklist

FM: WIC Food and Nutrition Survey 2005

NV: Novel Question

References

References

1. Rah J, et al. Women's perspectives and consumption behavior of soy products: Application of the Theory of Planned Behavior. 2002.
2. Townsend MS. Fruit and Vegetable Inventory. 2005/2007
<http://ucanr.org/sites/CEprogramevaluation/files/113712.pdf> Accessed on October 1, 2011.
3. Sylva K, Townsend MS, Marin A, Metz D. Food Stamp Program Fruit and Vegetable Checklist. 2006. http://townsendlab.ucdavis.edu/PDF_files/FV/FSP_FV_InstructGuide.pdf Accessed on April 7, 2012.
4. Holben, D. WIC Food and Nutrition Survey 2005.
5. Wheeler, A. Fruits and Vegetables Survey 2012

Appendix E

Fruits and Vegetables Informed Consent for Face Validity and Reliability Testing

Information about WIC Mothers Consumption of Fruits and Vegetables

Dr. Karen Chapman-Novakofski is doing this research. She works at the University of Illinois. She is in The Department of Food Science and Human Nutrition.

She is doing this research to see if WIC moms eat fruits and vegetables. She wants to know what they think about fruits and vegetables. She also wants to know about the WIC farmers' market vouchers. She wants to know if WIC moms used the vouchers and if it helped them to eat fruits and vegetables.

Before we do this, we want to see if our survey makes sense. We are asking you to take this survey about fruits and vegetables and farmers market vouchers and let us know if all of the questions make sense. We want you to fill out this survey and circle any difficult-to-read words and mark sentences that are unclear.

We also need to know if these are good questions. To find this out, we will ask you to do the survey two times. The second time, you do not need to circle words. You will take it once and then take it again in three weeks. If you complete the survey twice, you will receive a gift card for \$20. We will be at WIC on May __ and __ or June __ for follow up questionnaires and payments.

You do not have to complete this survey if you do not want to. You can stop taking the survey at any time. That will not affect your WIC eligibility or benefits. The decision to participate, decline, or withdraw from participation will have no effect on any possible current or future relations with the University of Illinois.

The survey has 48 questions. It will take you about 10 minutes, maybe longer to complete. You can complete the survey at the clinic. You can also complete it at home and return it to the clinic later. The date it has to be back at the clinic is on the first page of the survey. Your participation in the project is confidential.

You can only complete the survey one time. You have to be 18 to complete the survey or be in the drawing.

You do not have to answer all the questions if they confuse you or make you uncomfortable. If you have a question, you can call Dr. Karen Chapman-Novakofski at (217) 244-2852 or email her at kmc@illinois.edu. If you have any questions about your rights as a participant in this study, please contact the University Of Illinois Institutional Review Board at (217) 333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

This paper is yours to keep.

Appendix F

Fruits and Vegetables
Reminder Postcard for Reliability Retest

WIC Fruits and Vegetables Survey Reminder



Come claim your \$20 Walmart gift card!

This is your reminder to come in and take the Fruit and Vegetables survey a second time and receive your \$20 Walmart gift card reward. The WIC clinic is closed Monday, May 28, for Memorial Day, but we will be at the Champaign WIC office at the following times:

Tuesday (5/29): 1:00-5:30

Thursday (5/31) : 8:00-12:00

Wednesday (5/30): 8:30-12:00

Friday (6/1): 1:00-4:00

Please call Ashley at (217) 419-9715 if you have any questions or would like to schedule a different time to complete your second fruit and vegetables survey. Thanks!



RE: Ashley Wheeler

University of Illinois
238 Bevier Hall
905 S. Goodwin Ave
Urbana, IL
61801

Please
place
stamp
here



Appendix G

Fruits and Vegetables Informed Consent to Participate in Research

Information about WIC Mothers Consumption of Fruits and Vegetables

Dr. Karen Chapman-Novakofski is doing this research. She works at the University of Illinois. She is in the Department of Food Science and Human Nutrition.

She is doing this research to see if WIC moms eat fruits and vegetables. She wants to know what they think about fruits and vegetables. She also wants to know about the WIC farmers' market vouchers. She wants to know if WIC moms used the vouchers and if it helped them to eat fruits and vegetables.

You do not have to complete this survey if you do not want to. You can stop taking the survey at any time. That will not affect your WIC eligibility or benefits. The decision to participate, decline, or withdraw from participation will have no effect on any possible current or future relations with the University of Illinois.

The survey has 48 questions. It will take you about 10 minutes, maybe longer to complete. You can complete the survey at the clinic. You can also complete it at home and return it to the clinic later. The date it has to be back at the clinic is on the first page of the survey.

When you turn your survey in to the clinic, you will take the last page off. This is the information to enter you in a drawing. The drawing is to offer something in return for your time and information. There will be 10 drawings. Winners will get ___ by registered mail. The odds of your name being draw depend on the number of entries within a 3 month time period. After 3 months, the study will be over.

When the last page is taken off the survey, there will be no other marks on the survey to identify you. The information from the survey may be published as group data in a nutrition journal. You could not be specifically identified in the paper.

You can only complete the survey one time. You can only be entered in the drawing one time. You have to be 18 to complete the survey or be in the drawing. You do not have to answer all the questions if they confuse you or make you uncomfortable. If you have a question, you can call Dr. Karen Chapman-Novakofski at (217) 244-2852 or email her at kmc@illinois.edu. If you have any questions about your rights as a participant in this study, please contact the University Of Illinois Institutional Review Board at (217) 333-2670 (collect calls will be accepted if you identify yourself as a research participant) or via email at irb@illinois.edu.

This paper is yours to keep.

Appendix H

Fruits and Vegetables Survey Used in Research

Fruit and Vegetables

Please complete this survey only 1 time.

TELL ME ABOUT YOURSELF...

How old are you?	Years	
Do you do the grocery shopping for yourself and/or household?	Yes	No
Do you do most of the cooking for yourself and/or household?	Yes	No
Are your children enrolled in WIC?	Yes	No
Are you enrolled in WIC?	Yes	No
If yes, Are you a prenatal client (pregnant)? Are you postpartum (child has been born)? Are you breastfeeding?	Yes Yes Yes	No No No

The following questions are about you.

1. In consider my ethnicity/race to be mostly (check 1)

_____ African-American

_____ Caucasian

_____ Hispanic/Latino

_____ Asian

_____ Native American

2. My gender is

_____ Male _____ Female

3. The last grade of school I attended is (check 1):

_____ less than high school

_____ high school

_____ currently in college

_____ more than college

Please circle the answer to these questions about the fresh, frozen, and canned fruits and vegetables you eat.

4. Do you eat more than one kind of fruit a day? (Circle only one)

Never

Sometimes

Always

Often

5. How many servings of fruits do you eat each day?

Number _____

6. Do you eat fruit as snacks?

Yes

No

7. During the last week, did you have citrus fruit (such as orange or grapefruit) or citrus juice?

Yes

No

8. Do you eat more than one kind of vegetable a day? (Circle only one)
- Never Sometimes Always Often
9. Do you eat 2 or more servings of vegetables at your main meal? (Circle only one.)
- Never Sometimes Always Often
10. How many servings of vegetables do you eat each day? Number _____
11. Do you eat vegetables as snacks? Yes No

Please indicate your opinions of the following statements.

12. I feel that I am helping my body when I eat fruits and vegetables.
- Agree Disagree No Opinion
13. I may develop health problems if I do not eat fruits and vegetables.
- Agree Disagree No Opinion
14. I feel that I can eat fruit or vegetables as snacks.
- Agree Disagree No Opinion
15. I feel that I can buy more vegetables the next time that I shop.
- Agree Disagree No Opinion
16. I feel that I can plan meals or snacks with more vegetables during the next week.
- Agree Disagree No Opinion
17. I feel that I can plan meals or snacks with more fruit during the next week.
- Agree Disagree No Opinion
18. I feel that I can eat two or more servings of vegetables at dinner.
- Agree Disagree No Opinion
19. I feel that I can plan meals with more vegetables during the next week.
- Agree Disagree No Opinion

20. I feel that I can add extra vegetables to casseroles and stews.

Agree

Disagree

No Opinion

21. How would you describe your diet?

Excellent

Very Good

Good

Fair

Poor

Mark one...

22.

_____ I am not thinking about eating more fruit.

_____ I am thinking about eating more fruit... planning to start in the next 6 months.

_____ I am definitely planning to eat more fruit in the next month.

_____ I am trying to eat more fruit now.

_____ I am already eating 3 or more servings of fruit a day.

23. Mark one...

_____ I am not thinking about eating more vegetables.

_____ I am thinking about eating more vegetables... planning to start in the next 6 months.

_____ I am definitely planning to eat more vegetables in the next month.

_____ I am trying to eat more vegetables now.

_____ I am already eating 3 or more servings of vegetables a day.

The next questions are about the WIC Farmers' Market Nutrition Program. If you received farmers' market coupons this year, please answer the following questions about your participation the program.

24. Did you receive farmers' market coupons in 2011?

Yes

No

25. If farmers' market coupons were available in 2012, would you use them?

Yes

No

If you answered yes to question 24, please answer the following questions about your experience with the coupons. *If you did not receive the farmers' market coupons in 2011, you are finished with this survey.*

26.	Before receiving the farmers' market coupons, had you ever shopped at a farmers' market?	Yes	No
27.	Did the Farmers' Market Nutrition Program coupons provide enough fresh produce for you and your family?	Yes	No
28.	"I threw away excess food from the farmers' market."	Yes	No
29.	"I sold excess food from the farmers' market."	Yes	No
30.	"I traded excess food from the farmers' market."	Yes	No
31.	"I gave away excess food from the farmers' market."	Yes	No
32.	"I ate more fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers."	Yes	No
33.	I ate less fruits and vegetables because I had farmers' market vouchers than I do when I do not have farmers' market vouchers."	Yes	No
34.	I ate the same amount of fruits and vegetable because I had farmers' market vouchers than I do when I do not have farmers' market vouchers."	Yes	No
35.	I intend to eat more fruits and vegetables after my experience with the farmers' market.	Yes	No
36.	"I was satisfied with the foods available at the farmer's market."	Yes	No
37.	"I was satisfied with the location of the farmers' market."	Yes	No

38. "I could often not get to the farmers' market because I did not have transportation." Yes No
39. "I could not get to the farmers' market on the days and the times that it was open." Yes No
40. How many coupon books did your receive? Number _____
41. How many coupon books did you turn in for food? Number _____
42. Which farmers' market did you go to most of the time?

North First Street, Champaign WIC Parking Lot Lincoln Square, Urbana

Thank you for completing this questionnaire.